

EXERCISES

4.1. Analyze published papers

- A. Evaluate the papers you are reading. Which story structure do they use? Where are the OCAR elements? Are they effective?
- B. Pick a proposal. Analyze it in the same way.
- C. Go back to chapter 2 and the exercise I asked you to do to start writing a short piece. Look at those questions. Notice that I was asking you to define your OCAR elements.

4.2. Write a short article

Go back and evaluate your short article. Repeat the analysis you did on the pieces above. What story structure did you use? Was it appropriate for your intended audience? Did you have the OCAR elements in place?

If you (or your writing group members) feel that you haven't effectively developed the OCAR elements, go back and rewrite the piece to more powerfully emphasize those elements. Make sure that your opening, challenge, and resolution sections are clear and effective.

The Opening

The most important sentence in any article is the first one.

—WILLIAM ZINSSER, *On Writing Well*

Initial impressions are strong and lasting. Your first words have great leverage, making the beginning of a paper a "power position." You must use that power to accomplish three goals: identify the problem that drives the research, introduce the characters, and target an audience. If you're clever, you can foreshadow the challenge and even the conclusions. By establishing the paper's focus and tone, the opening identifies your intended audience—whom do you want to read your work and how do you want them to think about it?

You must start well. Your first sentences get readers moving and set the direction; you establish their expectations and generate momentum. If you start in one direction and then abruptly switch, readers get mental whiplash as they try to follow. Potentially worse, if the opening is unclear and doesn't go in *any* direction, they will sit twiddling their thumbs, waiting to figure out where to go.

The opening begins with a single sentence but typically encompasses the first paragraph, and sometimes several more. In a short paper or one for a narrow audience of experts, you can quickly remind people of a problem they already know. When you target a broader audience, one made up of people

who hold different schemas than you do, you may need a longer and more complex opening.

5.1. EXAMPLES OF GOOD OPENINGS

Here are openings from different areas of science. The fundamental question for each is: does it achieve the three goals? Is it clear what the paper is about? Does it frame the problem? Does it introduce the critical characters? Read the openings and answer these questions, before going on to my analysis. Do you agree with my assessment?

This first example is from a synthesis paper I wrote reevaluating our understanding of how nitrogen (N) is processed in soil.

Example 5.1

Since the late 1800s, N mineralization has been the perceived center point of the soil N cycle and the process that controls N availability to plants.¹

The key word in this sentence is *perceived*, a distinctive and unusual word that draws your attention. Clearly, this paper is going to challenge that perception. Additionally, there is going to be a historical element—evaluating how the perception has changed since the late 1800s.

The second example is from a study evaluating whether giving pregnant women supplemental folic acid may cause their children to develop asthma.

Example 5.2

Current public health guidelines in the United States, the United Kingdom, and Australia recommend that women consume a supplemental dose of 400 µg of folic acid per day in the month preceding and during the first trimester of pregnancy to reduce the risk of neural tube defects in children.²

Can you imagine that this paper is *not* going to challenge that 400 µg recommendation? That sentence doesn't give the grounds for challenging it, but because the title of the article highlights childhood asthma, you can infer the entire story: folic acid supplements during pregnancy may increase the risk of childhood asthma.

In these first two examples, the opening sentences are dramatic and launch quickly into the story. Frequently, however, openings require several steps to develop the issue, as illustrated in a paper on geomorphology that analyzed how

1. J. P. Schimel and J. Bennett, "Nitrogen Mineralization: Challenges of a Changing Paradigm," *Ecology* 85 (2004): 591–602.

2. M. J. Whitrow, V. M. Moore, A. R. Rumbold, and M. J. Davies, "Effect of Supplemental Folic Acid in Pregnancy on Childhood Asthma: A Prospective Birth Cohort Study," *American Journal of Epidemiology* (2009).

the size of the sediment particles created during erosion affect their abrasive properties and how fast they cut a river channel.

