Strategies for Peer Reviewing and Team Writing

Be a thoughtful reviewer; be a good team member

*Peer reviewing* (also called peer-editing) means people getting together to read, comment on, and recommend improvements on each other’s work. Peer-reviewing is a good way to become a better writer because it provides experience in looking critically at writing.

*Team writing*, as its name indicates, means people getting together to plan, write, and revise writing projects as a group, or team. Another name for this practice is collaborative writing—collaborative writing that is out in the open rather than under cover (where it is known as plagiarism).

Strategies for Peer Reviewing

When you peer-review another writer's work, you evaluate it, criticize it, suggest improvements, and then communicate all of that to the writer. As a first-time peer-reviewer, you might be a bit uneasy about criticizing someone else's work. For example, how do you tell somebody his essay is boring? Read the discussion and steps that follow; you'll find advice and guidelines on doing peer reviews and communicating peer-review comments.

**Initial meeting.**

At the beginning of a peer review, the writer should provide peer reviewers with notes on the writing assignment and on goals and concerns about the writing project (topic, audience, purpose, situation, type), and alert them to any problems or concerns. As the writer, you want to alert reviewers to these problems; make it clear what kinds of things you were trying to do. Similarly, peer reviewers should ask writers whose work they are peer-reviewing to supply information on their objectives and concerns. The peer-review questions should be specific like the following:

Does my explanation of virtual machine make sense to you? Would it make sense to our least technical customers? In general, is my writing style too technical? (I may have mimicked too much of the engineers' specifications.) Are the chapter titles and headings indicative enough of the following content? (I had trouble phrasing some of these.) Are the screen shots clear enough? (I may have been trying to get too much detail in some of them.)

**Peer-reviewing strategies.**

When you peer-review other people’s writing, remember above all that you should consider all aspects of that writing, not just—in fact, least of all—the grammar, spelling, and punctuation. If you are new to peer-reviewing, you may forget to review the draft for things like the following:

- Make sure that your review is comprehensive. Consider all aspects of the draft you're reviewing, not just the grammar, punctuation, and spelling.
- Read the draft several times, looking for a complete range of potential problem areas:
  - Interest level, adaptation to audience
  - Persuasiveness, purpose
  - Content, organization
  - Clarity of discussion
  - Coherence, use transition
  - Title, introduction, and conclusion.
  - Sentence style and clarity
  - Handling of graphics
- Be careful about making comments or criticisms that are based on your own personal style. Base your criticisms and suggestions for improvements on generally accepted guidelines, concepts, and rules. If you do make a comment that is really your own preference, explain it.
- Explain the problems you find fully. Don't just say a paper "seems disorganized." Explain what is disorganized about it. Use specific details from the draft to demonstrate your case.
Whenever you criticize something in the writer's draft, try to suggest some way to correct the problem. It's not enough to tell the writer that her paper seems disorganized, for example. Explain how that problem could be solved.

Base your comments and criticisms on accepted guidelines, concepts, principles, and rules. It's not enough to tell a writer that two paragraphs ought to be switched, for example. State the reason why: more general, introductory information should come first, for example.

Avoid rewriting the draft that you are reviewing. In your efforts to suggest improvements and corrections, don't go overboard and rewrite the draft yourself. Doing so steals from the original writer the opportunity to learn and improve as a writer.

Find positive, encouraging things to say about the draft you're reviewing. Compliments, even small ones, are usually wildly appreciated. Read through the draft at least once looking for things that were done well, and then let the writer know about them.

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Peer-review summary.

Once you've finished a peer review, it's a good idea to write a summary of your thoughts, observations, impressions, criticisms, or feelings about the rough draft. See the peer-reviewer note below, which summarizes observations on a rough draft. Notice in the note some of the following details:

- The comments are categorized according to type of problem or error—grammar and usage comments in one group; higher level comments on such as things content, organization, and interest-level in another group.
- Relative importance of the groups of comments is indicated. The peer-reviewer indicates which suggestions would be "nice" to incorporate, and which ones are critical to the success of the writing project.
- Most of the comments include some brief statement of guidelines, rules, examples, or common sense. The reviewer doesn't simply say "This is wrong; fix it." He also explains the basis for the comment.
- Questions are addressed to the writer. The reviewer is doublechecking to see if the writer really meant to state or imply certain things.
- The reviewer includes positive comments to make about the rough draft, and finds nonantagonistic, sympathetic ways to state criticisms.

Excerpt from a note summarizing the results of a peer review.

Spend some time summarizing your peer-review comments in a brief note to the writer. Be as diplomatic and sympathetic as you can!

Sexy Technical Communication Home

Strategies for Team Writing

As mentioned earlier in this chapter, team writing is one of the common ways people in the worlds of business, government, science, and technology handle large writing projects.

Assembling the team.

When you begin picking team members for a writing project in a technical writing course, choose people with different backgrounds and interests. Just as a diverse, well-rounded background for an individual writer is an advantage, a group of diverse individuals makes for a well-rounded writing team.

If you are the team leader, you might even ask prospective team members for their background, interests, majors, talents, and aptitudes. These following writing teams combine individuals with diverse backgrounds and interests:
### Writing team 1

<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>A report on current cloaking technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team members</strong></td>
<td></td>
</tr>
<tr>
<td>Shawn S.</td>
<td>Electrical engineering major, currently doing basic office-management chores at a law firm</td>
</tr>
<tr>
<td>Tracey K.</td>
<td>Senior English major, hoping this course helps with employment prospects</td>
</tr>
<tr>
<td>Sanjiv Gupta</td>
<td>Computer science major, currently doing computer graphics at a software development shop</td>
</tr>
<tr>
<td>Jeon Chang Yeon</td>
<td>Soon-to-be electrical engineering major, still developing English language skills</td>
</tr>
<tr>
<td>Alice B.</td>
<td>Undeclared major with a nontechnical focus, possibly in the wrong course, no stated skills</td>
</tr>
</tbody>
</table>

### Planning the project.

Once you’ve assembled your writing team, most of the work is the same as it would be if you were writing by yourself, except that each phase is a team effort. Specifically, meet with your team to decide or plan the following:

#### Planning Stages

- Analyze the writing assignment.
- Pick a topic.
- Define the audience, purpose, and writing situation.
- Brainstorm and narrow the topic.
- Create an outline.
- Plan the information search (for books, articles, etc., in the library).
- Plan a system for taking notes from information sources.
- Plan any graphics you’d like to see in your writing project.
- Agree on style and format questions (see the following discussion).
- Develop a work schedule for the project and divide the responsibilities (see the following).

Much of the work in a team-writing project must be done by individual team members on their own. However if your team decides to divide up the work for the writing project, try for at least these minimum guidelines:

- Have each team member responsible for the writing of one major section of the paper.
- Have each team member responsible for locating, reading, and taking notes on an equal part of the information sources.

Some of the work for the project that could be done as a team you may want to do first independently. For example, brainstorming, narrowing, and especially outlining should be done first by each team member on his own; then get together and compare notes. Keep in mind how group dynamics can unknowingly suppress certain ideas and how less assertive team members might be reluctant to contribute their valuable ideas in the group context.

After you’ve divided up the work for the project, write a formal chart and distribute it to all the members.
Scheduling the project and balancing workload.

Early in your team writing project, set up a schedule of key dates. This schedule will enable you and your team members to make steady, organized progress and complete the project on time. As shown in the example schedule below, include not only completion dates for key phases of the project but also meeting dates and the subject and purpose of those meetings. Notice these details about that schedule:

- Several meetings are scheduled in which members discuss the information they are finding or are not finding. (One team member may have information another member is looking everywhere for.)
- Several meetings are scheduled to review the project details, specifically, the topic, audience, purpose, situation, and outline. As you learn more about the topic and become more settled in the project, your team may want to change some of these details or make them more specific.
- Several rough drafts are scheduled. Team members peer-review each other's drafts of individual sections twice, the second time to see if the recommended changes have worked. Once the complete draft is put together, it too is reviewed twice.

When you work as a team, there is always the chance that one of the team members, for whatever reason, may have more or less than a fair share of the workload. Therefore, it's important to find a way to keep track of what each team member is doing. A good way to do that is to have each team member keep a journal or log of what kind of work he does and how much time he spends doing it.

At the end of the project, if there are any problems in the balance of the work, the journal should make that fact very clear. At the end of the project, team members can add up their hours spent on the project; if anyone has spent a little more than her share of time working, the other members can make up for it by buying her dinner or some reward like that. Similarly, as you get down toward the end of the project, if it's clear from the journals that one team member's work responsibilities turned out, through no fault of his own, to be smaller than those of the others, he can make up for it by doing more of the finish-up work such as typing, proofing, or copying.

Setting up a style guide or style sheet.

Because the individual sections will be written by different writers who are apt to have different writing styles, set up a style guide in which your team members list their agreements on how things are to be handled in the paper as a whole. These agreements can range from the high level, such as whether to have a background section, all the way down to picky details such as when to use italics or bold and whether it is "click" or "click on." See the excerpt from a project style sheet in the following. For discussion of these items, see stylesheets and style guides.

Before you and your team members write the first rough drafts, you can't expect to cover every possible difference in style and format. Therefore, plan to update this style sheet when you review the rough drafts of the individual sections and, especially, when review the complete draft.

Excerpt from a style guide for a writing project. The items listed represent agreements team writers have made in order to give their paper as much consistency as possible.

Reviewing drafts and finishing.

Try to schedule as many reviews of your team's written work as possible. You can meet to discuss each other's rough drafts of individual sections as well as rough drafts of the complete paper. When you do meet, follow the suggestions for peer-editing discussed in the previous section of this chapter, Strategies for peer-reviewing.

A critical stage in team-writing a paper comes when you put together into one complete draft those individual sections written by different team members. It's then that you'll probably see how different in tone, treatment, and
style each section is. You must as a group find a way to revise and edit the complete rough draft that will make it read consistently so that it won't be so obviously written by three or four different people.

When you've finished with reviewing and revising, it's time for the finish-up work to get the draft ready to hand in. That work is the same as it would be if you were writing the paper on your own, only in this case the workloads can be divided up.
Use a logical, natural structure—content and organization

The main parts of a technical-writing course focus on applications—ways technical writing skills are applied in the real world. However, these applications use varying combinations of information infrastructures. An information infrastructure is (1) a type of information content (such as descriptive writing), (2) a way of organizing information (such as a comparison or classification), or (3) both.

The information infrastructures reviewed in this appendix are the ones commonly used in technical writing. Of course, there are other infrastructures—maybe some that scholars of technical writing have not yet pinned a label on, but these are the most common and the most readily visible. And of course some of these infrastructures blend together. The main thing is that by knowing these, you have the intellectual tools for quickly organizing and structuring just about any writing project.

Description

What does it look like?

by David McMurrey

The biggest hurdle you may face in writing a description is remembering what the term means as it is used in this context. We all use the word description loosely to refer to practically any discussion or explanation. But in this context, it means the detailed discussion of the physical aspects of a thing. That means discussing things like color, shape, size, weight, height, width, thickness, texture, density, contents, materials of construction, and so on.

For example, this sentence is not really description in our sense of the word:

A computer diskette is a device used for storing electronic data.

It explains the function or purpose but provides little or no physical detail. However, this sentence is very definitely description:

The common computer diskette is 3.5 inches by 3.5 inches and approximately 1/8 inch thick.

Be sure to check out the example descriptions available with this chapter.

Contexts for Description

As mentioned earlier, descriptions are common element in technical writing—just not quite in the same way that instructions are. Descriptions appear more often as a sentence or two here, a paragraph there, or a whole section elsewhere. Certain kinds of technical writing feature description:

- Accident reports requiring plenty of description.
- Product specifications—documents that describe design and feature of a new or changed product—have plenty of description.
- Instructions often require description to enable readers to visualize what they are doing and what they are working with.

Contents and Organization of Descriptions

The following is a review of the sections you'll commonly find in descriptions. As you read, check out the example descriptions.
Introduction. Plan the introduction to your description carefully. Make sure it does all of the following things (but not necessarily in this order) that apply to your particular description:

- Indicate the specific object about to be described.
- Indicate what the audience needs in terms of knowledge and background to understand the description.
- Provide a general description of the object.
- Include an overview of the contents of the description.

Background

If the thing you are describing is not likely to be familiar to most of your readers, consider adding some background before you plunge into the actual description. If you are about to describe an SGO/3 density gauge to nonspecialists, you'd better first discuss what in the world the thing is, what it does, and on what part of the planet it is used.

Discussion of the parts or characteristics

The main part of your description is the discussion of each part or characteristic. You must divide the thing you are describing into parts, or characteristics, or both. Parts are easy: for example, a wooden pencil has lead, a wooden barrel, an eraser, and a metal clip. Characteristics are describable aspects of a thing but are not parts: for example, the pencil has a certain weight, length, width, and so on. If you were a budding real-estate tycoon and had to describe a vacant lot for company files, you'd probably describe it by its characteristics: its location, square footage, terrain, vegetation, access to utilities, and so on. (Check out the description of the primitive stone scraper in the examples; part of it is arranged by characteristics, and part by parts!)

Once you've divided the thing you are describing into parts, characteristics, or both, your next job is to describe each one. For mechanical things, it works well to start by defining the part, by explaining its function. After that, you describe the part from general to specific, using any of the sources of description that are appropriate.

Notice that in description, you can mix other kinds of writing. You'll find yourself explaining functions, defining terms, discussing a bit of process as you describe. That's not a problem as long as the primary focus and the majority of the content is truly description.

Discussion of the related operation or process.

At some point in a description, often at the end, it is useful to summarize the operation or process associated with the object you're describing. For example, if you've just described a mechanical pencil, you could briefly explain how it is used. If you've just described a snowflake, you could discuss the process by which it formed.

Sources of Description

When you write a description, you need to think about the kinds of descriptive detail you can provide. Sometimes, descriptions are rather weak in this area. Use the following list to plan your description or to review a description you have written. Think of the categories of descriptive detail you could provide, or use the following list to identify categories you have not used:

<table>
<thead>
<tr>
<th>color</th>
<th>depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>height</td>
<td>amount</td>
</tr>
<tr>
<td>width</td>
<td>pattern, design</td>
</tr>
<tr>
<td>shape</td>
<td>ingredients</td>
</tr>
<tr>
<td>weight</td>
<td>age</td>
</tr>
<tr>
<td>materials</td>
<td>subparts</td>
</tr>
<tr>
<td>texture</td>
<td>length</td>
</tr>
<tr>
<td>width</td>
<td>finish</td>
</tr>
<tr>
<td>location</td>
<td>temperature</td>
</tr>
<tr>
<td>methods of attachment</td>
<td></td>
</tr>
</tbody>
</table>
Schematic view of descriptions. Remember that this is just a typical or common model for the contents and organization—many others are possible.

**Miscellaneous Concerns**

In descriptions, you'll probably find yourself puzzling over how to handle numbers, abbreviations, and symbols:

**Numbers.**

Remember that technical writing breaks some of those rules you worked so hard to learn in past writing classes. In the technical writing context, we are often vitally concerned about numbers and want them to stand out. This means that you should use numerals in running text when the number indicates an exact, measured, or measurable amount or when it represents a critical value. For example, in these sentences, it seems to matter that the numbers are exact:

- The cup is 3 inches in diameter. Use 4 tacks to fasten the poster to the wall. However, this does not mean using numerals for indifferent values. For example, in this sentence, there is nothing heart-stopping about how many sections the report has: The report contains four major sections. See the section on **numbers vs. words** for further details.

**Anatomy of a descriptive paragraph**

Typically, it starts with some statement about the purpose or function of the part, with the descriptive detail following. Descriptive detail draws upon the "sources" of description—such things as color, shape, width, and height.

**Abbreviations**

In technical writing, we expect to see abbreviations. Use them in your description freely. Remember the rule on punctuating abbreviations—punctuate them only if they spell a word (for example, "in."). Remember too that abbreviations do **not** go up against the number they are used with (for example, make that "8 mm tape" or "8-mm tape" but **not** "8mm tape").

**Symbols**

The most common problem with symbols in instructions and descriptions has to do with inches and feet. If you're writing instructions for a carpenter's dream project where there are feet and inches all over the place, use the symbols " (inches) and ' (feet). However, if you cite inch and foot measurements only a few times, use the word or abbreviation instead.

**Graphics and Format in Descriptions**

In most descriptions, you'll need at least one illustration of the thing you are describing, with labels pointing to the parts. See the section on **graphics** for more on creating graphics, formatting them, and incorporating them into your descriptions.

**Headings**

In descriptions, you'll want to use headings and subheadings to mark off the discussion of the individual parts or characteristics. Remember that, ideally, you want to describe each part in a separate paragraph or section—and flag that discussion with a heading. If you have a background section, use a heading for it too. See the section on **headings** for the specific requirements.
Lists

Lists are not nearly so important in descriptions as they are in instructions. However, if you itemize parts or subparts or list specifications, these are good situations for lists. See the section on lists for the specific requirements.

Special notices

In descriptions, there is nothing like the important role for special notices as there is in instructions. After all, if it really is a description, readers should not be trying to follow any procedure, and therefore should not be running any risks of damaging equipment, wasting supplies, screwing up the procedure, or injuring themselves or others. However, you may find it useful to emphasize important points or exceptions. See the section on special notices for complete discussion of the proper use of these special notices as well as their format and placement within instructions.

Comparison

What's it like—what's it not like?

by David McMurrey

Another important information structure often used in technical writing is comparison.

What Is Comparison?

In technical writing, comparisons can be very important. Short comparisons to similar or familiar things can help readers understand a topic better; comparisons can also help in the decision process of choosing one option out of a group. An extended comparison, which is the focus in this chapter, is one or more paragraphs whose main purpose and structure is comparison. One type of comparison the analogy, which is a special type of extended comparison of an unfamiliar thing to a familiar thing.

Extended comparisons can be informative or evaluative. An informative comparison seeks to compare the topic to something similar or familiar to help people understand the topic or, in some cases, to help people understand both better. An evaluative comparison seeks to recommend one or more of the options by comparing them. This is the focus of the types of reports discussed in the section on recommendation reports, feasibility reports, evaluative reports.

Note: Be sure and check out the examples of comparison.

How to Identify Points of Comparison

When you write an extended comparison, you must start by identifying the specific ways in which you are going to compare the things you plan to write about. These points of comparison are like categories of comparative detail. For example, in an evaluative comparison of smart phones, you'd probably want to compare the best four or five machines according to the following:

- cost
- ease of use
- reliability
- special features, and so on

If you don't start by identifying the points of comparison, your comparison can become uneven—for example, you might say that model 1 is easy to use but not say anything about the ease of use of models 2, 3, or 4.

How to Organize Comparisons

One of the most important concepts to learn in writing comparisons has to do with organizing the contents. There are two basic ways to organize a comparison:
- whole-to-whole approach
- point-by-point approach

To get a sense of how these two approaches work, take a look at the following illustration of these two approaches. In the whole-to-whole approach, details about each of the options being compared are lumped together. This is our natural tendency—however, it does a sloppy, uneven job of stating the comparisons. The better way is to use the point-by-point approach. In the schematic diagram in the illustration, you'd have one paragraph comparing the costs of Models A, B, and C; then another paragraph comparing the warranties of the three models; and so on.

Use the point-by-point approach unless something about your topic, purpose, or audience dictates otherwise. With the whole-to-whole approach, the comparison is often uneven—you might forget to tell about the warranties for Model B; you might neglect to state the actual results of comparison—that Model C is better in terms of special features. In the whole-to-whole approach, writers often leave the actual comparisons up to the reader, thinking that just supplying the raw data is enough.

In the point-by-point approach, each of the comparative sections should end with a conclusion that states which option is the best choice in that particular category of comparison. Of course, it won't always be easy to state a clear winner—you may have to qualify the conclusions in various ways, providing multiple conclusions for different conditions.

Schematic view of the whole-to-whole and the part-by-part approaches to organizing a comparison. Unless you have a very unusual topic, use the point-by-point approach.

Short paragraph-length comparison.

**How to Write Comparisons?**

As with causal discussions, comparisons are not distinctive because of a certain kind of content. Instead, it's the special transitional words that make comparative writing work: for example, "similar," "unlike," "more than," "less than," and other such words that draw readers' attention to comparisons and highlight the results of the comparisons. Notice how many are used in the illustrations in this chapter.

When you write comparisons, take special care to use these transitional words. Emphasize the similarities and differences—don't force readers to figure them out for themselves.

Schematic view of comparisons.

Remember that this is just a typical or common model for the contents and organization—many others are possible.

**How to Format Comparisons?**

Comparisons don't call out for any special format; just use headings, lists, notices, and graphics as you would in any other technical document. For details, see:

- Headings
- Lists
- Notices
- Graphics

Sexy Technical Communication Home

**Classification**

http://distanceed.hss.kennesaw.edu/technicalcommunication/chapters/5_11InformationStructures/5_11InformationStructures_print.html
What are its categories—into which does it fit?

by David McMurrey

Another important information structure often used in technical writing is classification.

What is Classification?

In some technical reports, certain paragraphs or sections use a kind of writing and pattern of organization known as classification. Classification means either (1) explaining which class a thing belongs to or (2) dividing a group of things into classes. You may find that classification is an effective way to present background information to your readers.

See the complete example of a division-type classification.

True classification

You are "classifying" (in the strict dictionary sense of the term) when you place an object, action, or person in one of several classes. For example, the XYZ Corporation may have just come out with its new ABC computer but cannot decide whether to classify it as a laptop or a notebook computer. A botanist may have discovered a new species of fungus and must now decide how to classify it. Written documents on these questions would resemble comparison because features of the new item (the computer or the fungus) must be compared to those of the established classes. The Jupiter example in the following shows an example of a true classification in which the writer shows why the object belongs to one specific category.

