

4 Story Structure

All stories have a beginning, a middle, and an end.

When talking about story structure, many people will give you this simple platitude. Of course, if the proverbial monkey at a typewriter pounds away, the gibberish it types will start, end, and have stuff in the middle. Is this classic saying just a meaningless reflection of an obvious physical necessity? In fact, no. Beginning, middle, and end, however, don't reflect physical positions but story elements that carry out specific functions.

All stories have common elements that are necessary to make them engaging and memorable. To respond to their specific pressures, however, different genres have evolved traditions for assembling the elements, producing a number of standard structures. In science, we have adapted several of these for solving writing problems, but most of us are probably unaware of which ones we are using and why. Understanding the common elements, the ways you can put them together, and when each structure works provides a powerful tool for approaching different writing challenges.

There are four elements that underlie the structure of all stories, including those we write in science:

Opening (O): Whom is the story about? Who are the characters? Where does it take place? What do you need to understand about the situation to follow the story? What is the larger problem you are addressing?

- Challenge (C): What do your characters need to accomplish? What specific question do you propose to answer?
- Action (A): What happens to address the challenge? In a paper, this describes the work you did; in a proposal, it describes the work you hope to do.
- Resolution (R): How have the characters and their world changed as a result of the action? This is your conclusion—what did you learn from your work?

Together these elements generate the acronym OCAR, a concept that echoes throughout this book, whether we are talking about whole papers, sections, paragraphs, or even individual sentences. Understanding how to manage the OCAR elements is at the heart of successful writing. A story lacking any element from it will be unsatisfying, ineffective, and slippery, rather than sticky.

4.1. THE FOUR CORE STORY STRUCTURES

There are four story structures that different genres use regularly. Which one to use depends largely on the audience's patience. Are readers willing to wait to get the point of the story, or do they want to see it right away? In science, the audience's patience varies with what you are writing—a paper for a specialist journal, a paper for a generalist journal, a proposal, or a piece for the public. The following structures span from targeting the most to the least patient of audiences.

OCAR Structure: The simplest, but also the most slowly developing structure is to simply take the OCAR elements in sequence. This is used in some fiction; books may take several chapters to introduce the characters before defining what those characters must do. My favorite example of this is J. R. R. Tolkien's *The Lord of the Rings*. Only in chapter 2 do we get the first inkling of Frodo and Sam's challenge—to take the Ring of Power to Mt. Doom to destroy it. It takes until halfway through the first book to learn the full challenge—take the ring to the fire and restore Aragorn to the throne of Gondor.

OCAR is the structure we use most frequently in science because readers are patient—they want to assess your ideas and results as they develop. They want to see the evidence and the arguments clearly laid out before any conclusions are presented. Thus, a paper's challenge is presented at the end of the introduction, and its conclusion comes at end. Because OCAR is slow to develop, it requires a patient audience, one that is willing to watch the story unfold.

ABDCE Structure: Not all audiences are patient enough for OCAR. For those a step less patient, a structure known as ABDCE works well. This is the structure that modern fiction writers and scientific proposal writers use most frequently:

Action (A): Start with a dramatic action to immediately engage readers and entice them to keep reading.

- Background (B): Fill the readers in on the characters and setting so they can understand the story as it develops.
- Development (D): Follow the action as the story develops to the climax.
- Climax (C): Bring all the threads of the story together and address them.
- Ending (E): What happened to the characters after the climax? (This is the same as the resolution.)

The difference between ABDCE and OCAR is that ABDCE front-loads the story by moving the challenge up and collapsing it into the opening to create the initial “action”—an exciting start to grab your attention. Thus, A and B together comprise the O and C elements.

ABDCE gets the reader into the story faster by launching directly into the challenge, so it is good with an impatient audience, such as proposal reviewers. But it is less efficient than OCAR in moving the story forward—after the initial action, you have to back up and fill in the background. That inefficiency is a fair trade, however, if it gets readers committed to the rest of the story.