Example 5.3

The topography of mountainous landscapes is created by the interaction of rock uplift and erosion. River incision into bedrock is the key erosional process that controls the rate of landscape response to changes in rock uplift rate and climate.³

Clearly this paper is going to evaluate river incision ("the key erosional process"), but developing that point required two sentences. The first frames the focus of the story: the topography of mountainous landscapes, something many people find interesting. It also introduces the key character of erosion. The second sentence picks up the idea of erosion and develops a specific focus: river incision. It would have been hard to get all that into a single sentence, so the authors used an initial "positioning sentence" from which they could launch to make their specific point.

Sometimes the opening needs to be longer and can include the entire first paragraph. Example 5.4 is from materials chemistry and explores how the molecular structure of organic polymers affects their potential as semiconductors. In this example, I include the first and last sentence of the opening paragraph.

Example 5.4

Conjugated polymers are novel materials that combine the optoelectronic properties of semiconductors with the mechanical properties and processing advantages of plastics. . . . Thus, conjugated polymers offer the possibility for use in devices such as plastic LEDs, photovoltaics, transistors, and in completely new applications such as flexible displays.⁴

The first sentence frames the overall topic of the story—conjugated polymers are going to be exciting new materials for developing plastic optoelectronic materials. That is highlighted and made concrete in the last sentence, which describes devices that might be made. Whereas the opening sentence deals in abstractions, the last one sets the story in concrete terms—real applications. From this, we can infer that the rest of the paper is going to be about how to perfect the polymers so that they can be used to produce these devices.

3. L. S. Sklar and W. E. Dietrich, "Sediment and Rock Strength Controls on River Incision into Bedrock," *Geology* 29 (2001): 1087–90.

4. B. J. Schwartz, "Conjugated Polymers as Molecular Materials: How Chain Conformation and Film Morphology Influence Energy Transfer and Interchain Interactions," *Annual Review of Physical Chemistry* 54 (2003): 141–72.

5.2. BAD OPENINGS

The foregoing were all examples of effective openings. They vary in length, but all identify a problem of broad interest and give the reader a sense of where the story is going. But they raise the obvious question: how do you write an *ineffective* opening? Since the opening is supposed to provide direction about where the story is going, there are two obvious ways to fail: provide either misdirection or no direction.

5.2.1. Misdirection

An example of misdirection comes from a paper I wrote; this isn't terrible, but it could have been better. I analyzed the processes that control how much methane (CH_4 , an important greenhouse gas) is released from tundra soils of the Alaskan Arctic. Bacteria known as methanogens produce the CH_4 , but then plants transport it out of the soil through their roots. Here is the first paragraph and the first sentence of the second paragraph.

Example 5.5

Plants are a critical control of CH_4 dynamics in wetland ecosystems. They supply C [carbon] to the soil methanogenic community both through production of soil organic matter, and as fresh exudates and residues. Fresh plant material may be an important CH_4 precursor even in an organic matter-rich peat soil. Strong correlations between net primary productivity and system-level CH_4 fluxes across a wide range of ecosystems highlight the importance of plant C inputs.

Vascular plants, however, also transport CH_4 out of soil and sediment, effectively bypassing the aerobic zone of CH_4 oxidation.⁵

Why is this misdirection? The first paragraph introduces plants as the central character of the story and argues that they control CH_4 fluxes. That is accurate. But the first paragraph develops a story about how plants control CH_4 by feeding carbon to methanogens, and a reader would likely assume that is what the whole paper is about. That is inaccurate, which you realize once you begin the second paragraph. It opens by introducing a new mechanism—plants transport CH_4 out of the soil. That cuts the readers adrift and leaves them momentarily wondering: was the opening paragraph a false lead, highlighting what we thought the mechanism was, but that I will contradict—so the paper is going to be about transport? Or am I introducing an additional mechanism—so the paper will be about both? I started in one direction, but then struck out in a different one; that is misdirection, and it's confusing.

5. J. P. Schimel, "Plant Transport and Methane Production as Controls on Methane Flux from Arctic Wet Meadow Tundra," *Biogeochemistry* 28 (1995): 183–200.