Division

Classification can also refer to breaking a thing down into its types, classes, categories, or kinds and then discussing each one. For example, computers for some time now have been divided into several classes: minicomputers, microcomputers, and macrocomputers. And, if you have ever taken biology, you know that terrestrial life is divided into into plant and animal "kingdoms"; the kingdoms, broken down into phyla (the plural of phylum); phyla, into classes; classes, into families; families, into genera; and genera, into species. Each of these divisions—except perhaps the last—represents a grouping of types.

Several key words indicate that classifications are being discussed: classes, kinds, types, categories, sorts, or groups. Classification can be quite useful in technical reports: it breaks the discussion of a subject into smaller chunks, and it can make the job of evaluation and selection much easier.

Jupiter can be classed as a Jovian planet because of its size and its average density. Indeed Jupiter is the largest planet in our solar system (as shown in Figure 16) and one of the brightest objects in the sky, having attained a magnitude of -2.5, more than a full magnitude brighter than Sirius, the brightest star in the sky. Jupiter's brightness results from its great size of course but also from its high reflectivity: it reflects about 44 percent of the light it receives. The size and composition of Jupiter's interior are open to much speculation. Some astronomers picture the interior as having a radius of over 30,000 miles and as possibly being composed of liquid hydrogen. The core is small and dense and may contain iron silicates. The other Jovian characteristic of the planet is its density. Even though its diameter is only 11 times that of the Earth, its total volume is $11 \times 11 \times 11$, or over a thousand times that of Earth.
More graphically, over 1000 Earths could be packed into the space occupied by Jupiter.

"True" classification. In this example, the writer argues that Jupiter should be categorized as a "Jovian"-type planet. This is one type of classification; in the other, you divide a collection of things into categories, or types.

How to Identify Classes and the Principle of Classification?

Once you know what you are going to divide into classes, your next step is to identify the classes and the principle of classification. For example, if you were classifying dialysis machines (used to treat people with kidney disease), you might list these classes:

- parallel flow design dialyzers
- coil design dialyzers
- hollow-fiber capillary dialyzers

The principle of classification is the design of the structure through which blood is filtered.

The *principle of classification* then is the method you use to sort the items into classes. If you sorted marbles into red, green, and blue ones, you'd be using color as the principle of classification. You must be careful to use only one principle of classification at a time. For example, you couldn't sort your marbles by color *and* size—you might have some big red ones and some small red ones!

Here are some additional examples of classifications and their principles:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Classes</th>
<th>Principle of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical circuits</td>
<td>Series</td>
<td>Pathway of electrical current</td>
</tr>
<tr>
<td></td>
<td>Parallel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Series-parallel</td>
<td></td>
</tr>
<tr>
<td>Anemias</td>
<td>Blood-loss anemia</td>
<td>Main cause of the anemia</td>
</tr>
<tr>
<td></td>
<td>Iron-deficiency anemia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pernicious anemia</td>
<td></td>
</tr>
<tr>
<td>Hurricane track prediction methods</td>
<td>Total climatology and persistence methods</td>
<td>Combination of hurricane characteristics</td>
</tr>
<tr>
<td></td>
<td>Particular climatology and persistence method</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Circulation and climatology method</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dynamic model method</td>
<td></td>
</tr>
<tr>
<td>Wind machines</td>
<td>Lift machines</td>
<td>Interaction between the wind and propeller blade</td>
</tr>
<tr>
<td></td>
<td>Drag machines</td>
<td></td>
</tr>
</tbody>
</table>

How to Discuss the Classes?

When you write the discussion of the individual classes, you must choose sources of discussion that enable you to explain each class fully, add comparisons so that readers can see the differences between the classes, and plan for the length of your classification.
Choosing sources of discussion.

Writing the discussion of individual classes is much the same as it is with extended definitions: you combine a variety of sources to explain the classes fully—see the checklist for a listing of these sources. To discuss the three types of dialysis machines for victims of kidney disease, you might use these sources:

<table>
<thead>
<tr>
<th>Classification of dialysis machines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Process</strong></td>
</tr>
<tr>
<td><strong>Comparison</strong></td>
</tr>
</tbody>
</table>

Of course, some classifications may use only one kind of writing. For example, in the discussion of different hurricane track prediction methods, the discussion would most likely be process—step by step how the methods work.

Adding comparisons.

No matter which sources you use in discussing the classes, comparison is an important ingredient. It helps readers distinguish the different classes from each other. Check out the following example of how comparisons work in classifications.

- **Comparisons used in classification.**
  Comparing the types to each other gives readers a clearer sense of the types as well as their distinguishing features.

Short and extended classifications.

In short classifications, an overview of the types is packed into one sentence or into one paragraph. In an extended classification, you might have one or more paragraphs on each type. For an extended classification, you'll use a paragraph or more to discuss each of the classes, and a separate paragraph to introduce these classes—as illustrated in the extended classification in the following.

- Single-paragraph classification. All the classes are discussed briefly in this one section.
- Extended classification with classes treated each in their own paragraphs
- Schematic view of classification. Remember that this is just a typical or common model for the contents and organization—many others are possible.

How to Format for Classifications?

Classifications don't call out for any special format; just use headings, lists, notices, and graphics as you would in any other technical document. For details, see:

- **Headings**

http://distanceed.hss.kennesaw.edu/technicalcommunication/chapters/5_11InformationStructures/5_11InformationStructures_print.html
Causal Discussion

What happened—why did it happen?

by David McMurrey

Another important information structure often used in technical writing is the discussion of causes and effects.

What Is a Cause–Effect Discussion?

Discussions like these answer questions such as the following:

- What are (or were) the causes of this? How and why does (or did) this happen?
- What brought about a situation, problem, or accident?
- What are (were or will be) the effects, results, or consequences of this? What will happen if a certain situation or problem continues?
- How does this work? What causes this to function as it does?
- Why won't this thing work? What's wrong with it?
- What changes will occur if a certain plan or action is taken?
- How can a certain problem or situation be avoided?
- What are the advantages, benefits, or disadvantages of an action or object?
- What are one or more potential solutions to a problem?

Note: See the complete example of a causal discussion.

Some examples:

- What causes tornadoes? What sorts of damage do tornadoes cause?
- What will happen if the world continues to use petroleum resources at its current rate?
- What were the causes of the Great Depression?
- What are the effects of an economic recession?
- How does a photocopier work?
- What makes a microwave oven work? (Does this sound like your seven-year-old?)

As you can see from these examples, we can discuss the causes and effects of human or social processes, natural processes, mechanical or physical processes, historical or economic processes, meteorological or biological processes, and on and on.

If you think about it, there's not much difference between process discussion and causal discussion. Both occur over time; steps in a process often involve causes and effects. The distinction depends on your purpose and emphasis: process discussions are primarily concerned with how an event occurs; causal discussions, with why an event occurs. Process discussion focuses on the chronology of something; causal discussion focuses on the causes and effects.

- I can tell you step by step how to take a photo or what events occur inside the camera when you take a picture—that's process.
- But I can also explain to you what physical and chemical principles are at work when you take a photo, what principles actually enable you to take a photo—that's causal discussion.

For some topics, however, such as explaining tornadoes, it's almost impossible to make a distinction. Here are some contrasting examples:
Here are some common reasons why you may need to discuss causal and effects:

- You need a record of the damage done by something. Photographs work, but words may also be needed.
- You need an account of the scientific principles at work in a process so that you can understand what you are doing in an instructional procedure.
- You need to understand the causes of something so you can have a better understanding of how to control or eliminate it.
- You need to understand the effects of something so that you can work to prevent it or increase its likelihood.

How to Organize Causal Discussions?

How you organize the contents of a causal discussion depends on how many and what combination of causes and effects you discuss:

- Single cause–single effect—A single cause can lead to a single effect; for example, a radiator leak can cause the car to overheat.
- Multiple causes–single effect—Many different causes can be seen as leading to one effect: for example, high unemployment, high interest rates, and high real estate costs (causes) might lead to decreased real estate sales (effect).
- Single cause–multiple effects—A single cause can be seen as producing numerous effects. For example, proponents of the greenhouse effect believe that increased CO\textsubscript{2} in the atmosphere (cause) will lead to changes in weather patterns, higher temperatures, drought, increased storm activity, and higher sea levels (effects).
- Sequential causes and effects—One cause can bring about an effect, which in turn becomes the cause of another effect, and so on. For example, proponents of the greenhouse effect argue that increased burning of fossil fuels (cause) leads to increased CO\textsubscript{2} in the atmosphere (effect) which in turn is the cause of less thermal energy being reradiated out of the system (effect) which in turn becomes the cause of increased global temperatures.
- Alternate causes and effects—Causes and effects can be alternating. For example, if the car won't start (effect), it may be because of a dead battery (alternate cause 1), no gas in the gas tank (alternate cause 2), or a faulty part (alternate cause 3).

Organization of effects in a short causal discussion. First, the cause is stated; then the effects are discussed one after another.

Consider a simple example: imagine you want to discuss how a single situation has led to a number of problems, in other words, one cause leading to several effects. In a single paragraph, the first couple of sentences might focus on the cause; each of the following sentences would focus on the effects. In an extended discussion, there might be
a paragraph on the cause, and a paragraph on each of the effects. The preceding schematic diagram of a causal
discussion in shows you how the single-paragraph approach would look.

How to Discuss Causes and Effects?

Actual discussion of causes and effects is not as immediately identifiable as descriptive or process writing are.
Typically, causal discussions talk about events and describe things. What makes causal discussions distinctive is
the use of transitional words to indicate the causes and effects.

In this sentence:

*Increased deficit spending by the government leads to increased inflation*

the verb "leads to" establishes the connection between a cause and an effect. In this excerpt, the connective
"consequently" establishes a causal link between the increasing domestic anger over the Vietnam war and
Johnson's decision not to seek reelection:

Meanwhile at home, anger, hostility, and outright revolt against the war grew. Johnson, sensing he could not get
reelected in this atmosphere, consequently decided against running for another term.

Cause–effect relationship involving a single effect followed by an extensive exploration of its cause.

How to Format for Causal Discussions?

Here are a few suggestions on format as they relate specifically to causal discussions:

- Headings. If you write an extended causal discussion and have separate paragraphs for each of the causes
  or effects, then the headings should signal those causes. (See the examples in this chapter.) See the chapter
  on headings for details.
- Lists. If you discuss sequential causes and effects, you're likely to need in-sentence and vertical numbered
  lists. If you have multiple causes or effects but no necessary order amongst them, then bulleted lists are
  appropriate. See the chapter on lists for details.
- Graphics. Causal discussions often use conceptual diagrams to show the relationships between the causes
  and effects. In these you give a spatial representation of the causes and effects as they occur in time. See the
  chapter on graphics for details.
- Style. As with any other technical writing, you treat numbers, symbols, and abbreviations in process
  discussions the same. Exact measurement values should be numerals, regardless whether they are below
  10. See the chapter on technical style for details.

Schematic view of cause–effect discussions. Remember that this is just a typical or common model for the contents
and organization—many others are possible.

Extended Definition

How can you define it?

by David McMurrey

An important writing tool you'll need, particularly if you are writing for nonspecialists, is definition—or more
specifically, extended definition. An extended definition is a one or more paragraphs that attempt to explain a
complex term. Some terms may be so important in your report, there may be so much confusion about them, or
they may be so difficult to understand that an extended discussion is vital for the success of your report.
Note: See the complete example of an extended definition.

When you write reports, you may often discover that you need to explain certain basics before you can discuss the main subject matter. For example:

- in a report on new treatments for sickle cell anemia, you'd need a section defining the disease.
- In a report on the benefits of drip irrigation, you'd need to write an extended definition of drip irrigation, explaining how it works and what equipment is used.
- In a report showing small businesses how to weather economic recessions, an extended definition of the term economic recession would be needed first.

Writing Formal Sentence Definitions

One of the first things to do when you write an extended definition is to compose the formal sentence definition of the term you are writing about. Place it toward the beginning of the extended definition. It establishes the focus for the rest of the discussion. It is "formal" because it uses a certain form. Here are several examples:

Formal sentence definitions: their components are the term being defined, the class it belongs to, and its distinguishing characteristics.

Take particular care when you write the reference to the class to which the term belongs; it sets up a larger frame of reference or context. It gives readers something familiar to associate the term with. The term may belong to a class of tools, diseases, geological processes, electronic components; it may be a term from the field of medicine, computer science, agriculture, reprographics, or finance. Avoid vague references to the class the term belongs to: for example, instead of calling a concussion an "injury" or botulism a "medical problem," call them something more specific like "a serious head injury" and "a severe form of food poisoning," respectively.

Similarly, provide plenty of specific detail in the characteristics component of the formal sentence definition. Readers need these details to begin forming their own understanding the term you are defining.

Be aware, however, that your formal sentence definition will likely contain additional potentially unfamiliar terms. Somewhere in your extended definition, you'll need to explain them as well, possibly by using short definitions (explained later in this section).

A formal sentence definition used in an extended definition.

Choosing the Sources of Definition

When you write an extended definition, you literally grab at any of the writing resources or tools that will help you explain the term to your readers. This means considering all of the various sources of information that can help define the term adequately (for example, description, process narration, causal discussion, and classification).

Notice how many different kinds of writing are indicated in the examples in this chapter.

The key to writing a good extended definition is to choose the sources of definition to help readers understand the term being defined. Use this checklist to select the kinds of discussion to include in your extended definitions:

Checklist of sources for extended definitions

Outline of a report that uses extended definition. This view shows how different sources of definition can be used to write an extended definition.

Another extended definition. This one uses additional definitions, description (demographics), process.
Adding Short Definitions

As mentioned earlier, you'll find that in writing an extended definition, you must define other terms as well. Typically, short definitions—a sentence, clause, or phrase in length—will suffice. Notice how many are added to the "after" version in the following.

Extended definitions often need additional definitions. These can be short, phrase-length definitions.

This process of supplying short definitions "on the fly" is critical in good technical writing for nonspecialists. Notice how many quick definitions occur just in the first two sentences of the preceding illustration. "Maculopapular" is defined in parentheses as "(raised red)." "Endemicity" is defined by restating the idea in other words: "that is, people throughout the world are capable of contracting measles." And "infective particle" is quickly defined by providing an alternative: "or organism causing the illness." Obviously, the passage is almost tripled in length—but that's the price for thorough explanation and clarity.

Format for Extended Definition

Extended definitions don't call out for any special format; just use headings, lists, notices, and graphics as you would in any other technical document:

- Headings
- Lists
- Notices
- Graphics

Schematic view of an extended definition. Remember that this is just a typical or common model for the contents and organization—many others are possible.

Process Discussions

How does it happen?

by David McMurrey

In technical writing, process discussion is one of the most important kinds of prose: people need to know how things happen, how things work, how to operate things, and how to perform certain actions. A narration tells how something occurs over a period of historical time. A process is an event or set of events that can be performed or that occurs regularly or repeatedly. The words "procedure" and "routine" are closely related. When you "narrate" a "process," you explain how something works or how something occurs. We'll use "process discussion" here.

Note: See examples of process discussions.

What Is a Process?

Process discussion is an information structure—it's one of those fundamental combinations of content and organizational patterns you use in many different situations in technical writing. For example, instructions are an application of technical writing; instructions make heavy use of process discussion. (See the chapter on instructions.)

The focus of this chapter is some basic guidelines for writing noninstructional process discussions. These process discussions answer such questions as:

- How does this mechanism work?
- What are the typical steps in this natural, mechanical, social, biological, psychological phenomenon?
- How does this event (mechanical, natural, human, social) happen?
When we ask questions like these, we expect a systematic step-by-step explanation of how the mechanism works or how the phenomenon happens. We're not looking to perform it ourselves, just to understand it. In another chapter, you read about causal discussions. These are closely related to process discussions. In causal discussions, we're interested in why something happens, what causes it, what its results or consequences are. In process discussions, we are interested in how something happens, how it works, in a step-by-step fashion. Often the distinction between these two is blurry.

Process discussion. Step by step, this text explains how computers "recognize" speech.

Process discussions focus on things like formation of lightning, snow, hurricanes, cold fronts, tornadoes; gestation of a human embryo; pollination of a flower; automatic operations of a photocopier or a computer; occurrence of supernova, black holes, red giants, or white dwarfs. Process discussions explain the workings of such mechanisms as automobile batteries, light bulbs, telephones, televisions, microwave ovens, stereo receivers.

As mentioned previously, the focus in this chapter is noninstructional process. However, while explaining how doctors perform open heart surgery or how a nuclear power plant operates might sound like instructions, they aren't! Normally, documents on these topics would give people an overview of what goes on in these processes. This next illustration conveys a general idea of how seawater is converted into fresh water:

Process discussion. Step by step, this text discusses a method for the desalination of seawater.

How to Divide the Process into Steps?

When you write a process discussion—whether it's a single paragraph or a whole report—one of the most important tasks is to divide the process into its main steps, phases, stages, or periods. There are of course other ways to handle a process discussion, but division by steps is usually the best. For example, you might try organizing a process discussion by the key parts of a mechanism. Use whichever plan seems to work best for your readers, topic, and purpose.

A step is one action or event (or a group of related ones) that is performed or that occurs in the process. Consider a simple process such as making coffee with a drip coffee pot. Such an activity involves the following steps, each of which actually represents a group of actions:

1. Boiling the water
   a. Finding the kettle and taking it to the sink
   b. Turning on the water and rinsing out the kettle
   c. Filling up the kettle to the desired amount
   d. Turning off the water and walking to the stove
   e. Placing the kettle on a burner
   f. Turning on the burner
   g. Waiting for the water to boil

2. Rinsing the coffee pot and the basket

3. Measuring in the new coffee

4. Pouring in the boiling water

Obviously, no one needs to be told all these specific actions; the example shows that a step usually stands for a group of related specific actions or events. If you look back at the preceding desalination example, you see a more realistic example of this process of division into steps. The discussion focuses on four steps in the desalination
process: (1) pressurization and evaporation, (2) freezing, (3) separation, and (4) discharge of the briny portion of the seawater.

How are process discussions used in technical documents? First and foremost, processes are typically explained in instructions. For some situations, explaining how a thing works is almost as effective as providing the direct step-by-step instructions. And in any case, people understand the actions they are performing better when they understand the actions behind those actions. Process discussions are also vital in new product documents—either internal (meant for the product's designers and marketers) or external (meant for the product's customers and users). And finally process discussions are important in scientific research literature. You can imagine researchers studying acid rain or oil spills—understanding these processes might lead to controlling them better.

How to Discuss the Steps?

When you discuss a process, your goal is to enable readers to understand how that process works, the typical events that occur in that process. You use any writing tools at your disposal to accomplish that end. One of the most common ways of explaining a process is to divide it into steps, phases, periods, stages. These are essentially time segments—groupings of closely related events or actions. Take a look at any of the examples in this chapter; you'll see process sentences everywhere.

However, most process discussions aren't much without explanations of the causes and effects operating behind them. For example, it's not terribly exciting to read that when tornadoes form, it gets cloudy, wind and rain and twisters occur, wrecking things. We want more that just the bare-bones process: we want to know what causes them to form, what are the conditions favorable to their formation, how they behave once formed, and of course what sorts of damage they cause.

Other sorts of information can supplement the discussion of processes as well:

- Description: Explain how things look before, during, or after the process, or any phase within the process.
- Definitions: Explain the meaning of any technical terms used in the discussion.
- Comparisons: Compare the process, any of its phases or outcomes, to something similar or something familiar to help readers understand.
- Examples: Provide examples of the process you are explaining. For example, in a discussion of tornadoes, examples of tornadoes in history can help.

Mitosis is the process of cell duplication, during which one cell gives rise to two identical daughter cells. The process consists of four main phases: prophase, metaphase, anaphase, and interphase.

1. In **prophase**, the genetic material thickens and coils into chromosomes, the nucleus disappears, and a group of fibers begins to form a spindle.
2. In **metaphase**, the chromosomes duplicate themselves and line up along the mid-line of the cell. The halves are known as **chromatids**.
3. In **anaphase**, the chromatids are pulled at opposite ends of the cell by the spindle fibers. At this point, the cytoplasm of the mother cell divides to form two daughter cells, each with the number and kind of chromosomes the moher cell had.
4. In **interphase**, the daughter cells begin to function on their own, once their nucleus membranes and nucleoli reform.

Expanding example of process discussion. Information structures can work like an accordian—they can expand or collapse according to your needs. Click on the link in this example and see the expansion of the discussion of prophase.

How to Format Process Discussions?

Here are a few suggestions on format as they relate specifically to process discussions.

- Headings. If you write an extended process discussion and structure it by steps or phases, in other words, time segments, then the subheadings can be related to those steps or phases, as illustrated in the following schematic view of process discussions. If your process discussion has one section in which you explain the
process and another in which you discuss some supplementary aspect of the process, your headings would need to indicate that structure as well. See the chapter on heading for details.

- Lists. Because they focus on sequences of events, process discussions are likely candidates for in-sentence and vertical numbered lists as the examples in this chapter show. See the chapter on lists for details.
- Graphics. Process discussions are prime territory for flow diagrams such as you see in some of the illustrations in this book. In these you give a spatial representation of things as they occur in time. Useful also are diagrams and drawings of the mechanisms that take part in the process. See the chapter on graphics for details.
- Style. You treat numbers, symbols, and abbreviations in process discussions the same as in any other technical document. Exact measurement values should be numerals, regardless whether they are below 10. See the chapter on style and mechanics for details.