ABDCE reaches its apex in mystery and adventure stories. James Bond movies, for example, always start with wild action sequences—boat chases, gunfights, explosions. Or consider the beginning of *C Is for Corpse*, by Sue Grafton:

I met Bobby Callahan on Monday of that week. By Thursday, he was dead. He was convinced someone was trying to kill him and it turned out to be true, but none of us figured it out in time to save him. I’ve never worked for a dead man before and I hope I won’t have to do it again. This report is for him, for whatever it’s worth.

My name is Kinsey Millhone. I’m a licensed private investigator.

Here we are thrown immediately into the action and introduced to the key characters, in this case the dead Bobby Callahan and the living Kinsey Millhone. We are also given the challenge that Kinsey faces: who killed Callahan, and why?

This action-first structure has become common in a publishing world where overloaded editors may judge whole novels by the first page, but it isn’t new. Here is the opening from a well-known story: “All the survivors of the war had reached their homes by now and so put the perils of battle and the sea behind them. Odysseus alone was prevented from returning to the home and wife he yearned for by that powerful goddess, the Nymph Calypso, who longed for him to marry her, and kept him in her vaulted cave.” This is the opening to *The Odyssey* by Homer, one of the oldest recorded stories in human history. The classical in medias res structure of the epic is straight ABDCE.

One aspect to both the OCAR and ABDCE structures is that they have a resolution that shows how overcoming the challenge has changed the characters and their world. While people often see the climax as the focal point of the story—the point that all the action builds to and is the most exciting part of the story—ultimately, the resolution makes sense out of that action. The resolution wraps up the story that was introduced in the opening; it closes the circle.

“The climax is that major event, usually toward the end, that brings all the tunes you have been playing so far into one major chord, after which at least one of your people is profoundly changed. If someone isn’t changed, then what is the point of your story?”

ANNE LAMOTT, *Bird by Bird*

We want and need to know how our characters have changed for a story to be satisfying. Cinderella has to marry Prince Charming. The hero has to overcome his personal demons and move on to a different life. In science, we have to see how our understanding of the world has changed.

The importance of closing the loop means that a good story is circular; at the end, it must come back to the beginning. However, because things have changed, the “beginning” has moved. Thus, a story isn’t truly a circle, but a spiral (see figure 4.1). Highlighting this spiral structure is key to making an OCAR or ABDCE story powerful. A story without a resolution, such as Samuel Beckett’s *Waiting for Godot*, falls into the “Theater of the Absurd.” A science paper without a resolution falls into the reject bin.

LD Structure: ABDCE front-loads the story more than OCAR by collapsing the challenge into the opening, but some audiences are so impatient they won’t stick around for a resolution. For them, you need to intensify the front-loading. The most extreme case of this is used by newspaper reporters. Reporters use a structure that they call the “inverted pyramid”; I call it Lead/Development (LD) to highlight its key functional elements. In LD structure, the core of the story is in the first sentences (the lead, L) and the rest fills out and develops the story (the development, D). In LD structure, the lead collapses the opening, challenge, and resolution into a single short section, possibly as little as a single sentence.

The most important sentence in any article is the first one. If it doesn’t induce the reader to proceed to the second sentence, your article is dead. And if the second sentence doesn’t induce him to continue to the third sentence, it’s equally dead. Of such a progression of sentences, each tugging the reader forward until he is hooked, a writer constructs that fateful unit, the “lead.”

WILLIAM ZINSSER, *On Writing Well*

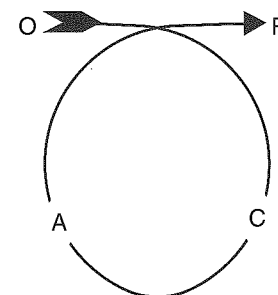


Figure 4.1. How an OCAR story makes a spiral: the story comes back to its starting point, but that point has moved.

LD structure developed in the newspaper business under the lash of the physical restrictions on space. A newspaper's front page has five or more stories that start there but may finish in the bowels of section B. Many people read only page 1; they don't bother opening the paper to finish stories. Additionally, in finishing layout on a tight deadline, an editor may slash the last few paragraphs of a story to squeeze it in. So writers cannot put the point at the end of the story—if they did, readers might never see it. It *must* go at the beginning.