I could have written this better and avoided any potential confusion by changing the first sentence, making it a broader positioning statement. "Plants control CH_4 dynamics in wetland ecosystems by two mechanisms. The first is to supply C to the soil methanogenic community . . ." This would have let you know that the paper is about both mechanisms and might imply that it evaluates the balance between them. It signals that the next sentences or paragraphs will identify and describe those mechanisms. Even though the first paragraph is about substrate supply, you would know that there is more coming, so the second paragraph would not feel like it was changing direction but completing the direction I had started.

Fixing this opening involved an almost trivial change, but it would have made the reader's job easier. Unfortunately you can't go back and rewrite a published paper; all you can do is try to learn from mistakes (in this case, mine) and make the next paper better.

5.2.2. No Direction

The other common error in the opening is giving no direction. Consider the following example.

Example 5.6

In meiosis, genes that are always transmitted together are described as showing "linkage." Linkage, however, can be incomplete, due to the exchange of segments of DNA when chromosomes are paired. This incomplete linkage can lead to the creation of new pairings of alleles, creating new lineages with distinct sets of traits.

Is this paper about the evolution of sex chromosomes in guppies, the distribution of Tay-Sachs disease among Louisiana Cajuns, or the ecology of the potato blight fungus *Phytophthora infestans*? You can't tell—this opening offers no direction as to where the story is going. Rather, it goes over basic, textbook material about eukaryotic genetics that should be second nature to most readers. It explains a schema that scholars in this field don't need explained.

Using an opening that explains a widely held schema is a flaw common with inexperienced writers. Developing scholars are still learning the material and assimilating it into their schemas. It isn't yet ingrained knowledge, and the process of laying out the information and arguments, step by step, is part of what ingrains it to form the schema. Many developing scholars, therefore, have a hard time jumping over this material by assuming that their readers take it for granted. Rather, they are collecting their own thoughts and putting them down.

There is nothing wrong with explaining things for yourself in a first draft. Many authors aren't sure where they are going when they start, and it is not until the second or third paragraph that they get into the meat of the story. If you do this, though, when you revise, figure out where the real story starts and delete

everything before that. At a writers' conference my wife attended, a well-known author said that he sometimes has to delete several chapters to get to where the story begins.

5.3. TARGETING YOUR AUDIENCE

The way you introduce your problem and your characters affects the audience's attitude toward the work and maybe whether they continue reading. You must know the intended audience to tailor the writing to them. This is particularly important for generalist papers and proposals, where reviewers and readers are impatient and may not be familiar with the schemas of your discipline. In such cases, the opening may determine the success of the entire piece—if it is published or funded.

Consider two papers about bacteria in the ocean; one was for a specialist and the other for a generalist journal. They both address the standard message in microbial ecology that we have identified and grown in culture less than 1 percent of all the bacteria that exist.

Example 5.7

For a specialist journal Epifluorescence microscopy and direct viable counting methods have shown that only 0.01 to 0.1% of all the microbial cells from marine environments form colonies on standard agar plates. Much of the discrepancy between direct counts and plate counts has been explained by measurements of microbial diversity that employed 16S rRNA gene sequencing without cultivation. The present consensus is that many of the most abundant marine microbial groups are not yet cultivated.⁶

This opening makes an important point that is fundamental to the story—organisms have not been cultured on standard agar—and so foreshadows that the authors will grow new organisms on nonstandard agar. The characters are methods (for counting and culturing) and microbes in the sea, characters that environmental microbiologists identify with and care about. As an alternative, however, consider the following.