Schematic of a process discussion. A typical or common model for the contents and organization—others are possible.

Sexy Technical Communication Home

**Persuasion**

Tell them why—get them on your side.

by David McMurrey

When the teaching of technical writing first emerged in university engineering schools, it was defined as rigorously objective in writing style—even to the extent of using the passive voice instead of the first person singular "I." The standard model was the primary research report. However, since then, it has become clear that technical writers must often engage in persuasive communication efforts in their primary work.

**What Is Persuasion?**

The infrastructure essential in proposals and progress reports is persuasion. To convince people to hire you to do a project and to reassure them that the project is going well, you need persuasive strategies. This chapter reviews the common persuasive strategies to get you ready to write those kinds of documents—as well as persuasive technical documents. Understanding general persuasive writing strategies, you will be well-equipped to develop these kinds of documents:

- Resumes
- Application letters
- Proposals
- Progress reports
- Complaint letters

Note: See examples of persuasion.

*Persuasion* is the communicative effort to convince people to think a certain or act a certain way—to vote for a city-wide recycling program, to oppose the building of more coal-fired electricity plants, and so on—or the opposite!

In the view of some, persuasion is not a legitimate tool for technical communication. For them, technical writing is supposed to be "scientific," "objective," "neutral." However, if you grant that proposals, progress reports, resumes, application letters, and even complaint letters are instances of technical communication because they often must convey technical information, then you see that persuasion is an important tool in technical communication.

**What Are the Tools of Persuasion?**

The classical approach to persuasion, laid down my Aristotle (384–322 BCE) in the *Art of Rhetoric*, involves these appeals to readers and listeners (remember your Rhetoric and Composition 101?):
Logical appeal—When you use reasons and arguments, backed up by facts and logic, to make your case, you are using the logical appeal. We normally think of the logical appeal as the only legitimate method of argument, but the "real world" shows us differently.

Emotional appeal—When you attempt to rouse people's anger or sympathies in a persuasive effort, you are using the emotional appeal. Showing a little girl fleeing from a burning village bombed by war planes or an oil-soaked seagull on a beach devastated by an oil spill—these images spark emotions like anger, horror, sympathy; but they don't make a logical case for or against anything. These images may, however, capture readers' attention and cause them to pay more attention to the rest of your persuasive effort.

Personal appeal—When you present your qualifications, experience, expertise, and wisdom or those others, attempting to build readers' confidence, you are using the personal appeal. As with the emotional appeal, there is no logical justification for the personal appeal. It's like saying, "Trust me." Despite that, readers sometimes want to know who you are and what gives you the right to speak so authoritatively on the subject. Just as the emotional appeal can be used legitimately to get readers to pay attention and care about your message, the right amount of personal appeal can build readers' confidence in you—or at least a willingness to hear you out.

You may also have encountered the "stylistic" appeal: the use of language and visual effects to increase the persuasive impact. For example, a glossy, fancy design for a resume can have a positive impact just as much as the content.

In your rhetoric and composition studies, you may also have encountered something called the Toulmin approach to persuasion. The complete system involves claims, grounds, warrant, backing, and rebuttal, but a particularly useful element is the rebuttal, and another known as the concession.

Rebuttal. In a rebuttal, you directly address counter-arguments that your persuasive opponents might bring up. You show how they are wrong or, at least, how they don't affect your overall argument. Picture yourself face to face with your persuasive opponents—what arguments are they going to come back at you with? How are you going to answer those arguments? In a written persuasive effort, you must simulate this back-and-forth, debate-style argumentative process. Imagine your opponents' counter-arguments (arguments they might put forth against your position) and then imagine your own rebuttals (your answers to those counter-arguments).

Counter-argument. A persuasion can be structured entirely around tearing down the opponent's argument. Consider this example:

Concession. In a concession, you acknowledge that certain opposing arguments have some validity, but you explain how they do not damage your overall argument. Concessions build personal appeal: they make you seem more open minded.

Synthesis. Modern rhetoricians urge us not to view the persuasive process as a win-lose, all-out war. When people are entrenched, they shut out the arguments of the other side. Such rigidity prevents us from resolving the issue and getting on with our lives. Instead, the process of counter-argument, rebuttal, and concession should be sincere and continuous until all parties reach synthesis—a middle ground where they drop their weapons and agree.

Single-paragraph example of persuasion. This paragraph would be one of several paragraphs attempting to discredit the recycling movement.

What Are the Common Flaws in Persuasion?

You should be aware too of the logical fallacies commonly found in persuasive efforts:

Hasty generalizations. When you draw a conclusion based on too little evidence, that's a hasty generalization. For example, if you conclude that there is a big social trend to return to the 70's look because you see two or three bellbottoms and paisley shirts one day, you've drawn a hasty generalization based on a very limited, incomplete sample.
Here are guidelines on writing persuasively in a technical-writing context:

- **Carefully pick your topic and your approach to it.** Finding a project for persuasion is like trying to pick a fight. Think of the main issues of the day—global warming, ozone-layer depletion, alternative fuels, mass transportation, pesticides, zero population growth, solar energy, cloning (bioengineering), abortion, effects of computer- and video-game violence, capital punishment, nuclear armaments, chemical warfare. Each of these topics has multiple issues that are hotly debated. Technical-writing courses are not the place for the common pro-and-con and letter-to-the editor essays you may have written in past writing courses. However, these topics have a technical side that challenges your abilities as a technical writer. What are the logical arguments for recycling—more specifically, a city-based curb-side recycling program? They range from altruistic (for the city, for the planet) to selfish (to reduce waste management costs, to decrease taxes). Which arguments you use depends on your readers. Altruistic arguments may be of no use to certain conservative or business readers or to city administrators, but they may be vital in getting ordinary citizens to back such the program.

- **Define each of your arguments; plan how you will support them.** You must prove each logical argument, using supporting data, reasoning, and examples. You can't just baldly state that something costs less, works better, provides benefits, and is acceptable to the public—you've got to prove it! In your persuasive effort to get the city to consider recycling, you might use the logical appeal that such a program would reduce landfill requirements. How can you prove that? Do some research. What's the city's daily input to the landfill; what are the costs? Can you determine the percent made up by recyclables? If you can get believable numbers, calculate landfill savings in terms of volume and dollars.

- **Consider emotional appeals.** At best, emotional appeals capture readers' attention and get them to care about the issue. At worst, they rouse strong emotions such as fear and anger, preventing readers from thinking clearly about the issue. What emotional appeals could you use for the recycling promotion (not that you actually would, of course)? Images of overflowing landfills might work; images of dwindling natural habitats, replete with deer, chipmunks, hummingbirds—these might work. Would they pull at the heart strings of your readers, or would readers cynically mutter "give me a break"? How would you feel about using such tactics?

- **Consider personal appeals.** Like emotional appeals, personal appeals have no logical relevance to an argument. If you use the personal appeal, you attempt to build readers' confidence in you as someone who is knowledgeable and reliable. Citing years of experience and education is a common example of building a personal appeal. What personal appeals could this recycling persuasion use? To get people to accept your data, cite believable sources, such as government reports or leading experts. To give yourself credibility, describe your past experience and training in this area. Perhaps also describe yourself as a long-time resident of the city. These appeals shouldn't have any relevance, but they may cause people to hear you out.
• Address any counter-arguments. It's a good idea to address counter-arguments—objections people might raise in relation to your argument. Imagine people out there saying "but—but—but—!" Discuss their counter-arguments and show how they are wrong, how they can be addressed, or how they are irrelevant to your main point. Notice that the persuasive document advocating recycling is structured on counter-arguments: **Recycling: Not a Waste of Money or Time!** As for recycling programs, you must address the standard objections. *It's a hassle.* Your might counter-argue that recycling is no more of a hassle than taking out the garbage. *It's a hassle sorting everything and keeping in separate bins.* That one is easy——most recycling programs don't require sorting. *It's messy and attracts pests.* Hmmm, that's a hard one——time for some research.

• **Plan an introduction.** In an introduction to a persuasion, you cannot start out guns blazing and swords rattling. It's not necessary to state your main argumentative point right away. Instead, just indicate the subject matter—not your main point about it. Your readers are more likely to hear you out. Imagine that you've written the main sections of this persuasion. You have logical appeals, counter-arguments, and possibly some personal and emotional appeals as well. Instead of demanding that the city adopt a recycling program, begin with a quiet purpose statement that this document "looks at" or "investigates" the possibilities for recycling. Indicate that this document is for both city officials and ordinary citizens. Provide an overview, indicating that you'll be discussing current and projected landfill use and associated costs, amount of recyclables in municipal waste, their recyclable value, potential revenue from a recycling program, costs of a recycling program, and necessary administrative and citizen participation in such a program.

• **Consider the conclusion.** In a persuasion, the final section is often a "true" conclusion. If you have not yet overtly stated your main argumentative point, now's the time. When you do, summarize the main arguments that support it. While the introduction may be the place for quiet understatement, the conclusion is the place to pound home your main point. Come out and state vigorously that the city should implement a recycling program and then summarize the main reasons why.

**How to Format Persuasive Documents?**

Here are a few suggestions on format as they relate specifically to persuasive documents.

• **Headings.** If you structure your persuasion by individual arguments, then the subheadings can be related to those arguments. Notice that the headings in the example persuasion address the counter-arguments: **Recycling: Not a Waste of Money or Time!**

• **Graphics.** Factual information—data—supplies a great deal of the legitimate support for your persuasive effort. Make that data more dramatic and vivid by creating tables, charts, and graphs. **Graphics**—illustrations, drawings, photos—can also supply that essential logical support—but also the emotional support mentioned earlier.
Logic and Logical Fallacies

Taken with kind permission from the book Why Brilliant People Believe Nonsense by J. Steve Miller and Cherie K. Miller

**Brilliant People Believe Nonsense [because]...**

They Fall for Common Fallacies

*The dull mind, once arriving at an inference that flatters the desire, is rarely able to retain the impression that the notion from which the inference started was purely problematic.*

— George Eliot, in *Silas Marner*

Even the brightest among us fall for logical fallacies. As a result, we should be ever vigilant to keep our critical guard up, looking for fallacious reasoning in lectures, reading, viewing, and especially in our own writing. None of us are immune to falling for fallacies.

Until doctors come up with an inoculation against fallacies, I suppose the next best thing is to thoroughly acquaint ourselves with the most common fallacies. I chose the following fallacies by comparing a dozen or so university sites that list what they consider the most common fallacies that trip up students. ¹

**Snoozer Alert!**

Sorry, but this chapter and the next don't contain fascinating stories and intriguing intellectual puzzles. But please resist the temptation to skim to the following section. To think critically, we simply must familiarize ourselves with logical fallacies. Otherwise, we're fair game for all sorts of nonsense. Think of it like math. While the formulas themselves might be boring, we learn them in order to hopefully use them for something practical in the future. You'll assuredly find many of the below fallacies used in conversations and articles.

Think of logical fallacies as the grammar you must master to learn a foreign language. Before you can use a language practically (like writing a note to that ravishing foreign exchange student in her native language), you simply must learn the vocabulary and grammar. Similarly, logical fallacies are a part of the vocabulary of logical thinking. I'll try to make understanding them as painless as possible.

So learn these well. Reflect upon them. Look for them in the media. Familiarizing yourself with errant reasoning goes a long way toward helping you to write, reason, speak, and listen with more critical precision.

**Tip:** If some of my definitions and examples don't sufficiently clarify, look up the fallacy in Wikipedia or other sources for alternate explanations.
Below this list of fallacies, I'll give you a bit of practice by asking you to connect a fallacy with an errant argument. Finally, I'll give a few tips on checking your own argumentation (particularly in writing and speeches) for fallacies.

Sexy Technical Communication Home

**Twenty-Seven Common Fallacies**

**Ad Hominem:**

translated into English: "against the person," aka "damning the source," the "genetic fallacy," "poisoning the well," related to "tu quoque" (you, too!). Defined as attacking the person (e.g. - can't be trusted, is a moron, etc.) rather than the argument.

**Example:** "I don't believe anything he says because he's a biased political liberal." Yet, shouldn't we assess his arguments based upon his evidence and argumentation, rather than solely because of his political label?

**Caution:** Sometimes a person has indeed been shown to be untrustworthy. Cautioning readers that he has been repeatedly caught in flagrant lies isn't an ad hominem fallacy. Noting a person's lack of integrity can be valid, if his argument requires us to trust him.

**Tip:** If the person's character is either irrelevant to the argument or unknown, focus on the facts and arguments.

**Affirming the Consequent:**

aka "converse error" or "fallacy of the converse." This is a formal fallacy (the form of the argument isn't valid) that assumes if the argument is valid going one direction, it's also valid when run the opposite direction.

**Example:**

Premise 1: If I get the flu, I'll be nauseated.
Premise 2: I'm nauseated.
Conclusion: Therefore, I have the flu.

This is invalid because while it may be true that if you get the flu, you'll get nauseated, the converse isn't always true. You can be nauseated and yet not have the flu. Perhaps you have a hangover, or are pregnant.

**Tip:** If you see an argument in the following form, it's affirming the consequent:

Premise 1: If P, then Q  
Premise 2: Q  
Conclusion: P

**Appealing to Extremes:**

taking an assertion to an extreme, even though the arguer may never take it to that extreme.

**Example:** "Avid health advocates blow out their knees by their 50s by running marathons. Therefore, don't prioritize regular exercise." But not all avid health advocates run long distances as their primary exercise. It's an extreme statement.

**Argument From Authority:**

aka "argumentum ab auctoritate," "appeal to authority." Claiming that a position is true because an authority says it's true.
Even when the referenced authority is a true authority in the field, arguments should ultimately be based upon facts and reasoning rather than quoting authorities. Also beware of people quoting false authorities, like football stars or models selling insurance or technology.

**Example:** "We know global warming is true because a number of great scientists assure us it's true."

**Caution:** Sometimes citing authorities can be a valid part of an argument. For example, if a hefty percentage of respected scientists who specialize in a related field are all warning us about the dangers of global warming, this in itself provides evidence that global warming is at the very least a viable theory that needs to be seriously considered. Alternately, if no respectable scientists took global warming seriously, then this would surely be a strike against it, even though ultimately we're looking for hard evidence rather than numbers of testimonies.

**Tip:** Ask yourself,

- Are these truly experts in the field I'm discussing? Would some view them as either biased or holding to fringe views on the subject?
- Have I explained clearly how I'm using these authorities as evidence, within the larger scope of my argument?
- Would it be relevant to explain the evidence that led the authorities to come to their position on the subject?
- Are you using their testimonies as helpful resources, quoting them as a part of a larger argument, or quoting them as a slam dunk argument to make your case? Make sure you're not saying something like: Dr. Authority believes x, so we should believe x as well.

**Argument from Ignorance:**

aka "appeal to ignorance," "argumentum ad ignorantium," related to "non-testable hypothesis." Assuming that a claim is true because it has not been or cannot be proven false (or vice versa, assuming that a claim is false because it has not been or cannot be proven true.)

**Example:** Nobody can prove that my client was at the scene of the crime, therefore he's innocent. (Of course, he may be in fact guilty. We may just lack sufficient evidence that he was there.)

**Caution:** While some would say "absence of evidence is not evidence of absence," this isn't true in every case. For example, if I walk outside and see no evidence of rainfall (no puddles, the streets aren't wet), I'm justified in taking this as evidence that it hasn't rained recently. In this case, the absence of evidence for rain is indeed evidence for the absence of rain.

**Sexy Technical Communication Home**

**Band Wagon:**

aka "ad populum fallacy," "appeal to widespread belief," "appeal to the majority," "appeal to the people." If a large number of people believe it, it must be true. It appeals to our desire to fit in.

**Example:** "Most people use Microsoft products, so they must be the best."

**Example:** "Everybody I know uses Meth, so it can't be that bad."
**Caution:** Some people naturally despise majority opinion and relish holding contrarian positions. Those who disagree with opinions held by a majority of intelligent people should at least make sure they understand the reasons informed people give to justify their beliefs.

**Tip:** Remember that popular opinion is often wrong, and what's cool today may seem foolish tomorrow. In fact, it's often those who stand against the crowd who change the world. As Apple, Inc. said it in their motto: "Think different."

### Begging (Evading) the Question:

aka "circular argument," "petitio principii," translated "assuming the initial point." The conclusion is assumed in a premise. This typically isn't as obvious as it first sounds.

**Example:** The Writing Center at the University of North Carolina gives a good example.

"Active euthanasia is morally acceptable. It is a decent, ethical thing to help another human being escape suffering through death."

At first read, it may seem pretty straightforward. But let's examine it as a premise and conclusion:

**Premise:** It is a decent, ethical thing to help another human being escape suffering through death.

**Conclusion:** Active euthanasia is morally acceptable.

Look closely at these two sentences and you'll discover that they actually do nothing more than state the same thing twice; the conclusion merely dresses up the premise in different words. "Decent, ethical" in the premise is worded "morally acceptable" in the conclusion. "to help another human being escape suffering through death" in the premise becomes "active euthanasia" in the conclusion.

Thus, the argument doesn't tell us much, if anything, about why euthanasia is morally acceptable. It leaves us asking the implied question over again, "But why is it acceptable?", showing that the premise and conclusion merely begged (i.e., evaded) the question.

**Tip:** Typically, rewriting the argument in the form of premises and a conclusion reveals when a question is being begged. Do you agree with the premises? Are there gaps in the line of argument? Does the conclusion say nothing more than the premises already stated?

### Bifurcation:

aka "false dichotomy," "black-or-white fallacy," the "either-or fallacy," related to a "false dilemma." The argument makes it appear that there are only two possible answers, but there are actually more.

**Example:** We discussed examples in the last chapter.

**Tip:** Ask yourself, are there really two and only two options? If not, are any of the other options viable? Have all other options been sufficiently ruled out?

### Dogmatism:

Not even considering an opponent's argument, because of overconfidence in one's own position.

**Statement:** "Mercedes makes the best car ever."

**Retort:** "But according to Consumer Reports...."

**Dogmatic Defense:** "I don't care what those studies say; I know! Mercedes is the best."
Emotional Appeals:

An appeal to emotion that is irrelevant (or largely irrelevant) to the argument.

**Example:** "The death penalty can't be right. Have you seen a person die in an electric chair?"

**Caution:** Emotion can often be a legitimate part of an argument.

**Example:** "Look at these poor birds dying from an oil spill. This demonstrates one reason we should take great precautions to avoid such mishaps."

Equivocation:

Related to "semantics," "playing with words." Using the same word with more than one meaning, thereby invalidating the argument.

**Example:** "Of all the animals, only man is rational. No woman is a man. Therefore, no woman is rational." In the first instance, "man" means "mankind," whereas in the second instance, "man" means "the male gender." This change in meaning invalidates the argument.

**Tip:** Look carefully at the argument's important words. Are they used in a consistent way, or do they shift meanings?

Fallacy of Exclusion:

Focusing on one group's behavior as if the behavior is exclusive to that group.

**Example:** "Watch those women drivers. They're always thinking of something other than their driving." But are male drivers any better? Shouldn't this statement be based on psychological studies and statistics of accidents rather than personal observations of one sex?

False Dilemma:

aka "false dichotomy," "either/or," "black/white," "excluded middle." A form of bifurcation, this fallacy allows for only two extreme positions, although a legitimate middle ground might be arguable. Sometimes they paint one side as so extreme that nobody could ever agree with it.

**Example:** "You either support Israelis in Palestine or you're an anti-Semite."

**Example:** "Are you for George Bush or are you for the terrorists?"

**Tip:**

When only two extreme alternatives are given, look for middle ground.

Faulty Analogy:

aka "weak analogy." Comparing two similar things to make a point, but the analogy breaks down because of one or more significant dissimilarities.

**Example:** "The war in Afghanistan is nothing more than a modern day Vietnam war."
Glittering Generality:

aka "Weasel Words." Using words in such a broad way that almost everyone resonates with them in the same way, thus lending credence to the argument. Thus, those who argue that their position is really about "freedom," "love," "human rights," etc., can gain a following, even though the words may mean different things to different people, or are being used in such a vague way as to be essentially meaningless.

**Example:** "Allowing this controversial artwork in our place of business is really about guaranteeing our freedoms, in this case our freedom of expression." Perhaps, but what if the artwork trivializes or misrepresents your business, or disgusts and demoralizes your employees? Framing it as solely an issue of freedom seems to make it a glittering generality.

Hasty Generalization:

related to "non-representative sample," "fallacy of insufficient statistics," "fallacy of insufficient sample," "fallacy of the lonely fact," "leaping to a conclusion," "hasty induction," "secundum quid (converse accident). A conclusion was reached via inadequate evidence, such as when a sample cited was inadequate (e.g., atypical or too small) to warrant a generalized conclusion.

**Example:** "Most Hollywood stars have terrible marriages. Just read the tabloids." Their conclusion may or may not be true, but reading tabloids is no way to decide the issue. News sources by their very nature select what's "newsy." Since a nasty divorce is more newsy than a stable marriage, the former gets the press, giving the impression that most Hollywood stars can't hold a marriage together.

**Example:** "I'll never fly again. I read about too many accidents and hijackings." Again, you don't hear about the thousands of flights with no incidents. Thus, you're judging from the news you hear, which is both an atypical and small sampling. The National Safety Council calculated the odds of dying in a motor vehicle accident as one chance in 98 over a lifetime. The odds for dying in air travel (including private flights) was one chance in 7,178.³

**Tip:** Notice the sample size and where it's drawn from. Is it adequate to warrant the conclusion? Is the conclusion stated in terms that are too general and sweeping?