LDR Structure: Journalists who write for magazines suffer a similar challenge to those who write for newspapers, although less extreme. There are many articles in a magazine, but they don't all start together on page 1, and you can't just skim the first page to get the sense of everything in the issue. Each story must keep you turning the pages to see all the *advertisements*. So the lead must be engaging enough to commit you to the story, but the writer can realistically hope that if you start reading, you may actually finish. Also, magazines aren't under the same production pressure as newspapers—editors don't cut paragraphs to make space. Magazine writers can afford to worry about ending well with an effective resolution.

"Often it takes just a few sentences to wrap things up. Ideally they should encapsulate the idea of the piece and conclude with a sentence that jolts us with its fitness or unexpectedness".

WILLIAM ZINSSER, *On Writing Well*

Thus, magazine journalists use a story structure I describe as Lead/Development/Resolution (LDR). It's conceptually similar to the newspaper LD but tuned to a slightly more patient audience.

These structures give us a continuum, based on readers' patience:

OCAR: *Slowest—take your time working into the story.*

ABDCE: *Faster—get right into the action.*

LDR: *Faster yet—but people will read to the end.*

LD: *Fastest—the whole story is up front.*

These story structures define the information you must present in different places. Readers intuitively understand and respond to different structures; they know how to identify the critical locations, and they anticipate the information that will appear. The opening is the first short section, and we use certain signals to tell the reader that we have reached the challenge or resolution. Readers take whatever information you put at those key locations—O, C, and R—and accept it as your opening, challenge, and resolution. If you put the wrong information there, they will get the wrong message.

You should be able to read the O, C, and R of a paper, and still get its key points. If you know the problem, the specific questions, the general approach to answering them, and the conclusions, you may have gotten all you need from that paper. You'll certainly know whether you need to go back and read it fully.

4.2. APPLYING STORY STRUCTURE TO SCIENCE WRITING

The OCAR functions are as central to a scientific paper as they are to a work of fiction. A good paper or proposal describes the larger problem and central "characters" (O); it frames an interesting question (C); it presents your research plan and results, developing the action (A); and it leaves the reader with an important conclusion about how our understanding of the world has changed as a result of the work (R).

Different types of science writing, however, use different structures to achieve best results. Papers for specialist journals generally use straight OCAR, framing the challenge at the end of the introduction. Readers of these journals are patient. They want your information and your thoughts, and they want to evaluate the progression from ideas through results to conclusions. In fact, in these journals, a lead-based paper might be considered suspect. Front-loading the story with conclusions could make it seem like you knew the story you wanted to tell and were simply forcing the data into that story—that is, you are trying to prove rather than test your ideas—a no-no going all the way back to the foundations of the philosophy of science.

In contrast, generalist journals, such as *Nature* or *Science*, need a faster structure, often closer to LDR. The need arises because the greatest hurdle to getting published in these journals is the editor. *Nature* and *Science* editors are professional editors, rather than practicing scientists who serve as editors on the side (as is typical for specialist journals); they are generalists, and they get swamped with manuscripts. They have to perform triage, deciding quickly whether a paper seems novel and important enough to invest the time to send it out for review. (I have submitted papers to *Nature* on Friday afternoon and had the rejection first thing Monday morning!) To make that first cut and get your paper sent out for review, you need a good lead.

A famous use of a lead-based structure in science is Francis Watson and James Crick's famous paper "Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid," in which the opening was: "We wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest."¹ The rest of the paper describes this structure and resolves with the statement, "It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material." They didn't bother to elaborate on that mechanism—it was obvious enough that they didn't need to.

Moving on to the least patient audience of all, we come to proposals. We review proposals because we owe it to the agencies that fund our work. We review proposals on airplanes when we would rather read a novel, watch a movie, or sleep. Patient? No. A proposal must convince reviewers that the topic identified in the

1. J. D. Watson and F. H. C. Crick, "Molecular Structure of Nucleic Acids—A Structure for Deoxyribose Nucleic Acid," *Nature* 171 (1953): 737–38.

opening is important and then compel them with the excitement of the questions posed in the challenge. If it fails to do this, it is dead.