Example 5.8

For a generalist journal: Antonie van Leeuwenhoek (1632–1723), the first observer of bacteria, would be surprised that over 99% of microbes in the sea

6. J. C. Cho and S. J. Giovannoni, "Cultivation and Growth Characteristics of a Diverse Group of Oligotrophic Marine Gammaproteobacteria," *Applied and Environmental Microbiology* 70 (2004): 432–40.

remained unseen until after Viking Lander (1976) set out to seek microbial life on Mars.⁷

This opening says something similar to example 5.7, but these authors (Farooq Azam and Alexandra Worden) were targeting the editors and readers of *Science*, a group with limited interest in methods for culturing bacteria. So, they opened with a short story whose characters are Antonie van Leeuwenhoek, the Viking Lander, and microbes. Most scientists have probably heard of van Leeuwenhoek and his "wee animalcules," and of the Viking Lander, so this speaks to a wide readership in a way that culturing bacteria cannot. To make their story engaging, Azam and Worden pulled strongly on the SUCCE elements. It is simple, and it is unexpected—we are searching Mars for life when we haven't found 99 percent or more of the life on this planet. It is concrete and credible, backed up by specifics. It is also emotional, pulling on your curiosity and amazement—we've been at this for 300 years and have seen at best 1 percent of the bacteria that exist!? This is a powerful start for a *Science* paper. I'm not surprised it was published there, the science was excellent—and so was the storytelling.

The opening that Azam and Worden use, however, might make the readers of a specialist microbial ecology journal uncomfortable. It launches the story so flashily that it would stick out. More important, it makes a point that most microbial ecologists already know—this isn't their knowledge gap.

While targeting the right audience is important in papers, it can be life or death in proposals. As an example of this power, consider a project I was part of in which we studied coastal redwood forests in California. These forests are a treasure, but they exist in a region where it often doesn't rain from April to November. During the long, dry summers, the trees depend on fog for water. Climate change may alter the amount and timing of fog, potentially placing those forests at risk. But there are other foggy forests, so this represents an important and general ecological phenomenon.

We submitted similar proposals to two agencies: the National Science Foundation's (NSF) Ecosystem Science Program, and another that had a management focus (for this exercise, think California Environmental Protection Agency; CalEPA). We used different openings.

Example 5.9:

The influence of fog on ecological and hydrological processes in coastal zones has long intrigued scientists.

Example 5.10:

California's coastal forests are among its most distinctive and treasured natural resources.

7. F. Azam and A. Z. Worden, "Microbes, Molecules, and Marine Ecosystems," *Science* 303 (2004): 1622–24.

Imagine submitting a proposal with the first sentence to the NSF—a reviewer might well be drawn in on the idea: “I never thought about fog being that important in ecology; I should read further.” A CalEPA reviewer’s response, on the other hand, would probably be closer to: “Ivory Tower academe that is irrelevant to my mission; I can ignore this one.”

The responses would differ with the second example. An NSF reviewer would likely think: “Regional interest and an environmental protection focus—this isn’t NSF science; I can ignore this one.” The CalEPA reviewer, though, might think: “That’s true, coastal forests are important resources that we *are* responsible for protecting. I’d better read further to find out how this research may help me do that.”

How we framed the problem here was critical. An effective first sentence might open the door to funding. An ineffective one could close it.

5.4. OPENING FOR A BROADER AUDIENCE: THE TWO-STEP OPENING

When you target experts in your field, you can open quickly, building off the discipline’s core schemas. Sometimes, though, you need to target a broader audience—people who might be interested in your work but don’t necessarily hold the same schemas you do. To do this, you need to open with an issue that engages your target audience, but then modulate it to one you want to work with. That requires a multistep opening in which you take time to introduce and then redefine the focus.

An example of this two-step approach is a paper written by Mike Weintraub, a doctoral student of mine. The paper described a laboratory experiment evaluating the factors that control decomposition of the organic material that makes up arctic tundra soils. Though the work was narrow, the opening was wide.