Inconsistency:

aka "non contradiction." The argument contradicts itself. (See the previous chapter for a more thorough explanation.)

**Example:** "Only statements that can be justified with scientific experiments can be believed." Yet, this statement itself can't be justified by scientific experiments.

**Example:** "Our brains developed, not to think logically, but for survival in an agrarian society. Therefore, we can't trust our reasoning." This statement uses logical reasoning, although it's claiming logical reasoning is not to be trusted.

Moral Equivalency:

arguing incorrectly that two moral issues are sufficiently similar to warrant the same treatment. It often compares lesser misdeeds to major atrocities.

**Example:** "Killing in war is legalized murder." In some instances, this may be true. But in all instances?

**Example:** "Our local police act like Nazis—they have no respect for my human right to drive my car like I want."
Non Sequitur:
translated: "it does not follow." A general category that includes "hasty generalization," "slippery slope," "affirming the consequent," "missing the point," etc.) The conclusion does not follow from the premises.

Example: "Patrick always smiled at me and was so respectful. He couldn't have burned down the gym." Is there some absolute law of nature that states that respectful, smiling people never burn down gyms? While Patrick's character in relation to you can be a relevant piece of evidence to be considered, it's a non sequitur to say that it proves he could have never burned down a gym.

Tips:
1. Forget the conclusion for a moment. Looking solely at the premises, ask yourself what can be concluded from the premises.
2. Now look at your conclusion. Ask yourself what kind and amount of evidence you'd need to support this conclusion. Do the premises provide that kind of evidence?
3. Is your conclusion too extreme? Would it be closer to the truth if it weren't overstated?

Failing Occam's Razor:

Prefer a simpler explanation (or hypothesis) to a more convoluted or complicated one.

Example: Your best friend Ralph flunked Calculus. Possible reasons:

1. If we were to run a psychological profile of both Ralph and his professor, we might find that they have diametrically opposed learning styles, thus making communication extremely difficult.
2. Aliens kept Ralph up all night before both the midterm and final exam, questioning him and keeping him from adequate rest and preparation.
3. Ralph admitted to never doing his homework and seldom attending lectures.

Occam's Razor would prefer the third, more simple and obvious explanation.

Warning: Occam's Razor doesn't decide all cases, since many explanations that end up being proven over time are indeed more complicated than their disproven counterparts. Typically, when choosing between competing scientific theories, the best fit with the observable data trumps simplicity. So it's wise to consider Occam's Razor a "rule of thumb" rather than a hard and fast rule.

Post Hoc Ergo Propter Hoc:
translated "after this, therefore because of this." Often shortened to "post hoc," also called "faulty causality," "faulty cause," "false cause," or "correlation vs. causation"). Correlation and causation are confused in that one event follows another and the former is falsely assumed to be the cause of the latter.

Example:
"Ever since his trip to India, Alfred's been sick. Obviously, he caught some-thing in India that our doctors can't diagnose."

Tips:
1. When one event is claimed as the cause of another, look for other possible causes. In the above example, perhaps Alfred caught something the day he arrived back home, or already had an illness before going to India, but never developed symptoms until he returned.

2. Give evidence beyond "this happened after that," to support your claim. For example, you might discover that Alfred consulted with seven American diagnostic specialists, who all agreed that it was a malady they'd never before seen. This would lend credence to the "he caught it in India" theory.

Red Herring:

Deflecting an argument by *chasing a rabbit* (an irrelevant topic.)
The name "red herring" was originally used in fox hunting, when a herring (type of fish) was dragged across a trail to throw the dogs off the scent of the fox.

**Example:** After Harry’s wife caught him gambling away his paycheck and asked for an explanation, he responded, "At least with gambling I have a chance to get my money back. What about your weekly purchase of clothes that ends up in a bag for Goodwill? And why isn't your recent raise helping us to pay our debts?"

Harry's arguments deflect from the immediate issue: he gambled away his paycheck.

**Example:** "Sure, the mercury found in seafood is often unsafe, but fishermen have to make a living like everyone else."

**Tip:** If you're not sure, write the argument out as a line of argument. This typically shows clearly where the argument got off track.

Reductionism:

aka "oversimplifying," "sloganeering."
Reducing large, complex problems to one or a few simplistic causes or solutions.

**Example:** "The problem with our economy can be reduced to two words: trade imbalance." What about other relevant issues, such as the drain of a huge national debt?

**Tip:** Ask yourself, "What other factors may contribute to this problem, or be a part of the solution?"

Slippery Slope:

aka "snowball argument," "domino theory," "absurd extrapolation," "thin edge of the wedge," "camel's nose." Arguing that one change or event will inevitably lead to another, eventually landing them at a place they never wanted to go.

**Example:** "If we allow more restrictions on purchasing guns, this will be followed by further restrictions and eventually the government will confiscate all our guns."

**Caution:** Slippery slopes do exist. The question is, just how slippery is the slope? Is it slippery enough to make the slide to the bottom inevitable?

**Tip:** Look closely at your argument for each link in the chain of consequences. Is there adequate evidence to conclude that each progression is either inevitable or fairly certain? Are there abundant historical precedents that back up the claim? Are there historical precedents that provide contrary evidence?
Stacking the Deck:

aka "cherry picking." Listing the arguments (or evidence) that support one's claim while ignoring the ones that don't.

**Example:** "Capitalism inevitably leads to a violent revolution by the proletariat. Here are fifty examples from history."

**Tip:** Ask yourself, "Are there counterexamples that the arguer is ignoring, or is she/he simply pulling out examples that support his/her theory?"

Straw Man:

presents a weak form of an opposing argument, then knocks it down to claim victory.

**Example:** Jack emailed his professor that he missed class due to a bad case of the flu and that he would bring a doctor's note. The next day, the professor announced in class that he would not excuse Jack's absence because his excuse was that he didn't feel like coming (not mentioning the flu or the note). Since the professor put Jack's argument in such a weak form, he was arguing against a straw man rather than Jack's actual defense.

**Tip:** Do you know the strongest arguments of your opponents? If so, are those the arguments you're arguing against?

Sweeping Generalization:

aka *dicto simpliciter.* Assumes that what is true of the whole will also be true of the part, or that what is true in most instances will be true in all instances.

**Example:** "All the preppies I know are materialists. Since Shawn dresses preppie, he must be a materialist."

**Tip:** Particularly when arguers use all inclusive words like "all," "always," "never," "nobody," or "everybody," ask yourself if the premises and/or conclusions should have been presented in less stark terms. Do you know people who dress preppie who don't appear to be materialistic? If so, then perhaps Shawn is a part of the subset of non-materialistic preppies.

Sexy Technical Communication Home

**Action Points**

**A Checklist for Spotting Your Own Fallacies**

(Ask these questions before turning in a paper, making a speech, or arguing with friends.)

- **How would your opponents respond to your argument?** What parts would they likely attack? Have you actually read the strongest arguments of your opponents and considered their side? Is there a way to strengthen your weak arguments?
- **How would your argument look as a syllogism or line of argument?** Do you have adequate evidence for your premises? Does your conclusion flow logically from your premises?
Is your conclusion presented with the degree of certitude that's warranted by the evidence? (Be especially cautious if you use all-encompassing words like "always," "never," "everyone," etc.)

Are there certain types of fallacies that you often fall for? (Consider how professors responded to your earlier papers or speeches, and how your friends respond to your arguments.)

Flex Your Neurons!
Pursuing the Point of Know Return
Can You Connect an Argument with Its Fallacy?

Making It More Personal
Practical Takeaways

Recommended Trails
For the Incurably Curious and Adventurous

1. For each fallacy that's still unclear to you, search it on Google to find more explanations and illustrations.

2. Watch or read some advertisements. Write out their lines of argument or put them in syllogisms. Do any of them fall for one of the above fallacies?

End Notes
Chapter 11: They Fall for Other Common Fallacies
1. I compared lists from 1) the writing center at the University of North Carolina, Chapel Hill, which includes tips for spotting fallacies http://writingcenter.unc.edu/handouts/fallacies/ 2) the University of Idaho http://www.webpages.uidaho.edu/eng207-td/Logic%20and%20Analysis/most_common_logical_fallacies.htm 3) California State, Fullerton, includes nice, down home examples - http://commfaculty.fullerton.edu/rgass/fallacy3211.htm 4) from Purdue University - https://owl.english.purdue.edu/owl/resource/659/03/ 5) the University of Texas, El Paso - http://utminers.utep.edu/omwilliamson/ENGL1311/fallacies.htm 5) Carson Newman, helpful for its division by categories - http://web.cn.edu/kwheeler/fallacies_list.html 6) the University of Louisiana, Lafayette, gives documented examples - http://www.ucs.louisiana.edu/~kak7409/Fallacies.html 7) Mesa Community College - http://www.mesacc.edu/~paoih30491/ArgumentsFallaciesQ.html 8) California State - http://www.csus.edu/indiv/g/gaskilld/criticalthinking/Six%20Common%20Fallacies.htm 9) Sacramento State University 9) the University of Wisconsin, Eau Claire http://www.uwec.edu/ranowlan/logical%20fallacies.html 10) St. Lawrence University 11) the University of Oklahoma 12) North Kentucky University. It's interesting that some of these universities use contradictory definitions of various fallacies.
2. Bertrand Russell demonstrated this tendency. He seemed to relish standing against the majority opinion. A person with his disposition should strongly consider that his assessment of evidence might be skewed by this character trait. See chapter 25 for an analysis of the passions that drove Russell.
Logic and Logical Fallacies

Taken with kind permission from the book *Why Brilliant People Believe Nonsense* by J. Steve Miller and Cherie K. Miller

*Brilliant People Believe Nonsense [because]*...

**They Contradict, Leave out Valid Options and Knock down Straw Men**

"Anyone who denies the law of non-contradiction should be beaten and burned until he admits that to be beaten is not the same as not to be beaten, and to be burned is not the same as not to be burned."

— Avicenna

**Those Who Question Logic**

To the mind that's yet to be "enhanced" by some strains of modern thought, the above quote probably comes across as amusing, but useless. After all, who would deny something as basic as the law of non-contradiction or the basic laws of logic? If saying "My roommate annoys me" is no different than saying "My roommate doesn't annoy me," then how can we ever say anything meaningful? Moreover, the very act of denying non-contradiction assumes the law to be true.

Yet, some argue that our brains, like our opposable thumbs and other body parts, evolved not to perfect our logic, but to optimize our survival. According to these thinkers, when early man moved up in the world from hunter-gatherers to the African Delta, survival of the fittest favored those who learned to cooperate to grow crops, raise families, and breed domestic animals. Thus, our brains evolved to foster domesticity, rather than think through logically rigorous legal or scientific or philosophical arguments.¹

(Digression: Surely it's equally plausible, even when reflecting upon recent history, that evolution should favor brains that are ruthless and conniving; employing a logic that's better suited to achieve selfish ends than to seek truth. When dispassionately objective intellectuals taught ideas that displeased Stalin, he removed them from the gene pool by the thousands. Thus, a large portion of 20th century man, under such regimes as Lenin, Stalin, Mao, Hitler, and Pol Pot, survived by suppressing their creativity and independent thought and perfecting a "don't piss off the morons in charge" type of thinking. In my mind, it would be difficult to prove that long ago, living in small communities on the Delta, brilliant misfits would have survived any better.)

Thus, following this naturalistic line of argument, our brains developed primarily for primitive survival, not to reflect accurately on the great scientific theories of cosmology or macroeconomics or to develop rigorous rules of logic. Those who walked about the early Delta with their minds distracted by such matters were almost certainly eliminated from the gene pool by animals higher up on the food chain.

Rather than being equipped for higher level thinking, according to this theory, we find our brains uniquely suited to think in ways that enhance our self-confidence, enable us to compete, socialize, and convince the opposite sex to mate with us.

As a result, today's brains should resonate more with *Glamour Magazine, Playboy and Sports Illustrated*, than *Physics Today* or *Philosophy Now*. In its favor, this theory successfully predicts the type and quality of magazines
available for purchase at service station check-out counters. Such academics as Psychologist Susan Blackmore and Philosopher Alex Rosenberg similarly argue that our brains, in their present state of evolution, deceive us in many ways and can't be trusted. Why then should we trust in the ability of our empirical investigations or logical argumentation to help us find truth?² Without recounting the intricate details, I should also mention that eighteenth century philosopher David Hume argued, with breathtaking influence on modern thought, that taking empiricism to its logical conclusion leads to skepticism concerning any certain knowledge. His works, and many who built upon his foundation, have led some contemporary intellectuals to a thoroughgoing despair of finding truth through science or logic or any other means.³ This is all to say that if you read widely, you'll run across many who teach that all truth is relative and a search for truth is futile. Rather than set forth a defense of our ability to find truth, or at the very least that we have the ability to weed through nonsense in order to get closer to the truth, I'll just note that I've never found a thoroughgoing skeptic who lives consistently with his skepticism.

As soon as he opens his mouth or wields his pen, he begins making statements that depend upon the very laws of logic he denies. When Blackmore argues that our minds deceive us and can't be trusted, why does she go on to write the next chapter? If she really believes what she wrote, she can't trust her reasoning. If I believe what she wrote, I can't trust in either the accuracy of her writings or my ability to interpret them. So why keep reading? After a professor teaches his students that we can't know truth, no sooner has he left the classroom and met his department chair than he engages her in an argument, based upon the facts and logic he denies in class, about his deplorable salary. And he certainly won't be satisfied if his boss responds that the argument is pointless because all truth is relative.

In the end, whether you claim to be a thoroughgoing skeptic or a believer in our ability to find truth, logic would seem useful, at least in arguing for a raise. So since this isn't a book on epistemology, let's proceed as if logic is indeed useful, and try to sharpen our ability to use it.

The Syllogism* as a Useful Starting Point

Increasingly, I find myself putting complex, convoluted, or long-winded arguments into the form of syllogisms in order to evaluate them. The value of this process was demonstrated to me at a recent philosophical conference. I was astonished to hear a philosopher attack a 450 page book by reducing the author's line of argument to a simple, three-line syllogism. If the philosopher succeeded, then no matter how many studies the author quoted, no matter how much data he accumulated, no matter how many more pages he wrote; if his line of argument was illogical, his conclusion wasn't warranted.
Here's the classic example of a simple, correctly formulated logical syllogism:

**Premise 1:** All men are mortal.
**Premise 2:** Socrates is a man.
**Therefore:** Socrates is mortal.

The beauty of a correctly formulated syllogism is that if we agree with the premises, then we must agree with the conclusion. Do you agree that all men are mortal? Do you agree that Socrates is a man? If so, then you must believe that Socrates is mortal. It's a logically air tight argument.

To evaluate someone's argument, try to put it in a syllogistic format and focus on two questions:

1. Do you agree with the premises? (Are they either intuitively obvious or well-supported by evidence?)
2. Does the conclusion logically follow from the premises?

Of course, arguments can get quite complicated, requiring complicated syllogisms to replicate them in logical form. If you're interested in exploring the more complex forms, study deductive logic. But I find that basic syllogisms suffice to evaluate the vast majority of meaningful arguments, even when evaluating chapters or entire books.

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**Let's Analyze an Argument!**

Let's start with an argument proposed by a bright person and analyze it. Here are a couple of formulations of an argument put forth by Richard Dawkins, a popular science writer who once taught at Oxford University.

In his book, *The God Delusion*, Dawkins seeks to establish atheism, primarily by attacking theism. But he does present one positive argument for atheism, which he claims demonstrates that there is almost certainly no God. Dawkins believes the argument is devastating to theism—"an unrebuttable refutation." It makes for a good argument to examine, since Dawkins states it in a few sentences rather than arguing it extensively.

Here's how he puts it:

"...any creative intelligence, of sufficient complexity to design anything, comes into existence only as the end product of an extended process of gradual evolution. Creative intelligences, being evolved, necessarily arrive late in the universe, and therefore cannot be responsible for designing it."5

Later in the book, he puts it this way:

"The whole argument turns on the familiar question 'Who made God?', which most thinking people discover for themselves. A designer God cannot be used to explain organized complexity because any God capable of designing anything would have to be complex enough to demand the same kind of explanation in his own right. God presents an infinite regress from which he cannot help us to escape."6
Think!

Before reading any further, try your own hand at responding to Dawkins. He says that he has "yet to hear a convincing answer" to his argument. Do you think it's irrefutable? If the argument seems rather muddled to you, start by reading one sentence at a time and asking yourself, "Do I agree or disagree with this statement, and why?" Perhaps trying to put it in syllogistic format would help, or trying to express it as a line of argument. (Caution: Try not to let your personal worldview interfere with your reasoning. The question I’m asking is not "Is there a God?" but rather "Is Dawkins' argument irrefutable?")

Using a Line of Argument* and Syllogism to Clear Muddy Waters

If I understand Dawkins correctly, here’s his line of argument:

There are only two possible ways that God’s existence could be accounted for:

1) **He was created by another being.** But that explanation doesn’t really help because then we have to ask, "Who made that designer, and the one who made him?" which leads to an infinite regress of questions which
we can never fully answer.

2) He slowly evolved through time. But if He evolved, He would not have developed His incredible intelligence and power until *the end* of a long process of evolution. Yet, in order to create the universe, He needed this intelligence and power *at the beginning*. Thus, He couldn't have created the universe. Besides, what are the odds that such a complex being could evolve through purely naturalistic causes?

Dawkins thus concludes that since both of these scenarios are highly unlikely, it's highly unlikely that God exists.³

Put in a syllogism, it might read like this:

**Premise 1:** If God exists, he must have come into existence by either being created by another being or evolving slowly through time.

**Premise 2:** It's highly unlikely that God came into existence by either being created by another being or evolving slowly through time.

**Conclusion:** It's highly unlikely that God exists.

---

**Think!**

Does laying it out as a line of argument and as a syllogism help? Do you think I did it accurately? Now think through the line of argument and syllogism. Do you agree with each of the premises? (Is it sound?*) Did Dawkins argue correctly from these premises? (Is it valid?*)⁴

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As we continue with this chapter, we'll introduce some logical fallacies and apply them to both Dawkins' argument and the introductory discussion.

**Fallacy #1: Bifurcation**

Dawkins' argument seems to be a good example of a fallacy called bifurcation, whereby the argument assumes that only two (note the prefix "bi", meaning "two") possibilities exist, whereas there are actually more. This fallacy is particularly pernicious because it seems to contain an element of sleight of hand. If it is presented by a person we respect or agree with, we tend to assume that his premises represent all possibilities and we focus on the validity of the argument rather than the accuracy of the premises.

So here's how Dawkins' argument appears to be guilty of bifurcation.

He assumes that there are two and only two possible explanations for the proposed existence of God:

1 - He was either created by another being, or

2 - He evolved by natural means slowly over time.

To justify limiting the existence of God to these two options, Dawkins should have eliminated a third, seemingly viable option: that God could have simply existed from eternity past. After all, until well into the 20th century, the majority of scientists saw no problem in believing that *matter* existed from eternity past. Why then could *God* not have existed from eternity past? Is there evidence (either empirical or logical) that if God exists, He could not have existed from eternity past (or, alternately, could not exist outside of time and space)? If there is such evidence, then Dawkins should forward it. Otherwise, his premises are misleading and inaccurate in that they unnecessarily ignore this option.⁶
To put it another way, Dawkins claims that there are two and only two ways the existence of God could be explained. By explaining those two away, he claims to have explained away the existence of God. Yet, he's ignored (or deflected his readers from) a third possibility which he needs to explain away as well: that God existed from eternity past. By overlooking this third option, his argument fails, falling to the fallacy of bifurcation.10

Other Examples of Bifurcation

- "The Atlanta Falcons' loss to the New England Patriots was due to either inept play or poor coaching."

But aren't there more options than two? Perhaps they lost primarily because of a brilliant strategy by the opposing coaching staff, or the Patriots quarterback was on a roll, or the injury to the Falcon running back caused the Falcons to resort to "Plan B" rather than "Plan A", or any number of other possibilities that the armchair critic needs to rule out.

- "The president must be either insane or stupid to make that decision."

What other factors may explain the decision? Isn't it possible that the president was privy to facts we weren't aware of, or had made a wise political bargain that required that decision, or any number of other factors?

- "What a despicable child! He obviously either inherited bad genes or has inept parents." What are some other possible contributing factors to the child's behavior? Perhaps he's sick or tired or teething.

Tip: Bifurcation becomes easier to spot once you're aware of it. When someone presents two options as if they're the only two options, I immediately ask myself, "Are there more options than he's presenting?" Ask the same question if someone presents three or more options as if they're the only ones. We could call it "trifurcation," etc.

Fallacy #2: The Straw Man

I'm dealing in this chapter with arguments that are very common. Familiarize yourself with them and you'll begin to see them everywhere—in articles, news broadcasts, Facebook discussions— everywhere!

The Straw Man fallacy presents a weak form of an opposing argument so that it's easy to destroy it and declare victory. The writer or speaker never actually attacks the opponent's arguments. Instead, he avoids the opponent's arguments by "knocking down a straw man."

Dawkins seems to have erected and knocked down a straw man in the argument we considered above. In brief, he argued that it's very unlikely that an evolved or created God exists. But the vast majority of theistic theologians and philosophers of the Western world would likely agree with this statement. In fact, I don't believe I've ever met a theist who believes in a created or evolved God. So arguing against this kind of a God says nothing about the existence of the eternal God that most of Dawkins' opponents believe in.