When I review proposals I make a “no/maybe” cut by the end of the introduction, and if it’s a “no,” that is irrevocable. I then only read the rest to be able to give feedback on how to improve the proposal for resubmission. A good experimental design can never compensate for boring questions. A “maybe” at that first cut means the questions are exciting, in which case I read the rest to see whether the experimental design is adequate to answer them. A saying I once heard attributed to D. A. Crossley at the University of Georgia said, “If you haven’t told them in the first two pages, you haven’t told them.” To “tell them” in the first two pages requires a front-loaded structure: either ABDCE or LDR.

4.3. MAPPING OCAR ONTO IMRaD

I have argued that most scientific papers follow an OCAR structure, but you won’t find a paper with sections labeled Opening, Challenge, Action, and Resolution. Instead, we usually write papers using some variation of IMRaD: Introduction, Methods, Results, and Discussion. So why discuss OCAR instead of IMRaD? First, even when the physical sections of the paper follow IMRaD, the conceptual structure of the story generally follows OCAR. Second, there are many permutations of IMRaD—some fields routinely combine Results and Discussion and some integrate Methods as well. Third, some types of writing—notably review papers and proposals—don’t follow IMRaD at all. Regardless of a piece’s form, however, it must still cover the OCAR bases. While IMRaD is a rule, OCAR is a principle.

Because IMRaD is the most common physical structure for science papers, I briefly discuss how OCAR maps onto IMRaD.

Introduction: This has three subsections, although they are rarely broken out as such:

- Opening:* This is typically the first paragraph that introduces the larger problem the paper is targeting. What is the context, and what are the characters we are studying?
- Background:* What information does the reader need to understand the specific work the authors did, why it is important, and what it will contribute to the larger issue? I consider this an extension of the O, as it fleshes out introducing the characters.
- Challenge:* What are the specific hypotheses/questions/goals of the current work?

Materials and Methods: This begins describing the action—what did you do?

Results: This continues the action by describing your findings.

Discussion: This develops to the climax and the resolution. What did it all mean, and what have you learned? It often ends with a conclusions subsection that is the resolution.

Thus, opening and challenge block the beginning and the end of the Introduction. Action encompasses the M&M, Results, and much of the Discussion. The resolution is the last section of the Discussion.

The resolution is as important in science as in fiction. As Anne Lamott points out, for fiction, at the end, we want to know that “one of your people is profoundly changed.” For science, at the end, we want to know how our understanding of the world has changed as a result of your work, or in the case of a proposal, how you think our understanding of the world *will* change. The resolution must map back to the opening. It must say something about the larger problem you identified there.

A closely related aspect of mapping OCAR onto IMRaD is that scientific papers have an hourglass shape to their content (see figure 4.2). They open with a problem of wide interest. Then they narrow down to a set of very specific questions that contribute to understanding that larger issue. Those specific questions comprise the challenge and define the width of the “neck” of the hourglass—that is as narrow as it is going to get. The Methods and Results sections stay narrow. Finally, as results are discussed, the context of the story expands toward conclusions that are more general and connect back to the problem developed in the opening. Importantly, the conclusions should address a topic as “wide” as the opening. That is what makes the story circular—in the resolution, you come back to the issue targeted in the opening.

In the following chapters, I discuss each of these elements in a science story: O, C, A, and R. How do we write them to most powerfully develop the stories we are telling and so create the most compelling papers and proposals?

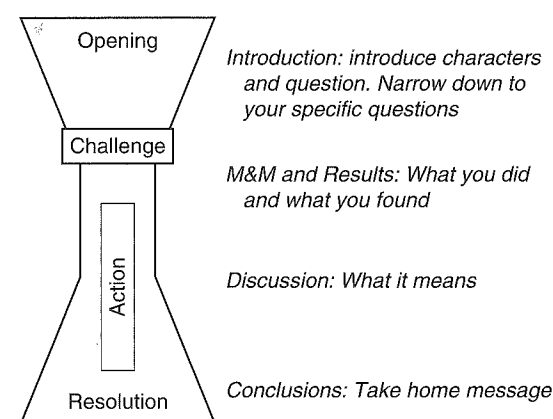


Figure 4.2. The hourglass structure of a paper. It starts wide with the opening, narrows with the challenge and action, and widens back out again at the resolution.

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