Example 5.11:

The Arctic has become a focus of attention because global warming is expected to be the most severe at extreme latitudes. The thick organic soils of the tundra contain large stocks of carbon (C), and these soils may act as either a source or a sink for atmospheric carbon dioxide (CO₂). It has been suggested that as the climate warms, increased organic matter decomposition will release CO₂ to the atmosphere, contributing to warming and creating a positive feedback that results in further increases in atmospheric CO₂. Alternatively, it has been argued that increased decomposition will release bound nitrogen (N) and other nutrients in the soil and thereby enhance plant growth, since plant growth is nutrient-limited in arctic tundra. Increased plant growth would allow the tundra to be a sink for atmospheric C because plant material has a wider C/N ratio than soil organic matter. Thus, the direction the C balance of the arctic will shift with warming is unclear and depends

on interactions between soil C and N cycling that we still do not understand in the tundra.⁸

Weintraub opened the paper by discussing the importance of tundra soils in the global carbon cycle and then worked down in scale through several issues that regulate tundra soil carbon. Only at the end of the paragraph did he frame the specific issue: the interactions between soil C and N cycling. He was writing for an audience of global change scientists, trying to convince them that this paper was something they should read, rather than targeting tundra soil ecologists, of which there are about a dozen worldwide. One result of the broad way he framed the story was that he won the 2003 Arctic Consortium of the United States award for “Best Student Paper in Interdisciplinary Arctic Science.” Weintraub was able to structure the story so that it spoke to an interdisciplinary audience. The award was a result of effective storytelling, rather than inherently interdisciplinary measurements.

In proposals, quickly engaging the reviewers is critical, so you may need to use this two-step approach. Review panel members come from diverse subfields and may not be expert in your specific topic. Writing the proposal for the panel means framing the issues broadly, in concerns held by most members. From there, you can narrow in on the specific research you propose.

I used this two-step strategy in a proposal I wrote to study plant succession—how plant communities colonize a new site and then are replaced by a series of new communities over time. I wanted to study succession in floodplain forests in the interior of Alaska, specifically how tannins produced by balsam poplar trees affect the soil microorganisms that regulate nutrient availability, and thus make the environment more favorable for poplar. I opened the proposal with the following.

Example 5.12

Succession has been a central theme in ecological research for almost a hundred years. Two questions have directed much of that research:

What causes the shifts in communities?

How do ecological processes change as a result of these community shifts?

These questions are linked through a feedback loop: plants affect soil processes which in turn affect plant community structure.

Although soil microbes and the processes they carry out were the central characters in my story, I did not introduce them in the first sentence or even the first few sentences. I did that deliberately—I submitted the proposal to the ecology program, and I knew the reviewers were likely to be plant (rather than microbial) ecologists.

8. M. N. Weintraub and J. P. Schimel, “Interactions between Carbon and Nitrogen Mineralization and Soil Organic Matter Chemistry in Arctic Tundra Soils,” *Ecosystems* 6 (2003): 129–43.

I wanted to engage them with a topic they were interested in (plant succession and the factors that regulate it), and then transition to the specific topic that I was going to develop (tannin effects on soil microbes), building the connection between their interests and my work.

I call this a two-step opening for two reasons. One is to highlight that it does take two steps, but also to highlight that, like the dance, it must be quick—if you take more than two steps, you will stumble.

5.5. CHANGING STYLE FOR DIFFERENT AUDIENCES

It is a principle of effective communication that you need to adapt your language, style, and approach to deal with different media and different audiences. To highlight how a skilled writer does this, consider this opening from another paper by Azam.

Example 5.13:

Larry Pomeroy's seminal paper revolutionized our concepts of the ocean's food web by proposing that microorganisms mediate a large fraction of the energy flow in pelagic marine ecosystems. Before 1974, bacteria and protozoa were not included as significant components of food web models. Pomeroy argued forcefully that heterotrophic microorganisms, the "unseen strands in the ocean's food web," must be incorporated into ecosystem models.⁹

In contrast to example 5.8, this uses more technical language and targets an audience of marine ecologists. You wouldn't write "microbes mediate a large fraction of the energy flow in pelagic marine ecosystems" if you wanted a physicist to read it—they might not know what a "pelagic marine ecosystem" is or have the schema of how energy flows through the marine food web to pick up the implications. Despite that, this opening has a clear dynamic voice—it is easy and engaging to read without seeming the least bit unprofessional. That is the product of someone who is good with both language and storytelling. This is a strong opening that effectively engages SUCCES elements. It is concrete, giving dates and directly attributing Pomeroy's paper. It is emotional, pulling on words like *revolutionary* and *argued forcefully* to create a sense of conflict. It even draws on the U factor by setting up the contrast between the thinking before and after 1974. This opening frames the story—it is going to be about the role of microbes in the ocean's food web and how our understanding of it has changed. The authors introduce key characters—Pomeroy's paper and marine food webs—and so establish the starting point.