Thus, Dawkins has set up an irrelevant straw man (or in this instance, a Straw God), and tried to disprove His existence. If successful, he merely succeeds in knocking down a position that his opponents never held. The philosophers and theologians he's attacking overwhelmingly define God as one who existed from eternity past (or exists outside time and space). Dawkins should have attacked the position held by those he attacks.

Michael Ruse, Professor of Philosophy at Florida State University, himself an atheist, criticizes Dawkins' argument in part for this very reason. He concludes:

"...I want to extend to Christians the courtesy of arguing against what they actually believe, rather than begin and end with the polemical parody of what Dawkins calls 'the God delusion.'"

Another Example of Arguing against a Straw Man

A friend remarks to you: "The last three winters have been colder than average. So much for the theory of Global Warming!"

Your friend assumes that Global Warming advocates argue in this manner: "If temperatures are truly rising, every year and every geographical location should show increased warmth." But nobody argues this. It's arguing against a straw man. Global Warming advocates actually argue that over long periods of time the average temperature is increasing. Those who argue against global warming should argue against this rather than a straw man.
Fallacy #3: The Law of Non Contradiction

Man has been accustomed, ever since he was a boy, to having a dozen incompatible philosophies dancing about together inside his head. He doesn't think of doctrines as primarily "true" or "false," but as "academic" or "practical," "outworn" or "contemporary," "conventional" or "ruthless."

— C.S. Lewis

In Chapter 9, I mentioned philosopher Alex Rosenberg's recent book. In it he argues, among other things, that:

1 - There's no free will. Thus, according to Rosenberg, we think only what we've been determined to think (by our genetics, etc.) How we think is determined by evolutionary processes that often have nothing to do with producing logical thinking. I can't direct my own thinking because there's no "I" outside my brain to direct my thinking. Our brains are just advanced computers, and computers can't think "about" things. Consciousness is thus an illusion.

2 - Our thinking is flawed. "Mother Nature built our minds for purposes other than understanding reality."

3 - We can learn nothing from history or people's life stories.

With that background, here's where I see contradictions piling up.

- On changing people's opinions - In his preface Rosenberg states that he wrote the book to help people discover the real answers to such questions as "Why am I here?" or "What is the meaning of life?" But if there's no free will, and all of our beliefs were therefore predetermined, how can he possibly hope to change anybody's opinion about anything? If evolution absolutely determines everyone's thought processes and beliefs, then how can he possibly trust his own mental processes or hope to change other people's thinking?

- On urging life change - Why does he keep urging us to action, if everything's determined and his urgings are therefore worthless?

Rosenberg preaches, "We need continually to fight the temptation to think that we can learn much of anything from someone else's story of how they beat an addiction, kept to a diet...." But what does it mean to "continually fight" a temptation if we're already destined to fight or not fight, to either beat the temptation or fall for it?

- On recommending a course of action - By the end of the book he's recommending that we adopt the philosophical nihilism of Epicurus, not take ourselves so seriously, and take Prozac if you're unhappy that life has no meaning. Can't he see that if we believed what he said earlier about that we can't learn anything from other people's life stories, we can also learn nothing from his own experiences and recommendations?

- On learning from history - He says we can learn nothing from history: "History, even when corrected by science, is still bunk." But then he recounts history to make his points. For example, how can we know if Prozac works, unless we accept the testimonies of other patients and rely on their stated medical histories?

Thus, it seems evident to me that Rosenberg's book is riddled with internal contradictions. Now perhaps if I asked Rosenberg personally about the apparent contradictions, he could clear them up. But in the present state of his
book, they seem flagrant, leading me to question many of his conclusions.

Sometimes contradictions are not so obvious. For example, a central tenet of Logical Positivists, whose views were very influential in the early 1900s (not only in philosophy, but also psychology and other sciences), expounded the verification principle, which can be stated as: "the only meaningful statements are those that we can verify through observation." Yet, their critics pointed out that this very statement (the verification principle) can't be verified through observation, making it self-contradictory, or self-defeating. In other words, they couldn't verify the verification principle with the verification principle, making it (to be consistent with Logical Positivism) a meaningless statement.

Well, that was rather embarrassing to Logical Positivists. This insight, in part, led to Logical Positivism's demise in the latter 1900s.  

Summary

The arguments we've examined in this chapter were put forth by bright people with topnotch education credentials—often PhDs holding prestigious positions. If they are subject to falling for logical fallacies, how much more the rest of us?

Why do brilliant people believe nonsense? Because they fail to sufficiently check their beliefs against logical fallacies. How can we guard ourselves from similar errors in thinking?

Action Points

How to Spot Logical Fallacies and Keep from Using Them in Our Own Communications

1. Take time to think through arguments that are important to you.

Most don't. In fact, they barely even pay attention. Philosopher and scientist Francis Bacon once wrote: "Some books should be tasted, some devoured, but only a few should be chewed and digested thoroughly." For the latter books, articles or lectures, if the argumentation is complicated or unclear, I often summarize it with a line of argument, sometimes chapter by chapter. It takes a bit of time, but it keeps me from ending the book in a mental fog.

2. Don't be intimidated by credentials and claims.

Surely this is, in part, why people take nonsense promoted by well-credentialed people at face value. Never listen to anyone without engaging your critical thinking.

3. Beware of the tendency to uncritically accept the arguments of those you agree with, or arguments that have an agreeable conclusion.

Professor H. Allen Orr, in the New York Review of Books, reflected on Dawkins' argument and his way of arguing. According to Orr:

"Indeed he suffers from several problems when attempting to reason philosophically. The most obvious is that he has a preordained set of conclusions at which he's determined to arrive. Consequently, Dawkins uses any
argument, however feeble, that seems to get him there and the merit of various arguments appears judged largely by where they lead."21

4. Ask yourself, "Are there facts or personal experiences that don't fit with either the premises or the conclusion?"

When I read Rosenberg's argument that we can't learn anything from history or life stories, I couldn't help but reflect on the wealth of valuable lessons I've learned from observing people's lives and reading great biographies. For example, by watching people make wise and poor financial and health decisions, I've learned much from their successes and failures. My personal experience represents one strike against his conclusion, causing me to look more critically at his argumentation.

5. Put it in a syllogism(or line of argument) and ask yourself two questions:

- Are the premises supported by sufficient evidence?
- Does the conclusion follow logically from the premises?

(To remember this point, reflect back on the D. R. of Dr. Cackler. Is the data complete and accurate? Is the reasoning from that data clear and accurate?)

6. Have others look at the argument.

Learn from Hewlett Packard's practice of running an idea by the person next to you. If the idea is important to you, discuss it with others. We all think a bit differently and it's very likely that others will see aspects of the issue that you don't see.

For example, Einstein once observed that scientists are typically poor philosophers. Whether he's right or not, psychologists do find people typically having strong and weak areas of reasoning. If a scientist is trying to reason philosophically, he might be wise to run his arguments by a philosopher. It's often wise to run important arguments by people who think differently from you.

7. See how others in the field respond.

Dawkins' argument is philosophical and the field of philosophy has a rich history of arguments concerning the existence of God. It would seem unlikely, though not impossible, that an expert in animal behavior (Dawkins) would dream up a slam dunk argument than never occurred to any great philosophical thinker from Plato to Immanuel Kant to Bertrand Russell. If Dawkins' argument were truly original and significant, I'd expect a loud chorus of respected philosophers to be hailing this argument's arrival.

Yet, the responses I've seen by philosophers and academics have been underwhelming at best. Philosopher William Craig went so far as to declare it "the worst atheistic argument in the history of Western thought."22 Academic biologist H. Allen Orr noted that the argument was "shredded by reviewers."23 For example, some attack the argument by noting that an explanation doesn't typically require an explanation of the explanation (responding to Dawkins' contention that theists must forward an explanation as to where God came from). In other words, if we were to visit the dark side of the moon and find an advanced, but long-abandoned (at least a century old, deduced from its state of natural aging) mining operation, where all the inscriptions were in a non-human language, wouldn't we be justified in positing that alien intelligences were behind it, even if we had no idea how the aliens came to be or where they were from? And it's not just theistic philosophers who find Dawkins' argument lacking.

Atheist Michael Ruse attacks Dawkins' argument in this way:

"Like every first-year undergraduate in philosophy, Dawkins thinks he can put to rest the causal argument for God's existence. If God caused the world, then what caused God? Of course the great philosophers, Anselm and Aquinas particularly, are way ahead of him here. They know that the only way to stop the regression is by making God something that needs no cause. He must be a necessary being. This means that God is not part of the regular causal chain but in some sense orthogonal to it. He is what keeps the whole business going, past, present and future, and is the explanation of why there is something rather than nothing."24

Surely such rejoinders are legitimate challenges that Dawkins should respond to. Had he run his argument by some philosophers prior to publishing, perhaps he could have responded to their objections.25
Think Different (Creative Thinking)

One of philosopher Immanuel Kant's most valuable contributions to practical human thought was his insight that we don't experience things entirely as they are. While some people insist that seeing is believing, we all know that seeing can also be deceiving. For example, Kant notes that we don't see objects directly. Rather, we're a step removed in that we see reflections of objects on our retinas. We take another step back from real objects when our brains bring our own interpreting mechanisms to those objects, such as "quality" or "cause and effect."

Modern psychology confirms and extends Kant's insight. We don't "see" the reflections on our retinas in the same way. While you may see a green object on your retina, I may see it as brown, since I'm color-blind to certain greens. And we're well aware of common optical illusions and misperceptions. That's why eye-witness testimony is often contradictory, even when the witnesses are honest. Often, what we see shouldn't be believed.

Example: You've probably seen illustrations such as this, where our minds fool us. How many "F"s do you see in this passage?

FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS.

Most people see only three. That's all I saw the first two times I read it. Actually, there are six. (Look slowly at each letter and count again, perhaps starting at the end.) This is similar to the problem drivers have spotting motorcycles on streets where they are rare. We're watching for cars and trucks and may not see the motorcycles at all.

Example: Are the horizontal lines below curved or straight? Use a ruler or straight edge to see.

Fallacies such as bifurcation, like a good magician or an illusion, play on our brains' tendencies to see certain things incorrectly or to be distracted from crucial details. How can creativity help us to overcome distractions and wrong directions in order to innovate productively?

1. Broaden your range of input.

Who would you prefer to edit your writing?

a) A dyslexic, who struggles to read well?
b) Slow readers?
c) An autistic who often misses the big picture?
d) A top academic who teaches grammar and literature?
e) A person so proficient at reading that she can polish off an entire novel in an evening?

Intuitively, most authors seem to seek out exclusively d) and e) types, and I agree that their input has a place. After all, shouldn't avid readers and top grammarians have valuable input?

But I'm increasingly seeking editorial input from a wider range of people. True, autistics often miss the big picture because they're fascinated with the details. But this attention to detail makes them more likely to see the "F"s in the above illusion. Proficient readers hardly see the word "of," and may miss a broad range of errors in my manuscripts. Higher functioning autistics may see all those little details that most of us miss.

While fast readers may excel at telling you if your story is interesting and flows well, the slow reader may be better for thinking through your line of argument, spotting places that need more documentation, or helping you with the rhythm produced by combinations of long and short sentences. Literature professors tend to love clever analogies and brilliant descriptions, whereas the average reader may see these as distractions from the story line. That's why I like input from both.

Academics have a high tolerance for detailed argumentation and theory. While I'll get their input on this book, I can't quite trust their verdict if they tell me it's interesting. If I'm writing, not primarily for professors, but for their students and the broader public, I treasure input from those who aren't naturally interested in my subject matter. I'm blessed with dyslexic twins, and love their input. That's one reason I use lots of white space, bullet points, and illustrations. Dyslexics cringe when they see a page full of unbroken words. I've found that if I can hold the attention of struggling readers, I'm more likely to captivate a broad range of readers, and in the end delight academics as well.

2. At times, ignore the current theory that drives your research, and allow non-experts to offer ideas; or just throw a bunch of stuff against the wall to see what sticks.

Sometimes our theories and methods keep us from trying potentially fruitful experiments. Since we seldom recognize that the ruling theory may have deflected us onto a side road, it sometimes helps to toss it and try something new.

Isn't this the way inventor Thomas Edison often proceeded? I still picture him in his later years, stopping beside the road to sample plants that might be used as a substitute for the rubber used to make tires, which was in short supply during World War II.

- A thirteen year old, Jack Andraka, took an intense interest in trying to cure pancreatic cancer, after it killed a family friend. Being new to the field, he took a different direction from the standard research, resulting in his inventing a simple, cheap test to detect pancreatic cancer early, when it can be successfully treated.26

- Don Valencia, a cellular biologist who developed tests to diagnose autoimmune diseases, had worked on isolating molecules in human cells without destroying them. It occurred to him that this technique might work for making a concentrated extract of coffee that could capture its flavor more successfully than other extracts. He experimented with it in his kitchen, trying out different flavors on his neighbors. Once perfected, he took it to Starbucks. They eventually hired him and used the technology to expand their product line to coffee ice cream, bottled beverages, etc.27

3. Employ higher levels of reasoning.

Bloom's Taxonomy (most refer to the "revised" taxonomy), distinguishes different types of thinking, suggesting ways for us to move past rote memory. Unfortunately, many students seem to seldom move past merely identifying and memorizing the important parts (what might be on the test) of texts and lectures.

Yet, to succeed in real life, we must go further than recognition or rote memorization (see Level 1 in the below graphic.). We need to develop the skills of comprehending (Level 2), applying (Level 3), analyzing (Level 4),
synthesizing (Level 5) and evaluating (Level 6). Search "Bloom's Taxonomy" in Google and you'll find many lists of specific characteristics of each level of thinking. Referring to such lists when working through an issue can suggest new ways to approach it.

For example, in our discussion of Richard Dawkins' argument, I first stated it (Level One) and several times put it in my own words to try to clarify it (Level Two). We skipped application, but analyzed it (Level Four) by putting it in a line of argument and syllogism, so that we could identify and examine the premises. We did a bit of synthesis (Level Five) when we brought in outside ideas of how theists conceive of the eternal existence of God, and how other thinkers have responded to the argument. Finally, evaluation (Level Six) came to play when we noted that there seems to be an element of smoke and mirrors involved in the fallacy of bifurcation.

So if you're evaluating an argument or a proposal, consider running it through Bloom's Taxonomy to expand your ways of looking at the issue. Note how several levels involve creativity.

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Flex Your Neurons!
Pursuing the Point of Know Return

1. Write your own example of a "straw man" argument.
2. Write your own example of a "bifurcation" argument.
3. If you agree that Dawkins' argument makes no sense, why do you think such a smart person would forward such a nonsensical argument? If you believe that the argument could make sense if reformulated, how would you change it to overcome the difficulties scholars have brought forth?
4. How could you use Bloom's Revised Taxonomy
   as a practical tool for thinking more critically about issues you study and write about?
5. How could you use Bloom's Revised Taxonomy to think more creatively?
6. Since our brains often deceive us, how can we protect ourselves against such deceptions?

Making It More Personal
Practical Takeaways

What are one or more ideas provoked by this chapter that you can apply to help you think more critically?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

What are one or more ideas that you can apply to help you think more creatively?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

What else do you want to make sure you don't forget?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Recommended Trails
For the Incurably Curious and Adventurous

1. To more fully understand a fallacy, it's often helpful to read other people's explanations and examples. To do this, Google "bifurcation" or "straw man."

2. Learn more about "Bloom's Taxonomy." This Wikipedia article is a good starting point to introduce it, discover the main controversies, and find other resources: http://en.wikipedia.org/wiki/Bloom%27s_taxonomy

3. Here's a TED talk of Jack Andraka talking about his development of a test for pancreatic cancer. Why do you think a young teen was able to develop such a test, when the experts had failed? http://www.ted.com/talks/jack_andraka_a_promising_test_for_pancreatic_cancer_from_a_teenager?language=en
1. Analytical philosopher Alvin Plantinga argues that this line of reasoning is consistent with, and even demanded by, philosophical naturalism. 

2. Susan Blackmore and Alex Rosenberg argue that since our brains were constructed solely through naturalistic evolutionary processes—for survival than for finding truth—our brains build mental models that we can't control (there is no "I" or "self" directing the brain, in the view of both authors) and they can't be trusted to lead us to truth. Susan Blackmore, Dying to Live (Buffalo, New York : Prometheus Books, 1993), pp149-164; 221-225; Alex Rosenberg, The Atheist's Guide to Reality (New York: W. W. Norton & Company, 2011).

3. For example, Hume's radical empiricism led him to deny that we can establish cause/effect relationships—a belief which would obviously wreak havoc in science.


5. Ibid., p. 52.

6. Ibid., p. 136.


8. Ibid., see also pp. 186-188.


10. In The God Delusion, Dawkins doesn't even mention the option of God being eternal, much less argue against it. In one of his earlier books, The Blind Watchmaker, he least acknowledges that some would argue that God exists eternally, but brushes this option off (rather than forward an opposing argument) with a sentence: "You have to say something like 'God was always there', and if you allow yourself that kind of lazy way out, you might as well just say 'DNA was always there', or 'Life was always there', and be done with it." Richard Dawkins, The Blind Watchmaker (New York: W. W. Norton & Company, 1996), p. 200. But why does Dawkins consider "something was always there" an invalid option? After all, prior to the 20th century, the majority opinion of scientists was that the universe was always there, extending into eternity past. Was that "lazy" on their part? In fact, when we consider ultimate origins, we'd seem to be left with two options: either there was nothing prior to the Bang (the standard scientific view of the Big Bang, according to Dawkins), so that something appeared out of nothing, with nothing to cause it, (that's absolutely nothing—no empty space, no vacuum), or that the beginning of the universe was caused by something that existed in some non-material form outside of time and space, existing from eternity past. Is the latter option really stranger than something coming from nothing on its own accord? If not, then why does Dawkins think it so inconceivable (or lazy) that God could have existed eternally? He fails to address this question.


15. Ibid., p. 16.

16. Ibid., pp. 2,3,310,311.

17. Ibid., pp. 313-315.
18. Ibid., p. 311.


20. "Minus logical positivists, tremendously influential outside philosophy, especially in psychology and social sciences, intellectual life of the 20th century would be unrecognizable." Yet, "By the late 1960s, the neopositivist movement had clearly run its course. Interviewed in the late 1970s, A. J. Ayer supposed that "the most important 'defect' was that nearly all of it was false." http://en.wikipedia.org/wiki/Logical_positivism#Critics. For a brief history of Logical Positivism, see articles such as "Logical Empiricism" or "Theism" in The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.). It's a wonderful (free!) resource for all things philosophical.

21. H. Allen Orr, op. cit. Dawkins would seem to be a master of the straw man. Perhaps he gives us a clue as to why in his introduction to The Divine Watchmaker, where he states his opinion that Darwin's first edition of Origin of the Species was more persuasive than the last edition, because in the first edition Darwin didn't deal with all the objections. Apparently, in Dawkins' mind, Darwin's stating other people's objections took away from his argument. So perhaps Dawkins knows many of the objections people would give to his arguments, but is afraid that if he presents the strongest arguments for all sides of his statements, that this will take away from his persuasiveness. Thus, he presents straw men, which are much more easily knocked down. Example: if you look carefully at his arguments against the existence of God in chapter three of The God Delusion, he doesn't present the arguments as his strongest opponents present them. In the form he presents them, they're easily destroyed. For example, on Dawkins' critique of the Cosmological Argument for God's existence, see philosopher Edward Feser's critique at http://edwardfeser.blogspot.com/2011/07/so-you-think-you-understand.html. Also, view Dr. William Craig's presentation at Oxford on the same topic at https://www.youtube.com/watch?v=P9CwDTRoOE.


25. Note other objections to this argument:

1. Going along with our argument concerning the mining operation on the moon, philosophers argue that an immediate explanation doesn't require an ultimate explanation. Example: William Craig suggests that if we found artifacts of a lost civilization, that's sufficient evidence that the civilization actually existed, even if we have no ultimate explanation of where the civilization came from. Contending with Christianity's Critics, op. cit., p. 4.

2. From a purely naturalistic perspective, we have no ultimate explanation of anything. For example, you may ask why this cat is sitting on my desk looking at me? I may respond, "It wants to lick the milk out of my bowl of cereal." But what if you counter, "That's no explanation, where did the cat come from?" I may say, "Its mom." And you may complain, "Yes, of course. But if you can't give me the ultimate explanation of where the cat came from, I refuse to believe that it even exists." Yet, from a naturalistic perspective, all scientific explanations end with the Big Bang, a place at which physics as we know it breaks down and at which scientists tell us all scientific questions stop. All reductionist scientific explanations end with the Big Bang, and if we ask one more "Why?" beyond the Big Bang, science lets us down, because the Big Bang is a singularity. Thus, if all arguments about the existence of this or that must answer the ultimate question of origins to be meaningful, aren't we stuck with no meaningful arguments at all? Thus, from a naturalistic perspective we can't ultimately answer the question, "Where did this cat come from?" But would Dawkins thus concede that we therefore can't argue for its existence? Surely not.


27. For the story of the development of Starbucks' instant coffee, see Schultz, Howard and Dori Jones Yang, Pour Your Heart Into It: How Starbucks Built a Company One Cup at a Time (New York: Hyperion, 1997), pp. 216-218.
Logic and Logical Fallacies

Taken with kind permission from the book Why Brilliant People Believe Nonsense by J. Steve Miller and Cherie K. Miller

Brilliant People Believe Nonsense [because]...

They Either Fail To Recognize Fallacies, or Misapply The Ones They Know

"Read not to contradict and confute; nor to believe and take for granted; nor to find talk and discourse, but to weigh and consider."

— Francis Bacon, Of Studies

WARNING:

Learning fallacies can be fatal to your argumentation and detrimental to your relationships. For these reasons, I teach logical fallacies with a great deal of hesitation. It's a bit like selling firearms to a person with no training in how to use them. I'd hate to be known as one who arms Internet trolls.*

So before I present a large list of fallacies, I'll acquaint you with a particularly pernicious type of fallacious reasoning that's running rampant on the Internet, but which is strangely absent from lists of fallacies. I call it "The Fallacy Fallacy."

The Fallacy Fallacy: Debunking Debunking

I often read comments on blog posts or articles or Facebook discussions which accuse the writer of committing a specific logical fallacy and thus declaring the argument thoroughly debunked, typically with an air of arrogant finality. While the debunker may feel quite smug, intelligent participants consider him quite sophomoric.* In reality, he's typically failed to even remotely understand the argument, much less apply the fallacy in a way that's relevant to the discussion.

Surely this fallacy deserves a proper name and should be listed with other fallacies. Thus I'll define "The Fallacy Fallacy" as "Improperly connecting a fallacy with an argument, so that the argument is errantly presumed to be debunked."

1
Don't be a troll. Here are a few ways people misapply fallacies, thus committing "The Fallacy Fallacy":

1. They misunderstand the fallacy.

"YOU'RE ALWAYS ARGUING WITH JAMIE, WHICH IS OBVIOUSLY AD HOMINEM." (Trolls delight in using all caps, confusing louder with smarter.) If the person was actually arguing against Jamie's arguments, rather than putting Jamie down as a person, then the arguments weren't ad hominem at all.

2. They fail to appreciate nuance. (They understand the fallacy, but apply it errantly.)

Someone quotes Albert Einstein to bolster his argument. "THAT'S AN APPEAL TO AUTHORITY!" shouts the troll. But citing authorities isn't always fallacious. If a person cites Einstein concerning a question of relativity theory, then Einstein is a legitimate authority. Thus, quoting him can be a legitimate part of an argument, although it's typically not a slam dunk in itself. While arguments concerning establishing facts should be argued on the basis of the evidence, in many cases citing authorities can help to substantiate the evidence.

3. They assume a thorough debunking when there's typically more to the argument.

While trolls are celebrating their "brilliant" comments with a victory dance and a handful of Skittles, their opponents are often typing a clarification that makes the Trolls' comments irrelevant. We simply must take the time to thoroughly understand the arguments we're evaluating.

Sexy Technical Communication Home

Making Arguments More Fruitful

For those who sincerely want to learn from one another by hashing out issues, consider this: Trolls "flame" opponents by either calling them morons or presenting their arguments dogmatically, as if they have crushed their opponents. If you're concerned about the truth, seek more to understand than to demonstrate your brilliance. To accomplish this, suggest rather than slam; express tentativeness rather than dogmatic finality; ask questions rather than accuse.

Does it in any way weaken a counter-argument to word it in a cautious, humble manner, such as: "At first glance your argument appears to be an unwarranted appeal to authority. Are you really saying that your position is correct solely because Einstein believes it as well?"

In this way, the opponent is more likely to respond in a reasonable manner and you save face in case you took the comment out of context or otherwise misunderstood it.

Benjamin Franklin on Fruitful Argumentation

Franklin was one of the most influential people in American history. He learned a lesson early in life which he considered of such significance that he discussed it at some length in his autobiography. He describes learning Socratic argumentation, which he delighted to use in humiliating his opponents. (As an annoying ass during this phase of a few years, he was a predecessor to the modern day Internet troll.)

But over time, he realized that this method failed to either persuade others or to help him learn from them. Rather, it disgusted people. So he changed his method of argumentation. In Franklin's own words, he discovered the value of:

"never using, when I advanced anything that may possibly be disputed, the words certainly, undoubtedly, or any other that give the air of positiveness [meaning "dogmatism"] to an opinion; but rather say, I conceive or apprehend a thing to be so and so; it appears to me, or I should think it so or so, for such and such reasons; or I imagine it to be so; or it is so, if I am not mistaken. This habit, I believe, has been of great advantage to
me when I have had occasion to inculcate my opinions, and persuade men into measures that I have been from time to time engaged in promoting." (italics his; brackets mine)

As a result, Franklin became a skilled negotiator and persuader, allowing him to help start America's library system, organize firefighters, run a successful printing business, improve our postal service, negotiate with the French to aid us in the Revolutionary War, and assist in finalizing and adopting the Declaration of Independence, just to name a few of an astonishing array of accomplishments.

Some Helpful Ways to Organize Fallacies

The plethora of known fallacies can be quite unwieldy, so let's first of all look at some helpful ways of classifying them. In this way, when you sense an argument is invalid but can't remember the name of the specific fallacy, at least you might be able to identify the category in order to better evaluate or research it.

(Example: "That sounds like a fallacy of definition.") Although no single categorization scheme has become standard, you'll find some of the categories (such as "formal" and "informal") used widely.

Aristotle

Aristotle was perhaps the first to categorize logical fallacies in his De Sophisticis Elenchis (Sophistical Refutations). He lists 13 fallacies under two categories: **Verbal** (those depending on language) and **Material** (those not depending on language). In modern times, those building on Aristotle's two divisions often add a third: **Logical or Formal**—fallacies that violate the formal rules of the syllogism.

Philosopher J. L. Mackie

Mackie divided fallacies into:

**Fallacies in a Strict Sense**

*invalid forms of deductive reasoning; the conclusion doesn't logically follow from the premises.*

- **Formal Fallacies** - The conclusion is invalid because of the argument's form. Example: Exerting the consequent—If there are too many cooks, there's chaos in the kitchen. There's chaos in the kitchen, therefore there are too many cooks. (If p then q, q, therefore p)

- **Informal Fallacies** - The conclusion is invalid for reasons other than its form. (Example: Using vague or ambiguous terms.)

**Fallacies in Non-deductive Reasoning and in Observation**

*errors in inductively reasoning from evidence to a conclusion or hypothesis.*

- **Induction and Confirmation** - example: *post hoc ergo propter hoc* - the fact that event "b" followed event "a" doesn't absolutely prove that event "a" *caused* event "b".

- **Analogy** - A weak analogy, one that has few or trivial points of resemblance, may have no evidential value at all.

- **Classification** - Example: A company may argue that all people classified as autistic are unemployable. Yet, autistic people vary greatly in their skills, so that highly functioning autistics, or those wrongly categorized, may be overlooked.
Statistics - Example: If students from City High School outperform students from County High School on standardized tests, this doesn't necessarily imply City High School has better teachers. Perhaps administrators skew the scores, or one district has more high risk students.

Probability - Example: Although the probability of flipping a coin five times and getting heads every time is low, that doesn't mean that if you got heads four times in a row, it's very unlikely that you'll get heads in the next flip. The odds are still 50/50.

Observation - Example: Often what we observe is skewed by what we want or expect to observe.

Fallacies in Discourse

The argument fails because of some reason other than invalid deductive reasoning or arguing from evidence.

Inconsistency - You can't have it both ways. "Petitio Principii" - Including your conclusion in your premises (aka begging the question or arguing in a circle).

A Priori Fallacies - Bringing to the argument unfounded preconceptions that influence the conclusion.

"Ignoratio Elenchi" - Missing the point: An argument concerning something that was never meant, in the context of the argument, to be proven.

Fallacies of Interrogation - Demanding a narrow and specific answer to questions that demand broader answers. Example: "Answer yes or no: Have you stopped beating your wife?"

Fallacies in Explanation and Definition - Example: using the same word in two different ways in an argument, thus invalidating the argument.

History in Discourse

In Fischer's instructive and delightful book, Historians' Fallacies, he discusses 112 fallacies under 11 categories. Note that these apply far beyond professional historians. Whenever we blog about an event, summarize our family vacation on Facebook, or write that first high school paper on "What I Did for My Summer Vacation," we're telling history, and risk committing these fallacies. Here are Fischer's categories:

Question-framing - Historians begin their research by asking one or more questions. If these questions are vague or ill-conceived, they will yield the wrong answers. Example: asking a complex question and expecting a simple answer.

Factual Verification - Failure to rigorously employ the best methods for verifying historical data.

Factual Significance - Historians can't report every fact from a period of history; they must be selective. If they select based on the wrong criteria, their conclusions will likely be wrong as well.

Generalization - Improper statistical reasoning from historical data. Example: Drawing a general conclusion from an insufficient sampling of data.

Narration - Historians gather threads of historical data and weave them into stories. Yet, "nothing but the facts" is often at odds with great storytelling, which assigns feelings and even time sequences that may not be warranted by the historical data.

Causation - Example: The reductive fallacy reduces a complex historical cause to a simplistic one.

Motivation - Historians often assign motives without sufficient evidence; for example, assuming that a Roman Emperor thinks, reacts, and is motivated by the same things that motivate a middle-aged academic historian at Berkeley.

Composition - Historians tend to study and write about groups, or individuals as part of groups, whether the groups be social, religious, nation al, ideological, cliques, castes or economic. One fallacy of composition is assuming that the character of one member is shared by the rest of the group.
False Analogy - Example: People often reason from a partial analogy to declare there's an exact correspondence; but in reality, analogies are seldom exactly parallel.

Semantical Distortion - Problems with unclear or imprecise prose. For example, the failure to clarify definitions of terms.

Substantive Distraction - The argument shifts the reader's attention to issues that are irrelevant to the discussion.

While categorization schemes are helpful for getting an overview of types of fallacies, none seem to be without their downsides. For example, some fallacies seem to fit snugly into multiple categories.

A Great Big List of Fallacies

In my first Appendix, I list a great number of fallacies. I don't recommend trying to memorize them. Rather, familiarize yourself with each of them so that in the future, when you run across an argument that doesn't sound quite right, you can return to the list to search for a fallacy that might apply. If you're reading this for a class, your teacher or professor may single out certain fallacies that they deem the most important or the most frequently abused in literature and the media.

Conclusion

There are many ways to go wrong in our arguments. Some are a bit technical. But by familiarizing ourselves with fallacies, learning to apply them correctly, and discussing disagreements in a civil and humble manner, we can learn from each other and mutually come closer to the truth.

Matching Exercises

1. What do you think motivates trolls to flame people in social media or to start arguments in social settings?
2. How do trolls hinder the process of finding truth?
3. How can we keep from behaving like trolls?
4. Write your own examples (lines of reasoning that contain the fallacy) of five fallacies (from the list in the appendix) that especially interest you.
Recommended Trail

For the Incurably Curious and Adventurous

For any fallacies that seem unclear or are of special interest to you, Google them to find other explanations and illustrations.

End Notes

Chapter 12: They Either Fail to Recognize Fallacies, or Misapply The Ones They Know

1. Aristotle was the first I'm aware of to discuss examples. Apparently, back in 350 BCE, Greek predecessors to today's trolls strolled about annoying the great philosophers, imagining that they were spouting profundities. Thus, Aristotle wrote a work about "Sophistical Refutations," which he defined as "what appear to be refutations but are really fallacies instead." While mainly writing about logical fallacies, he also spoke of assigning fallacies incorrectly. See Aristotle, *Sophistical Refutations*, written c. 350 B.C.E., translated by W. A. Pickard-Cambridge, available digitally here: http://classics.mit.edu/Aristotle/sophist_refut.1.1.html.

2. Aristotle describes this issue: "By a sophistical refutation and syllogism I mean not only a syllogism or refutation which appears to be valid but is not, but also one which, though it is valid, only appears to be appropriate to the thing in question." (Italics mine, Part Eight, *Sophistical Refutations*.)


4. Tetlock, in his respected work, *Expert Political Judgment*, suggests that those who use more temperate language tend to be more accurate in their predictions. He brings together a wealth of research showing that the foxes (who know many little things) predict better than the hedgehogs (who know one niche area in depth), although the latter are typically considered the experts and practically everyone (e.g., news sources) wants to hear from them. Those who speak in terms of "perhaps," and "possibly" are far better predictors than the dogmatic, assured experts. Philip E. Tetlock, *Expert Political Judgment* (Princeton, New Jersey: Princeton University Press, 2005, 2006).


7. From his article "Fallacies," op. cit.

Usability: Evaluating Documents and Websites

I will never forget a Christmas Eve many years ago, when the kids were finally asleep and Mr. and Mrs. Santa Claus began the assembly of the much desired "brand name" doll house. Out came the tools, out came a hundred or so tiny plastic parts, and out came an instruction sheet written by someone clearly from another land far away. After several hours of attempting to decipher some of the worst instructions ever written, we recruited a neighbor's 12 year old, a seasoned veteran in the world of dream houses, and the assembly was completed in time for Christmas morning.

Whenever usability is mentioned, this incident comes to mind. Usability, a term that refers to how easily and effectively a person can use a document, website, or product to achieve a purpose, is an integral element of workplace and technical writing and must not be overlooked at any level. On the web, it's critical for survival...if users can't figure out how to purchase that awesome table lamp, they will quickly go elsewhere on the web to shop. The vendor loses money. If users can't find the information they need, they will move on...there is plenty else out there that will meet their needs. And someone loses money. In the office, if employees spend large amounts of time figuring out unclear documents or deciphering poorly written instructions, the company loses money.

The concept of testing usability is relatively new...in the 1960's the rise of the computer industry brought about a need for user manuals and engineers realized that it would be important to know how users interacted with the materials and the technology. When personal computers became available in the 1980's and the 1990's brought the World Wide Web into households and businesses, engineers and designers...and technical writers...recognized that research into how people used and interacted with computers and documents was essential for the development of not just programs and software, but for instructional materials. (Jameson p399).

As a technical writer in the 21st century, you must incorporate some level of usability testing or evaluation in the documents you create. Think back to Chapter 1, The Nature of Sexy Technical Writing, and to the standards that determine if your document will be effective. Without some level of testing, you won't know if you have done the job...or if your reader is annoyed or frustrated by writing that is not accurate and comprehensible, a design that is not accessible, information that is missing, or even links and design features that simply don't work.

Characteristics of Usable Documents

According to Jakob Nielsen (2012), a usable document or web site must have several key elements.

- It's easy to learn so that the person can quickly accomplish the desired tasks
- It's efficient, enabling the person to accomplish the task in a timely manner
- It's easy to remember the process needed to use the document or web site to accomplish this task
- It's free from errors, enabling the user to complete the task without mistakes
- It's satisfying to use...the user will find it pleasant or enjoyable to use this design

In addition, a usable document or website combines utility...it has the functions needed...with usability...how pleasant or easy it is to use.

In addition, it has some other attributes, one of which is utility. Does the document or website do what the user needs it to do? If it meets the criteria above, then it is useful. And useful is essential to effective technical writing or design.

Usability Evaluation

The best way to guarantee that your site or document is usable and useful is to evaluate it or test it. How does this work? The methods you choose will largely depend on the size and significance of the project and can range from the simple to the complex.

At the first level, careful proofreading or evaluation of the document using a checklist may reveal areas that need development or clarification. Ask someone to review your draft or prototype and offer suggestions that will improve...
Usability Testing for User Centered Design

Dr. Carol Barnum (2002) identifies the following characteristics of usability testing:

- The goal is to improve the usability of a product
- The participants represent real users
- The participants do real tasks
- The researchers observe actions and record what the participants say
- The researchers analyze the findings, diagnose problems, and recommend changes

The important thing to notice here is the inclusion of paid participants, or users, who are representative of the target audience, and a researched protocol that the testing follows. There are a number of testing models, including lab testing, testing without a lab, and field testing.

In the usability lab (which is the most expensive and time consuming process) a number of users come into a controlled environment and are given a task to complete in a specific time frame. Observers may watch from behind 2 way mirrors and record what they see or hear or use a television monitor to observe and listen to the participants. Typically a lab requires dedicated space and lots of equipment, including video or audio recording devices.

Testing without a lab requires a space like an office or conference room where the participants and observer will not be disturbed. The observer may sit next to the participant and record manually or with a recorder what the participants does, or have the participant "think aloud" during a process. Modern technology, like computers or phones with cameras and microphones, make this form of testing easily available and economically feasible, but, according to Jakob Nielson (2012), a notepad and pen are the only equipment you will need,

Field testing means that the observer goes to the user and "tests" in the actual environment that the document or device will be used, and as an added bonus, can observe users in their natural environment with supports and distractions.

What if I just skip this process all together?

Yes, usability testing can be expensive and time consuming, but in most cases will be worth the time and expense. The costs of not testing a product or program are reflected in the amount of additional training needed to support the users, the competitive advantage of the product or program, the image and reputation of the organization, and the efficient use of employee and client time (Barnum p.23).

Start by making a plan

http://distanceed.hss.kennesaw.edu/technicalcommunication/chapters/6UsabilityTesting/6UsabilityTesting_print.html
If you are going to conduct a usability test, you have to start with a plan. That's how you will document what you're going to do, how you're going to do it, how many participants you need to recruit, and what you will have them do. In this case, you will be the usability specialist.

For your plan, you need to identify the scope and purpose of the testing, decide when and where you will do the testing, identify the equipment you will need, determine how many sessions you will conduct and how long each will be, and how many participants you think you will need. You must determine what tasks you will be testing, and develop the metrics for evaluation. For example, subjective metrics include the questions you'll ask the participants about ease and pleasure, and quantitative metrics indicate what data about errors, completion rate, or time to complete a task you will collect. You may need to identify your staff and what role other members of the team will play (usability.gov Planning a Usability test).

Recruit the participants

Once you have a plan, you will recruit your participants. You will try to find people who are as close to your target audience as possible, and you may have multiple users groups. Its okay to use your own colleagues for testing during piloting stages, but not during actual testing. If you are seeking insights, Jakob Neilson states that 5 users will give you as much information as you will need. For quantitative data collection, seeking statistics, you will need at least 20 users. If you are going to conduct iterative testing over the course of developing a document or site, you should have a different group of participants for each test. Lastly, since participants are usually compensated, you will need to decide how you will pay them. Keep in mind that you cannot pay federal employees.

Run the test!

A typical usability test might look like this:

The facilitator welcomes the participant, explains the test session, and asks any demographic questions. The facilitator will then explains what the participant will do, then explains the task scenario. The participant begins working on the scenario and may think aloud during the process while the observer or facilitator takes notes of what is said and the participant's actions. The session ends when tasks are complete or the mandated time is up, and the facilitator either interviews the participant with end of session subjective questions or thanks the participant, offers the compensation, and escorts the participant from the testing area.

Jen Bergstrom (2013) observes that choosing the best moderation technique for the session depends on the goals of the session. A concurrent think aloud (CTA) is useful for understanding participants thoughts as they work through the task. The retrospective think aloud (RTA) has the participants retrace their steps when the session is complete. Concurrent probing (CP) requires that the facilitator ask follow up questions whenever the participant makes a comment of does something out of the ordinary. Retrospective probing (RP) waits until the end of the session and then asks questions about the participants’ thoughts and actions as a follow up. Each method has its pros and cons, and none of them contribute to collecting quantitative metrics data.

Interpret and record the data

After you finish conducting your tests, it will be necessary to turn all that data into information that you can use to improve the document or site. Essentially, you will sort the quantitative data, like performance measures, and the subjective data, like attitude. You will analyze it carefully, looking for problems. Lastly, you will present your research in a report. Here's an example of a usability report for a study conducted on The Purdue OWL.

Don't forget accessibility!

Typically, usability testing does not consider the user with a disability. As a technical communicator, you have a responsibility, both legally and ethically, to produce documents and sites that meet are compliant to Section 508 of the Americans with Disabilities Act. A site that is accessible presents information through multiple channels that allows users with disabilities to access the same information as users without disabilities. Check out the Americans with Disabilities web site, (below) for more information.

http://ada.gov/ada_intro.htm

Activities and Discussion
1. For discussion: Why must you, as a sexy technical writer, need to consider usability evaluation and/or testing through all stages of generating documents or websites?

2. For discussion: How does the concept of "usability" support the principle characteristics of effective technical communication?

3. Activity or discussion: Take a look at your school's website. Imagine you are going to conduct a usability test on it. What tasks would you generate? What participants would you involve? For example: Find out how a community group not affiliated with the university can book a space to host an event.

4. Activity or discussion: Locate a set of instructions for something you own and evaluate the instructions on the basis of the five characteristics of usability. Are you able to suggest improvements to the design?

5. Activity or discussion: In small groups, choose some of your favorite websites, examine them, and create a user profile. Your profile will include gender and sex, age, education level, economic status, profession, or whatever else you determine. Then...turn it around. Create a different user profile and identify what changes you would make to improve the site for this new user.

6. Activity or discussion: The FEMA (Federal Emergency Management Agency) website has resources for people who need assistance. Consider the usability of the site for an individual with limited computer experience...what would you do to improve the chances of this individual in a flood or hurricane?

7. Activity: In the instructions chapter, you created an instruction manual. Recruiting friends or classmates, design a usability test for your manual, conduct it, and then write up the report following the format of a scientific or lab report.

References


Perhaps you are just beginning your collegiate career, or you may be finishing it up. Either way, whether you’re someone new to college or someone who has been around the block for a period of time, you’ve probably had some experience working in a group or on a team of some sort. You’ve probably been a part of an athletic or academic team. Perhaps not. Perhaps you have some group experience from being a cheerleader, a boy scout or girl scout or a member of the 4H Club. Either way, I’m sure you’re familiar with the inner workings of a team or group environment.

But have you been fortunate enough to work collaboratively in a writing capacity? Whether your answer is “yes” or “no,” this chapter is designed to help you look more closely at what it means to write collaboratively.