9. F. Azam, D. C. Smith, G. F. Steward, and A. Hagström, "Bacteria-Organic Matter Coupling and Its Significance for Oceanic Carbon Cycling," *Microbial Ecology* 28 (1994): 167–79.

Whereas the *Science* paper targeted a wide audience, this one aimed more narrowly—it starts by naming Pomeroy's seminal paper and so constrains the target audience to people who already know that paper. Where the opening to the *Science* article might put off readers of a technical journal, this one is written to engage them. The broader readership of *Science* is free to read this paper, but they aren't actively courted. In fact, they may be subtly discouraged from coming to this party; "Larry Pomeroy's seminal paper" is the secret password to get in.

Skilled writers know their audiences and think carefully about what works for them. As you gain experience, these choices become easier and require less conscious effort. To gain that experience, analyze what works, what doesn't, and your own decisions—who is your audience and what are their schemas? Could you write in a way that would expand that audience? The opening is critical to that answer—do you want to target people who know Pomeroy's paper, or everyone who has ever read about van Leeuwenhoek's work? Let your opening signal those choices.

5.6. HOW WIDE SHOULD YOUR OPENING BE?

How widely you should cast your net with the opening? Remember—getting published is not the ultimate goal; getting *cited* is. You want people to use your work. Ideally, therefore, you would like it to be read and valued by a wide community. So you should set your opening, the top of the hourglass, to draw in as broad a readership as you can manage. The opening tells readers what the story is about and establishes a compact with them. You must deliver on that compact. To achieve that, the bottom of the hourglass should be the same width as the top (figure 5.1a). If you cast your opening too widely and the top of the hourglass is wider than the bottom, readers will feel cheated (figure 5.1b). Consider the following opening and two potential resolutions.

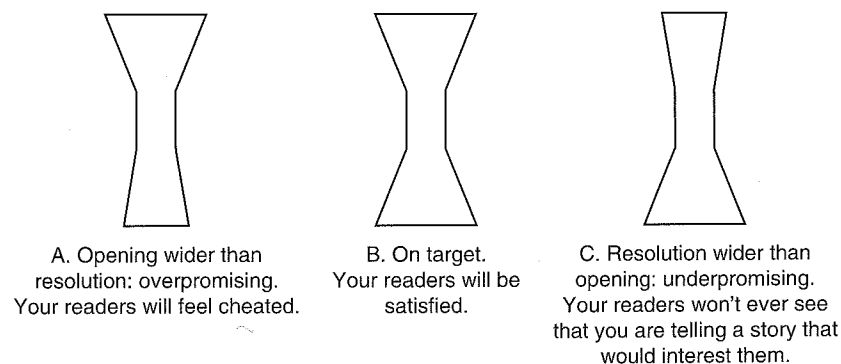


Figure 5.1. Matching the opening to the resolution.

Example 5.14:

Opening: The Arctic is important in the global climate system because tundra soils store a large amount of carbon that may be released to the atmosphere as CO₂. An important recent discovery is that wintertime CO₂ fluxes from soil are large.

Resolution 1: Developing a reliable model of CO₂ fluxes in the Arctic therefore requires a better model of winter C cycling processes.

Resolution 2: In the arctic tundra, microbial community composition changes little through the winter.

Resolution 1 is framed at roughly the same “width” as the opening. The opening said the story was about wintertime tundra CO₂ fluxes and their role in global climate, which is what the paper ended up being about. But if the story ended up with resolution 2, readers would be dissatisfied. It ended up being about soil microbial communities—a bait and switch that wastes readers’ time.