In this chapter, we will focus on writing in groups or teams. Specifically, we will discuss collaborative writing, which differs slightly from team and group writing.

- Collaborative writing defined
- Successful collaborative writing
- Ineffective collaborative writing
- Pulling together your team
- Strategies for effective collaboration
- Tools for collaboration
- Dealing with differences
- Dealing with conflict
- Finalizing the project
- Reflecting for future projects
- Activities and discussion

What is Collaborative Writing?

Collaborative writing, group writing, team writing, distributed writing – all terms used interchangeably to describe what it generally means to perform collective writing in a professional atmosphere. For our purposes, however, we won’t use all of those terms. Why? Because there is a vast difference between collaboration and working in groups or teams; thus, the terms collaborative writing differs greatly from team, group or distributed writing. We will refer to the act of writing together as collaborative writing.

Collaboration involves a mindset that sees the whole as more important than its parts. In other words, when people decide to collaborate, they are deciding to set aside their individual goals for the good of the group or company they represent. Collaboration seeks to combine multiple skill sets, knowledge bases, ideas and engagement from a number of people for the sole purpose of accomplishing a goal that benefits all – regardless of position or title. A collaborative mindset is focused on company success more than it is individual success.

Conversely, team and group writing tends to focus on gathering together for a period of time to accomplish a set goal for a certain project during a specific time or event. It does not necessarily entail a long-term, ingrained mindset that seeks constant success for the good of the company or group. So, collaboration differs from teams and groups because it requires every member of the group or team to take responsibility for the final outcome. It’s what happens, for example, when the parents of a child see the success of that child as the responsibility of both parents, not just one. Collaboration is the reason that companies such as Cisco and Coca Cola thrive. According to Ron Ricci and Carl Wiese, authors of The Collaboration Imperative (2011), a company’s success lies within the people they employ. “It’s not hiding in a budget spreadsheet or a warehouse full of inventory. It lies within your people – in their ideas, their experiences, their focus, their energy. The more you empower them to share their knowledge and skills, the more successful your organization will be. From ideas come innovation and new forms of productivity.”

In their 2015 book Collaboration Begins with You: Be a Silo Buster, best-selling author and management expert Ken Blanchard along with co-authors Jane Ripley and Eunice Parisi-Carew discuss what collaboration means. “Collaboration is a whole order of magnitude beyond teams. It’s in the DNA of the company culture,” they write. The authors continue, “It’s an environment that promotes communication, learning, maximum contribution, and
innovation – which, of course, all lead to healthy profits.” Thus, successful collaborative writing stems from a company culture that invites collaboration not just writing by way of teams and groups.

Collaborative writing, then, can be defined as...

Writing that entails the collaborative efforts of a group of people who gather together to write documentation, produce images, provide subtext, and more in an effort to bring a project to completion. Members can work in spaces that are face-to-face or virtual. The main goal of collaborative writing is to produce the best work for the good of the company by including the ideas and skill sets of multiple authors.

Why Write Collaboratively

In today’s ever-changing, fast paced world of information, technology and social media, it is increasingly necessary to engage people who are able to contribute a varied set of skills, specialties and who come from various cultures in an effort to produce information that best reflects the company it represents. Today, people in government, science and technology are called upon on a regular basis to communicate large bodies of information in the best and most cost-efficient way possible with an outcome that allows a broad range of people from various backgrounds and walks of life to not only access the information, but to understand the information set forth. Thus, collaborative groups of writers have become more important than ever, making information even more accessible to multiple groups of people.

But collaborative writing is not something that happens in a vacuum, nor is it magically produced after a brief period of writing. Collaborative writing, like all other types of writing is something that requires exercising the process of writing. And it is something that requires time and labor. And, the results can be rewarding. Companies all over the world have found that writing collaboratively can produce favorable outcomes for their better interests. This, however, does not come without costs. While there are many benefits to collaborative writing, there are also disadvantages if the project morphs into team or group writing.

Successful Collaborative Writing

Collaborative writing has many benefits. Because many companies believe the advantages of collaborative writing outweigh the disadvantages, many companies choose to have employees work together on projects with writers as a part of those teams.

But the positive results often attained on company projects rely heavily on the formulation of the team, skill sets, and positive group dynamics, something we’ll talk about a little later. For now, let's look at the advantages of collaborative writing below.

- **Collaborative writing creates a more enjoyable work environment.** Because members of the team share the responsibilities of the project or writing, they must communicate verbally, electronically, and in some instances they must communicate virtually. These interactions often work to improve and foster a collegial atmosphere, producing a workplace that adds to the overall good of the company.
- **Collaborative writing creates a product that considers diverse audiences.** When a team is created with the thought of diversity, the work they produce tends to be more sensitive to varied cultures and audiences. If, for example, the team incorporates the skill sets of women, men, members of the LGBT community, cis and non-cis males and females as well as members of various races and cultures, the final product will have taken into consideration the complexities of multiple communities, something that is not so easily attained by a single community of writers.
- **Collaborative writing provides an opportunity for employees – both new and not-so-new – to explore skills as both leaders and subordinate team members.** A sage once said, “To be a good leader, you must learn to follow.” Now and then a true leader is born, but a really successful leader is one who has learned to follow. Employees who have been groomed and allowed to rise through the ranks often make the most successful leaders because they are able to understand the tasks at hand and empathize with the challenges created as a result of the task. Likewise, when organizations choose to rotate the roles of team members, it allows employees to participate in roles such as team lead, recorder, researcher, editor, reporter, and more.
Collaborative writing fosters engagement through active learning. When employees write collaboratively, they put themselves in a position to either learn from or hone their dormant skills as they work with colleagues who may be more adept at a certain skill than they are.

Collaborative writing helps to grow the organization. When all of the members of the team see their contribution as not just important but imperative to the success of the project, they contribute as an owner rather than a worker, ultimately affecting the bottom line – profit. And when a company has become successful as a result of fully engaged employees who see their contributions as the reasons behind the company’s success, the longevity of the company is inevitable.

Collaborative writing produces a superior product or outcome. When performed correctly (see notes above about what true collaborative writing is and is not), the end result of the project will be more superior to anything produced outside of collaboration because the most advanced skills will have been utilized and because the members of the team will have drawn on their commitment to the end result for the good of not just themselves but for the good of the entire company.

Collaborative writing draws on the use of technology. With the emergence of so many new collaboration tools and other technological advances designed to make writing more efficient, employees are better able to engage with their colleagues and produce projects in less time and with fewer obstacles than they could without those tools. There are various types of collaboration tools, including e-mail, voicemail, instant messaging (IM), VoIP video call (or voice over IP), online calendars, wikis and shared document workspaces.

A Look at Successful Collaboration

Establish clear objectives and tasks

Successful collaboration is created by the use of several strategies, including the ability to establish clear objectives and tasks. Just as with individual writing, team writing must employ clear objectives. It is imperative for the success of the project that the objective is clear from the outset. Clear objectives serve as a goal or end result the team aims to achieve. Those goals or objectives serve as a sort of “lighthouse” that can be seen from a distance to help guide the members to “safe harbors” or guide the members to a successful end result.

Each member of the team should know from the start what is expected of her. She should know her specific part and the connection of that part to the tasks and roles of other team members. Each member should see her role as important and one, which, if not completed with an inside-out mindset (a term created by Blanchard, Ripley and Parisi-Carew to indicate the need for collaboration to start on the inside of a person’s heart, move to her intellect and finally to the hands – where the work occurs), will negatively impact the project.

It is important, then, that the team develop a space to meet and discuss the project – to ask questions, share ideas, provide input on the overall project, etc.

Conduct effective meetings

Another strategy of successful collaboration is the ability to conduct effective meetings that allow members to comfortably share their views and expertise. Being able to do so is often contingent on the ability of the team to employ careful listening skills versus just allowing a member to speak where team members just hear what is being shared. The difference in the two – listening versus hearing – is defined by intent and purpose. In *The Science and Art of Listening* (2012), Seth Horowitz delineates the two this way: “The difference between the sense of hearing and the skill of listening is attention.” In order to listen versus hear what is being said, then, you must choose (or intend) to understand what is being said, you must give your attention to what is being said. “Listening is a skill that we’re in danger of losing in a world of digital distraction and information overload.” (Horowitz, 2012). “The richness of life doesn’t lie in the loudness and the beat,” he continues, “but in the timbres and the variations that you can discern if you simply pay attention.” (Horowitz, 2012).

Set a project schedule

Successful collaboration is also dependent upon setting a project schedule. In today’s technological world, there is an abundance of tools that enable teams to successfully achieve their end result by have a clear view of what is needed and when. Tools such as WorkZone, Basecamp, and Microsoft Project, among others, allow teams to know the schedule of their project and see the progress throughout.
Keep them honest

Maintaining a sense of ethical responsibility toward the project and team members is not only important, but it is imperative for the success of the project. In Business Ethics: Concepts and Cases (2011), Manuel G. Velasquez outlines ethical standards that are helpful to consider in collaborative situations.

- **Rights**: Everyone has a right to engage in intellectual discussions at work without fear of reprisal. Likewise, when a document or product is produced, the general public has a right to expect that honesty was central in its production.
- **Justice**: Everyone should receive the same justice regardless of race, gender, or sexual orientation. Team members should be treated the same. If not, the team can become divided into separate "camps," and the project can, in turn, become derailed.
- **Utility**: Consideration should be given for how group decisions will impact all involved. When the group operates as one unit, members will consider the impact that decisions will have on each of its members. The idea of operating as silos is thrown out of the window because it is understood that what affects one affects all.
- **Care**: Because the group operates from the "inside-out" mindset (heart-head-hand), care is given to those who are closest to members and with whom members work.

Encourage discussion and diversity

Finally, successful collaboration is contingent upon the very definition of collaboration as discussed earlier in the chapter – fostering an environment that promotes communication, learning, maximum contribution, and innovation. (Blanchard, Ripley, Parisi-Carew, 2012). In other words, team members must feel comfortable sharing and at times debating about their ideas. Members should be allowed to fully operate in the diversity they bring to the team. No team member should be made to feel that her contribution is less important than that of other team members because she may be differently abled. Likewise, a team member who is a part of the LGBTQ community, even if his sexual orientation is not considered a part of the majority in the workplace, should be allowed to communicate ideas on the project from his perspective. Allowing a contribution of ideas from diverse perspectives is best for the project because it takes into consideration the diverse audience who will most likely be the readers of the project. In the end, openness in discussion creates a product that considers the audience, a primary rule in writing for technical audiences.

In his article "6 Fundamentals of Effective Collaboration" (2010) that appeared in Talent Culture World of Work, Chris Jones, an IT Strategy and Change Management consultant, muses on his "secret sauce" ingredients for effective collaboration. Jones identifies six ideas he insists is necessary for effective collaboration.

- Engagement
- Keeping it real (being authentic)
- A bias for learning and discovery
- Respect for community members
- Driving a positive vibe
- Focus on results

Notice the similarities between the four standards identified by Velasquez (2011) and the six ideas listed by Jones (2010). Indeed, without these, collaboration in writing or in any other team setting will not be successful.

**How is collaboration viewed in the working world?: A view from the U.S. Office of Personnel Management (OPM)**

In guiding federal employees on creating work environments that best reflect the vision and policies of the federal government, the Office of Personnel Management produced documentation that encourage collaborative team environments. The OPM cites the following as requirements for successful collaboration

- Have a common purpose and goal
- Trust each other
- Clarify roles
- Communicate openly and effectively
Ineffective Collaborative Writing

When collaborative writing morphs back to a team or silo mindset, it creates situations that work against the good of the group. Keep the following in mind as you establish your team and as you work through the project.

- **Avoid the "Me" syndrome** where too many people seek the role of leadership. When a clear hierarchy and roles have not been established in the group, the inevitable outcome is that you develop disjointed teams, thereby developing a disjointed project. This takes away from the collaborative environment.
- **Avoid the development of a multi-voice project** where an agreed upon voice does not come through in the project. Having an agreed upon style sheet can help to alleviate this problem. Another strategy to avoid creating a multi-voice project is to establish a team member or members as editors who review the final draft, checking specifically for the voice and tone of the message.
- **Avoid the tendency to have one or a few people shoulder the load of the team.** This is sometimes created when ethical standards are not maintained and when members feel de-valued. When this happens, other members of the team who feel alienated tend to lose motivation to work, often abandoning the project.
- **Avoid the tendency to engage in groupthink** where members care more about getting along and becoming friends than they do about the goal of the project.
- **Avoid the tendency to side with certain persons based on traits held in common** when a conflict arises. Always maintain the goal and purpose of the project so that conflict resolution is paramount for the good of the team and the project.

Scenarios for Consideration

**Scenario #1**

You work as a technical communicator for Apple, Inc. You have been charged with pulling together a team of writers, graphic artists, and subject matter experts (SME) to produce instructions for the latest Mac Book. The instructions must be produced in 30 days, a shorter time period than the three months typically given for such a project.

After assembling the team, assigning tasks and setting a schedule, you find that two of the team members, a subject matter expert and technical writer, have had past conflicts and have since found it difficult to work together. You pull the two team members aside, listen to each of their positions and insist that they leave the past behind them for the good of the project.

Two weeks pass, and you find that the two have not met to discuss their tasks. The problem with this is that other tasks given to other members of the team heavily rely on the SME and writer meeting to get the ball rolling.

As the project lead, you call the two together again to help them work through their differences. During the meeting you inform the SME that she must acknowledge her past fault for the good of the project. You say nothing to the writer about her contribution to the past conflict.

Consequently, the work on the project begins, but the spirit of the group is at an all time low at every group meeting. The project is finished, albeit two weeks late.

While presenting the finished product to the executive team, the response is negative, and you, the team lead find that the blame has been placed on you for not producing a superior product.

Questions for consideration:

1. What, if anything, went wrong?
2. What, if anything, could have been done differently to produce different results?
3. Considering the suggestions above for successful collaboration, which guidelines were or were not followed?
4. As a mentor to the team lead, what specific suggestions would you give her for her next project?

**Scenario #2**

Sherry, an environmental engineer working for the Environmental Protection Agency (EPA), was chosen as the team lead on a project designed to provide a clearer understanding for the community of the EPA's role in the new water project being instituted for the *Clean River Initiative* in the Greenspane Chattahoochhee Community. In order to fulfill her responsibility to her employer and the community, she recognized the need to produce documents – pamphlets, posters, blogs, radio advertisements, etc. in preparation for the upcoming festival a year away to unveil the project to the community.

Sherry enlisted the help of several members from various departments of the EPA, including Valarie, a production design assistant; Ricky, a systems engineer; Gabriella, community outreach coordinator; Myron, a health educator; and Erin, technical writer.

Once assembled, Sherry explained the project and the need for the group to understand the "","" approach – the need to focus on the heart of the project followed by their intellect followed by the use of their hands. In other words, Sherry explained that the end result was contingent upon the entire team to see the project as something they all owned and were doing for the good of the organization and the community. "In the end," Sherry explained, "the community will benefit and have access to clean drinking water, which in turn will impact the cleanliness of all rivers."

The team came together to create a strategy for how best to communicate the message that clean rivers produce better health, which creates a stronger community. Working over a period of 12-14 months, the project came together as Sherry and her team created events that involved the community and that explained the connection of health to clean water vs. dirty water. The events included documents created by Valarie based on research produced by Diana and written by Sam. Ricky, in turn, saw to it that the documents created could be used across technological mediums such as social media, television, radio, and the internet.

The outcome was an event that the entire team and the organization could claim as their own, for they all played integral parts in making the project a success.

Questions for consideration:

1. What, if anything, went wrong?
2. What, if anything, could have been done differently to produce different results?
3. Considering the suggestions above for successful collaboration, which guidelines were or were not followed?
4. As a mentor to the team lead, what specific suggestions would you give her for her next project?

**References**


This chapter focuses on editing technical documents. In particular, this chapter will address some of the most common types of technical editing you can do, as well as processes, resources, and techniques you can use.

- Overview of technical editing
- General procedure for editing
- Contracts
- Levels of edit
- Editors' resources
- Strategies for writing comments
- Strategies for marking up technical materials
- Hard-copy editing marks
- Special ideas for editing visual materials
- Special ideas for editing websites

Overview of technical editing

You may find that technical editing is very different from what you expect. When people hear the word "edit," they think of rewriting an author's words; working with authors on issues such as character plot, and storyline; suggesting the most appropriate word in order to make a manuscript "sing." That's not technical editing.

Instead, technical editing is a highly rhetorical, detail-oriented process of ensuring that specialized information appears so that it is appropriate for end users, and technical editors make informed, thoughtful suggestions for improvement toward that purpose.

Technical editing is a collaborative process with authors, who are often subject-matter experts (SMEs, pronounced "smees"), to check correctness of such things as chemical formulas, specialized terminology, equations, and matchups between textual and visual elements, as well as more traditional aspects of writing.

Technical editing is a recursive process, not a one-and-done routine. Technical editors often review the same materials multiple times and have their edits reviewed before the materials are printed or posted online. Only rarely will technical editors make changes and then publish the materials immediately.

Technical editing covers a surprisingly wide variety of subjects, contexts, and materials. Job ads for technical editors seek people who can comment on—and create new—paper documents, electronic documents, images, visual designs, websites, audio and video files, and multimedia presentations, just to name a few examples.

This chapter will focus on editing text on hard copy, soft copy, and websites, but it will also provide you with concepts and techniques that you can use in graphics-heavy and multimedia editing tasks.

General procedure for editing

The way you go about editing technical materials will depend on multiple factors. You will need to consider the artifact you are editing—is it mostly text? does it contain visuals? is it mostly visuals? is it paper-based or in electronic format? does it contain multimedia content? is it static or interactive?—and the type of edits that you are responsible for making. Even so, you can use the same general strategy when approaching most technical editing projects:

1. Analyze the materials' purpose, audience, format, and uses.
2. Evaluate the materials to see if they fit. In particular, consider the materials'
3. Set up objectives and plan your project's sequence.
4. Review the plan with the author.
5. Edit the materials.
6. Evaluate the outcome.

Editor-Client Contracts

Sometimes, you and the technical materials' creator will work inside the same organization. In this case, your job title and job description likely already define your relationship with the creator, and both you and the creator will have set responsibilities and deadlines.

Other times, you may be editing materials for a client, a person who is not your coworker. In this case, you need to write a contract that defines your professional relationship with your client.

At the least, a contract should specify:

- the type of materials you will edit
- the number of items
- the length (or size) of the materials
- the format of the materials
- the level of edit
- the deliverable (what you will return to your client)
- a schedule for completion
- your compensation

A clearly written contract benefits both yourself and your client. You will not be overworked or underpaid, and both you and your client will know what to expect and when to expect it.

As a general rule of thumb, if you are an inexperienced editor, double your estimate of how long it will take you to edit a project, and charge a per-hour or per-page rate. Once you are more experienced and know how quickly you can actually edit, you can charge a per-project flat fee.

Levels of edit

When you begin an editing project, avoid the temptation of diving in and making any-and-all changes that you think will be valuable. Instead, find out what "level of edit" you need to perform, and stick to it.

A "level of edit" defines how "deep" you should go with your edits. Levels range from superficial to extremely deep. Many different levels of edit can exist; experts disagree about how many levels of edit are necessary and what the different levels should involve, and some types of materials may not require specific levels of edit. Even so, you can use three basic levels for most technical editing projects:
- **Consistency and correctness.** Edit for surface-level issues such as spelling, punctuation, grammar, word use, page numbering, cross-references, and color consistency. Changes from these edits will not deeply impact the document as a whole.
- **Visual readability.** Edit for substantive issues such as typeface choices and consistency; graphic elements’ locations, sizes, labels, and captions; and document layout. Changes from these edits may have ripple effects across a document and create new errors with consistency and correctness.
- **Content and structure.** Edit for deep issues such as internal organization, sentence structures, logical flaws, image appropriateness, and overall meaning. Changes from these edits often require fundamental changes in the document and may create entirely new problems with other levels of edit.

When you edit any technical materials, do multiple passes through the material, moving from the deepest to the most superficial level of edit. That way, you will avoid wasting your time on marking up or correcting surface-level problems that will be deleted anyway.

If you see a problem that is outside your responsibility as an editor—for example, if you see a logical problem but you're only responsible for fixing comma splices—note the issue and contact someone with the authority to correct the problem.

**Editors' resources**

When you edit technical materials, consult a style guide or style sheet, and create a style sheet of your own.

**Style guides**

A style guide is an existing, authoritative source that lays out rules for the materials you are editing. For example, you have almost definitely used a dictionary at some point in your life, and if you have taken a first-year composition course, you have used a writer's handbook. Both of these examples are style guides.

Many technical editors use their employers' own in-house style guides, but many technical editors also use commercially-available style guides. Some that are commonly used in technical communication include *Scientific Style and Format: The CSE Manual for Authors, Editors, and Publishers*, the *APA Publication Manual*, and the *Chicago Manual of Style*.

Specialized style guides for highly technical subject matter also exist. If you are editing materials that require specialized knowledge, consult an appropriate style guide. For example, if you're editing documentation for factory-control equipment that will be exported to Russia, refer to *The English-Russian Dictionary of Mechanical Engineering and Industrial Automation*.

Always be prepared to justify your edits with a style guide reference. If you make up your own rules or follow your gut instinct instead of following a style guide, your author may reject your edits, or worse, you may introduce new errors.

**Style sheets**

Style sheets are small-scale, local style guides that provide consistent, quick-reference answers to common problems. Technical editors often develop style sheets to cover separate-but-related projects or different phases of a major project, and to make sure that all the editors on a project are following the same rules.