On the other hand, if you frame the opening narrowly and then end up with a wide story (figure 5.1c), you undersell yourself. For example, imagine if the story were about modeling CO₂ fluxes in the tundra (resolution 2), but you opened the paper this way:

“Bacteria living in tundra soils are well acclimated to surviving the cold conditions of the Arctic winter.”

This promises a story about the physiology of tundra bacteria, not something that would interest someone focused on the global C cycle. This would turn off a community of potential readers who might have been interested in your conclusions.

Frame your opening to promise the story you will deliver. If you err, though, it’s better to err slightly on the wide side. If you oversell in the immediate opening, you can still filter down quickly. Example 5.11 illustrates this; Weintraub targeted the entire community interested in the role of the Arctic as a storehouse of carbon. We felt that his work should interest that community, and I think we were right—the paper has been well cited in journals ranging from microbial ecology to global biogeochemistry. The first paragraph, however, makes it clear the paper is about carbon and nitrogen interactions in tundra soils. Though we tried to convince the biogeochemistry community that they should care about this, if they don’t, they can stop reading there. If you frame too narrowly, you lose readers immediately, and once lost, you can’t get them back.

5.7. POSITIONING STATEMENTS: PAWN-PUSHES VERSUS QUEEN-LAUNCHES

One student I know says she hates first paragraphs, particularly first sentences, because they usually say little, offering standard platitudes rather than insight. In poorly written papers, that is true. Inexperienced writers often imitate opening lines and come up with platitudes. But in a well-written paper, the sentence may

be more—it may be a careful positioning statement that is critical to building the story. How can a sentence be an effective opening in one paper and a throwaway line in another?

Let me answer that with the analogy of a chess game. There are only 20 possible first moves in chess. The most common is to advance the king’s pawn two spaces (pawn to king 4; figure 5.2a). Beginners and masters both start games with this move. But it isn’t really the same. When a master pushes that pawn forward, it is a carefully thought-out positioning move, the start of a sequence designed to take control of the board and define the structure of the game. Beginners, on the other hand, may push the pawn because they have seen their betters open that way and have a vague understanding that it is a “good” move, but without a sense of what they intend to follow it with.

Though chess is limited to 20 first moves, writing is not. You don’t have to push a pawn. If you want to open by launching your queen into the middle of the board, you can (figure 5.2b). You can start a paper with a strong statement that dives in to take control of the story.

For examples of these different approaches, consider first, example 5.3, the Sklar and Dietrich paper on river incision. They used a two-sentence opening. The first was an undramatic pawn push, but it was carefully designed, allowing them to introduce erosion at the end of the sentence—a power position. That was an essential first step to prepare for their next one, introducing stream incision. In contrast, in example 5.8, Azam and Worden launched a queen with their opening about van Leeuwenhoek and Viking.

When you write a straight OCAR story, as is common for specialist journals, you can use a pawn push—an opening that unfolds for a patient audience. If you’re writing for *Nature* or the National Institutes of Health, however, you are likely using an ABDCE or LDR structure that start with action, so you had better launch a queen.

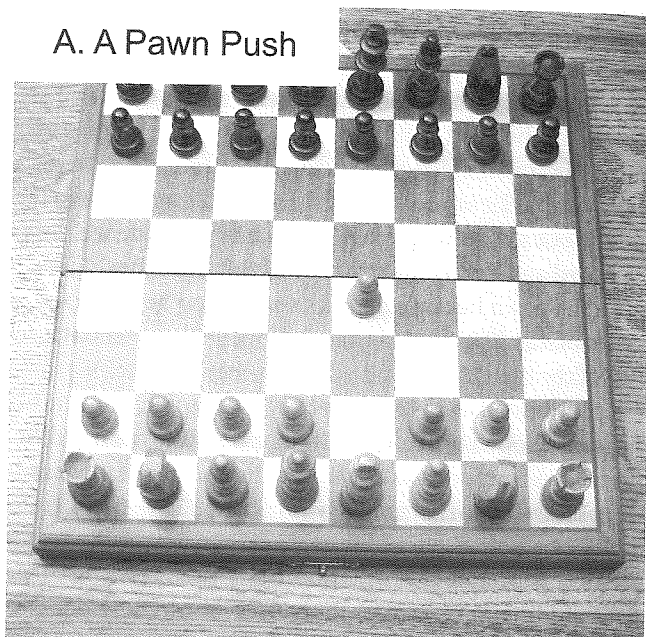
William Zinsser argues that the most important sentence in any article is the first one. Yet the student I mentioned thinks most opening sentences are a waste. So who’s right? They both are. Most openings are poorly done and unnecessary pawn pushes. That doesn’t make Zinsser wrong. To write well, you need to learn how to use the power of the opening. Learn when to use a pawn push and when to launch a queen. Learn to push a pawn like a chess master—as the first step in a strategy to develop your argument and take control of the game. Remember the words of Aristotle, “Well begun is half done.”

EXERCISES

5.1. Analyze published papers

Evaluate the openings of the papers you are analyzing. Did they do a good job of identifying the larger issue? What style of opening did they use? Was it a pawn push or a queen launch? Did they dive straight in, targeting a narrow audience, or did they use a two-step approach to engage a wider audience?

A. A Pawn Push



B. A Queen Launch

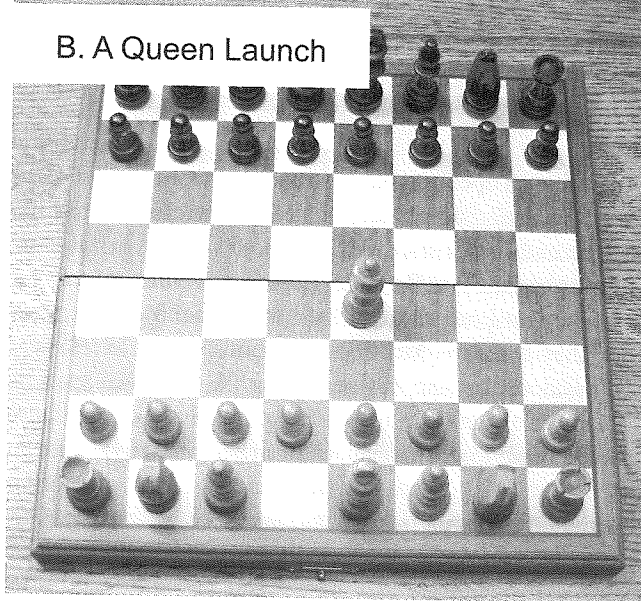


Figure 5.2. A pawn push versus a queen launch. A queen launch isn't possible in chess, but it is in writing.

5.2. Write a short article

Evaluate the opening of your short piece and those of your writing group members. Who is the intended audience? Was the opening effective? If not, can you rewrite it to make it so? Is the opening a pawn push or a queen launch? If it was a pawn push, could you write it as a queen launch?

5.3. Revise the following to make them more effective openings. Make the direction clearer and more engaging:

- A. The rates of all chemical reactions increase with temperature. This phenomenon grows directly from physical chemistry's transition state theory and the Arrhenius equation. However, respiration in soil doesn't always appear to follow this pattern. Some studies have shown no respiration response to increasing temperature, while a few have even reported a negative response.
- B. Chemotherapy is a dominant treatment approach for many types of cancer, and with the development of new targeted-delivery systems has the potential to become even more widespread and efficacious. A common constraint to effective chemotherapy is, however, patient resistance to the treatments. Such resistance is often closely associated with the activity of the enzyme γ -glutamyl transpeptidase (GGT), which acts to increase intracellular concentrations of glutathione and thereby block the apoptotic cascade in tumor cells. Inhibiting GGT before chemotherapy would therefore reduce tumor cell resistance and increase treatment effectiveness.