You should compile your own style sheet every time you edit anything. Do not simply list every error you encounter. Instead, list recurring errors or problems with answers that you need to look up frequently, and alphabetize the contents to make them easy to navigate. Click here for an example style sheet.
Strategies for writing comments

When you edit technical materials, do not simply insert corrections unless the edits are simple or you have explicit permission to make final decisions. Instead, write comments to the author and suggest changes.

Before you write the comments, analyze the person you're writing to. Who is the author that created the materials you are editing? How will this person react to your comments? People are often very sensitive to criticism of their writing.

When you write the comments, actively think about the words and sentence structures that you use. Some authors are more open to criticism than others, but even receptive authors will ignore weak comments and balk at rudely stated commands.

Write your editorial comments using the strategies that Mackiewicz and Riley (2003) suggest:

- **Opinion**
  - "I would use Verdana for the document's typeface."
  - State your opinion if you mean the author should make a change.

- **Suggestion with an active modal verb**
  - "You should probably use Verdana as the document's typeface. It'll make the text more readable onscreen."
  - Combine a strong suggestion with "should," will," or "ought" if you mean the author should make a change. You can include a "downgrader" such as "probably" to soften the tone. You can, but don't have to, explain the payoff.

- **Command**
  - "Use Verdana as the document's typeface, please. It'll make the text more readable onscreen."
  - Issue a command if you mean the author should make a change. You can include a "downgrader" to soften the tone. You can, but don't have to, explain the payoff.

- **Possibility statement with an active verb**
  - "You could use Verdana as the document's typeface. That's just an idea. It would make the text more readable onscreen."
  - Make a suggestion with "can" or "could" if you are suggesting a non-mandatory option. You might also state the payoff.

- **Question**
  - "Could you change the document's typeface to Verdana?"
  - Ask a question only if you don't know the answer. Otherwise, avoid this strategy.

- **Suggestion with a passive voice modal verb**
  - "The document's typeface should be changed to Verdana."
  - Avoid this strategy.

- **Possibility statement with a passive voice modal verb**
  - "The document's typeface could be changed to Verdana."
  - Avoid this strategy.

- **Hint**
  - "Using a sans serif font for a document that will appear onscreen increases the document's readability."
  - Avoid this strategy.

Strategies for marking up technical materials

When you edit technical materials, your specific actions will depend on the type of editing and the materials' format.

**Copyediting vs. Proofreading**

Technical editors help develop technical communication artifacts as well as review them just before they are published. Before you begin editing, make sure you know which approach you should take.

Editing during the developmental phase is called copyediting. This type of editing may involve "shaping" the document through deep edits and multiple comments to the materials' author. Documents that are being copyedited in hard copy are often (but not always) double-spaced.
Editing during the pre-production phase is called **proofreading**. Ideally, proofreading should only require a superficial level of edit because it requires an editor to look for differences between the approved "dead copy" that has been edited multiple times and the first printed proof version—the "galley"—that will be reproduced and published. Documents that are being proofread in hard copy (on paper) are almost always single-spaced.

**Procedural markup vs. Structural markup**

Technical editors use different types of markup on text that depend on the editing goals and the edited materials’ format. These approaches are complementary, not opposite.

**Procedural markup** involves going through a document and marking specific changes. A common example is correcting misspelled words or deleting blank spaces. You may also use procedural markup to provide instructions for changing a document's layout and design.

**Structural markup** involves "tagging" sections of a document to indicate they belong to specific categories. It is akin to using the Styles function of MS Word.

You can also combine the two approaches by using procedural markup to indicate textual changes and structural markup to indicate formatting changes.
in one package, several areas of technical communication and rhetoric of science that are addressed separately in the present scholarship. The theoretical cornerstones of this project will be Habermas’s concept of the ideal speech communication situation and pragma-dialectic argumentation.

**Ideal Speech Communication Situation**

Habermas’s ideal speech communication situation is strongly analogous to how scientific discourse is supposed to work; i.e., an unconstrained dialectic interchange among members of an intellectual community, oriented toward finding truth. In Habermas’s terms, the ideal speech communication situation depends on communicative action that is free from strategic action and takes place in the public sphere, which is part of the lifeworld. In the paragraphs below, I define each of these terms and briefly explain how I will use them in my dissertation analysis.

**Communicative Action**

Communicative action can be thought of as the instantiation of critical discourse within the public sphere. Dayton (2002) describes it as “communication aimed at coming to an understanding with others, the primordial form of human communication from which all other forms are derived” (p. 365). In order to qualify as communicative action, though, Habermas provides four criteria—Comprehensibility, Truthfulness, Sincerity, and Legitimacy—that must be fulfilled.

I have reproduced, in rough form, a chart for applying these four principles:

<table>
<thead>
<tr>
<th>Norms of Practical Communication</th>
<th>Corresponding Questions</th>
<th>Evidence of Systematically Distorted Communication</th>
<th>Suggestions for Preventing Distortions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensibility</td>
<td>“What’s this mean?”</td>
<td>Public exclusion by jargon</td>
<td>Minimizing jargon; creating public review committees</td>
</tr>
<tr>
<td>Truth</td>
<td>“Is this true?”</td>
<td>Information withheld; responsibility obscured; need misrepresented</td>
<td>Utilizing independent/critical third-party expertise</td>
</tr>
<tr>
<td>Sincerity</td>
<td>“Can we trust?”</td>
<td>Rhetorical reassurances; expression of false concern; hiding motives</td>
<td>Organizing counteradvocates; checking with contacts, networks</td>
</tr>
<tr>
<td>Legitimacy</td>
<td>“Is this justified?”</td>
<td>Unresponsiveness; assertion of rationalizations; professional dominance</td>
<td>Making decisions participatory; checking with affected persons</td>
</tr>
</tbody>
</table>

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**Structural Markup**

---
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</thead>
<tbody>
<tr>
<td>Corresponding questions</td>
<td>“What’s this mean?”</td>
</tr>
<tr>
<td>Evidence of systematically distorted communication</td>
<td>Public exclusion of jargon</td>
</tr>
<tr>
<td>Suggestions for preventing distortions</td>
<td>Minimizing jargon; creating public review committees</td>
</tr>
</tbody>
</table>

**Hard copy materials**

It is becoming less and less common for editors to work in hard copy (on paper), but it still happens. You may find that editing on paper is easier on your eyes, or that until you learn how to use a program's editing tools, editing on
If you do choose to print out and mark up technical materials, you should follow a few standard procedures.

- Mark changes to text inside each page's main body. (Except if you're proofreading. In that case, mark changes in the margins.)
- Mark changes to layout in the margins.
- Write comments to the author in the margins, and label them as comments. "AU:" is a common label.
- Circle any marginal notes that are instructions.
- Use standard marks that other people will understand, not your own made-up marks.
- Choose the simplest markup.
- Clarify potentially ambiguous marks. (For example, if you insert a lower-case letter L, write it in cursive, and/or circle the letters "el" next to it.)

**Ambiguous Markup**

![Ambiguous Markup Example](image)

- Be consistent, and mark every instance of an error.
- Use a bright-colored (not blue or black) pen or pencil, with a medium tip.
- Erase all stray marks. They can be misinterpreted as instructions to make changes.
- Be neat. Scribbles, squiggles, and smears will only confuse the author and/or your fellow editors, and you may cover up important items.
- If you use structural markup, provide a legend that specifies each tag's formatting requirements.

**Soft copy materials**

More and more often, technical editors work in soft copy (on a computer). Doing so lets you avoid double-handling documents, erase mistakes, revise comments and markup, track versions easily, and automate repetitive tasks.

If you edit in soft copy, you should follow slightly different standard procedures:
• Use programs' built-in tools to write comments to authors.
  ○ On MS Word, highlight text and click **Insert > Comment**.
  ○ On Acrobat or Acrobat Reader, use the **Comment** menu. Click in the document and use the "Add sticky note" function, or highlight text and click "Add note to text."
• If you edit text on a word processor (for example, MS Word), activate the program's change-tracker and actually make changes. Don't just mark problems.
• If you edit text on a layout program (for example, InDesign) or a PDF handler (for example Acrobat or Acrobat Reader), mark up the document using the program's built-in commenting tools. Then, revise the text in a word processor and re-create the document.
• Apply structural markup instead of just marking for it. Use document templates, high-level formatting tools (such as MS Word Styles), and/or tagging languages (such as HTML or XML).
• Use find-and-replace tools to fix repeated errors.
• Use accept/reject functions to incorporate or reject changes and delete editors' comments.
• Toggle between viewing the edited document with markup and the document without markup. Without the change-tracker's highlighting, you may see new problems "hiding" in plain sight.

Sexy Technical Communication Home

**Hard copy editing marks**

Editors in many disciplines use two fairly standard sets of marks that you can use to tag hard copy documents. One set is specifically for **copyediting**; it assumes that the edited document will be double-spaced, with lots of room between the lines for an editor's scribbling. The other set is specifically for **proofreading**; it assumes that the edited document will be single-spaced.

There is some crossover between copyediting marks and proofreading marks, but they are not interchangeable. Keep them separate.

**Copyediting Symbols**

Copyediting Symbols: Words and Letters
### Copyediting Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Text Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>🗑️</td>
<td>delete</td>
<td>I love editing!</td>
</tr>
<tr>
<td>🔧</td>
<td>delete, close up</td>
<td>I also love proofreading!</td>
</tr>
<tr>
<td>🏷️</td>
<td>replace letter</td>
<td>Melinda went into a trance.</td>
</tr>
<tr>
<td>❌</td>
<td>delete word</td>
<td>It's in the back yard.</td>
</tr>
<tr>
<td>🕵️‍♀️</td>
<td>insert</td>
<td>My telephone kept ringing all night.</td>
</tr>
<tr>
<td>🕵️‍♀️</td>
<td>insert space</td>
<td>Why won't he go away?</td>
</tr>
<tr>
<td>🕵️‍♀️</td>
<td>insert space</td>
<td>The graffiti letters were unreadable.</td>
</tr>
<tr>
<td>🎲</td>
<td>transpose</td>
<td>You should transpose the letters.</td>
</tr>
<tr>
<td>✂️</td>
<td>close up space</td>
<td>Eliminate the extra space.</td>
</tr>
<tr>
<td>✶️</td>
<td>capitalize</td>
<td>John works at the IBM factory in Ohio.</td>
</tr>
<tr>
<td>✶️</td>
<td>small caps</td>
<td>The alarm rang at 6 a.m.</td>
</tr>
<tr>
<td>✶️</td>
<td>lower case</td>
<td>It's not a federal case.</td>
</tr>
</tbody>
</table>

### Copyediting Symbols: Text Formatting
### Copyediting Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>lower case, all</td>
<td>Who keeps capitalizing FEDERAL?</td>
<td></td>
</tr>
<tr>
<td>initial cap only</td>
<td>Fred attended the IRON MAIDEN concert.</td>
<td></td>
</tr>
<tr>
<td>change to italic</td>
<td>I saw Star Wars the year it debuted, in 1977.</td>
<td></td>
</tr>
<tr>
<td>change to roman</td>
<td>Of course, I was only four years old.</td>
<td></td>
</tr>
<tr>
<td>boldface</td>
<td>Click the Enter key and wait ten seconds.</td>
<td></td>
</tr>
<tr>
<td>superscript</td>
<td>Chuck wrote $E=mc^2$ on the textbook’s cover.</td>
<td></td>
</tr>
<tr>
<td>subscript</td>
<td>It’s a very bad idea to drink H202.</td>
<td></td>
</tr>
<tr>
<td>delete underline</td>
<td>Nobody, and I mean nobody, likes cold feet.</td>
<td></td>
</tr>
<tr>
<td>spell out</td>
<td>The man signed his order in ASL.</td>
<td></td>
</tr>
<tr>
<td>change to numeral</td>
<td>Cool Hand Luke ate 50 eggs in an hour.</td>
<td></td>
</tr>
<tr>
<td>ignore the edit</td>
<td>The editor made a mistake.</td>
<td></td>
</tr>
<tr>
<td>ignore the edit</td>
<td>The editor blew it twice in a row.</td>
<td></td>
</tr>
</tbody>
</table>

### Copyediting Symbols: Punctuation Marks

- **Period** (.)
- **Comma** (,)
- **Semicolon** (;)
- **Colon** (:)
Copyediting Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>.</td>
<td>period</td>
</tr>
<tr>
<td>,</td>
<td>comma</td>
</tr>
<tr>
<td>:</td>
<td>colon</td>
</tr>
<tr>
<td>;</td>
<td>semicolon</td>
</tr>
<tr>
<td>(</td>
<td>parentheses</td>
</tr>
<tr>
<td>[</td>
<td>brackets</td>
</tr>
<tr>
<td>=</td>
<td>hyphen</td>
</tr>
<tr>
<td></td>
<td>hyphen</td>
</tr>
<tr>
<td></td>
<td>hyphen</td>
</tr>
<tr>
<td>—</td>
<td>em-dash</td>
</tr>
<tr>
<td>–</td>
<td>en-dash</td>
</tr>
<tr>
<td>=</td>
<td>equal sign</td>
</tr>
</tbody>
</table>

Copyediting Symbols: Spacing and Positioning
### Copyediting Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>¶</td>
<td>paragraph break</td>
<td>She liked it. Zhaleh raced out the door.</td>
</tr>
<tr>
<td>″</td>
<td>line break</td>
<td>Poetry often uses line breaks inside sentences.</td>
</tr>
<tr>
<td>—</td>
<td>run together</td>
<td>You’ve gotta be crazy if you think I’m going to eat fricassee squirrel.</td>
</tr>
</tbody>
</table>
| ■      | set as a paragraph, not as a list | Elise bought many kinds of books, including:  
- paperbacks  
- hardbacks  
- ebooks |
| ☐      | justify left  | Why is this line indented? |
| ☐      | justify right | Align this text to the right margin. |
| □      | center        | This line should be centered. |
| ™      | ragged right  | Full-justified text can look peculiar, especially when “lakes” and “rivers” of white form in its middle, or the words’ spacing gets stretched, as is happening in this short paragraph. See?. |
| □      | align         | No way, man.  
I don’t follow your silly rules.  
Free spirits like me…we just gotta be free. |

### Copyediting Symbols: Alignment and Spacing

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
</table>
| ☐      | align       | This should be fun. I’m going to align every line behind the first letter “e.”  
Why? Because I can.  
Note the top and bottom vertical lines. |
| ☐      | indent one em | You need to indent this line just a tad more. |
| ☐      | indent two ems | Indent this line twice as much. |
| ☐      | indent all text by two ems | There is no need to update your information with any merchants who automatically bill to your account. |
| ☐      | transpose words | What is going the heck on here? |
| ☐      | close up vertical space | Charley started typing his paper at noon yesterday and has already hit a thousand pages. I’m worried about him. |
| ☐      | insert vertical space between lines | **Famous Movie Villains**  
Darth Vader is one of the most iconic baddies in the history of cinema. |
Copyediting Symbols Quizzes

- match the symbol to its meaning! (punctuation)
- match the symbol to its meaning! (words & letters 1)
- match the symbol to its meaning! (words & letters 2)
- match the symbol to its meaning! (alignment & spacing)
- match the symbol to its meaning! (spacing & positioning)

extra practice 1
extra practice 2

Proofreading Symbols

Proofreading Symbols: Words and Letters

**Special Rules for Proofreading**

Put marks in both the margin and in the text.

If there is more than one error on a line, list them in order, and put slashes between their marks.

<table>
<thead>
<tr>
<th>margin mark</th>
<th>in-text mark</th>
<th>operation</th>
<th>explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>delete</td>
<td></td>
<td>delete</td>
<td>Deleting extra letters is easy.</td>
</tr>
<tr>
<td>delete, close up</td>
<td></td>
<td>delete, close up</td>
<td>Free way is one word, not two.</td>
</tr>
<tr>
<td>replace letter</td>
<td>e</td>
<td>replace letter</td>
<td>Melinda was a Ghostbusters for Halloween.</td>
</tr>
<tr>
<td>delete word</td>
<td></td>
<td>delete word</td>
<td>Cut out extra extra words.</td>
</tr>
<tr>
<td>insert letter(s)</td>
<td></td>
<td>insert letter(s)</td>
<td>The leaky faucet dried all night.</td>
</tr>
<tr>
<td>insert word</td>
<td>word</td>
<td>insert word</td>
<td>Oh, my...the most important is missing.</td>
</tr>
<tr>
<td>insert space</td>
<td>#</td>
<td>insert space</td>
<td>There should be space between the words.</td>
</tr>
<tr>
<td>transpose</td>
<td>cTO</td>
<td>transpose</td>
<td>Switch the letters’ order.</td>
</tr>
<tr>
<td>close up space</td>
<td><code>&lt;</code></td>
<td>close up space</td>
<td>Delete the empty space inside the word.</td>
</tr>
<tr>
<td>capitalize</td>
<td>CAP</td>
<td>capitalize</td>
<td>I think my keyboard’s right shift key is broken.</td>
</tr>
</tbody>
</table>

Proofreading Symbols: Text Formatting
### Proofreading Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>se</td>
<td>small caps</td>
<td>The paper is due at 11:59 p.m.</td>
</tr>
<tr>
<td>lc</td>
<td>lower case</td>
<td>Charlene visited the State capitol building.</td>
</tr>
<tr>
<td>lc</td>
<td>lower case, all</td>
<td>You’ve gotta be KIDDING me.</td>
</tr>
<tr>
<td>ulc</td>
<td>initial cap only</td>
<td>I love KENNESAW State University.</td>
</tr>
<tr>
<td>ital</td>
<td>charge to italic</td>
<td>Cletus subscribes to Cat Fancy magazine.</td>
</tr>
<tr>
<td>rom</td>
<td>charge to roman</td>
<td>He breeds Maine Coon cats.</td>
</tr>
<tr>
<td>bf</td>
<td>boldface</td>
<td>Press the F5 key to reload the webpage.</td>
</tr>
<tr>
<td>lf</td>
<td>lightface</td>
<td>They don’t need five wet wipes.</td>
</tr>
<tr>
<td>wf</td>
<td>wrong font</td>
<td>My cat simply adores me.</td>
</tr>
<tr>
<td>superscript</td>
<td>Journey’s Time box set is pretty good.</td>
<td></td>
</tr>
<tr>
<td>subscript</td>
<td>Dihydrogen monoxide is also known as H₂O.</td>
<td></td>
</tr>
<tr>
<td>spell out</td>
<td>Michelle owes me seven $</td>
<td></td>
</tr>
<tr>
<td>stet</td>
<td>ignore the edit</td>
<td>The editor made a mistake while proofreading.</td>
</tr>
</tbody>
</table>

### Proofreading Symbols: Punctuation Marks
Proofreading Symbols

<table>
<thead>
<tr>
<th>margin mark</th>
<th>in-text mark</th>
<th>symbol</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>.</td>
<td>.</td>
<td>period</td>
<td>Nobody likes Ramsay Bolton.</td>
</tr>
<tr>
<td>,</td>
<td>,</td>
<td>comma</td>
<td>I asked “Why are you picking on Janet?”</td>
</tr>
<tr>
<td>?</td>
<td>?</td>
<td>question mark</td>
<td>Are you serious?</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
<td>colon</td>
<td>There’s one exit from this room the window.</td>
</tr>
<tr>
<td>;</td>
<td>;</td>
<td>semicolon</td>
<td>Westley is mostly dead he can’t speak.</td>
</tr>
<tr>
<td>(</td>
<td>)</td>
<td>parentheses</td>
<td>Kennesaw State University KSU is awesome!</td>
</tr>
<tr>
<td>[</td>
<td>]</td>
<td>brackets</td>
<td>The woman Charlene bought a box of bullets.</td>
</tr>
<tr>
<td>‘</td>
<td>‘</td>
<td>apostrophe</td>
<td>You’re right about that, I realize now.</td>
</tr>
<tr>
<td>”</td>
<td>”</td>
<td>quotation marks</td>
<td>Go outside and play! said the boys’ mother.</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>hyphen</td>
<td>That Chevy has a four barrel carburetor.</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>en-dash</td>
<td>My choice for the job Dave is well-qualified.</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>em-dash</td>
<td>There were 40-50 people at the party.</td>
</tr>
</tbody>
</table>

Proofreading Symbols: Spacing and Positioning
Special ideas for editing visual materials

Most of the concepts and techniques described in this chapter focus on editing text, but they can also apply to other technical materials. This section will address ideas specific to editing visual elements.

Consider these six concepts when you edit visuals:

**Appropriateness**

- Decide if text, an image, or a combination of the two is most effective.
- Match the type of image (e.g., table, bar chart, scatterplot, pie chart, Gantt chart, flowchart, map, line drawing, cutaway, cross-section) to the idea/thing being discussed.
- Match the illustration's emotional tone to the subject matter's emotional tone.
- Follow established design conventions.

Clarity

- Use contrasting colors. Bright colors and dark shades attract the most attention.
- Make sure the visual elements' layout follows consistent rules on the screen or page.
- Omit any "non-data pixels" that do not carry information.
- Place an illustration next to the text that references the illustration.
- Explain every illustration's content and relevance in the text, preferably before the illustration appears.
- Label and caption every illustration.
  - Use the correct type of label.
  - Use a sequential numbering pattern.
  - Number tables and figures separately.
- Include "white space" (blank space) around illustrations.

Emphasis

- Use arrows, callouts, and boxes to highlight elements that a user will find important, but don't go overboard.

Ethics

- Avoid images that exclude categories of people or play to stereotypes.
- Avoid inhumane images that downplay effects on people.
- Follow copyright law and create, cite, and/or pay for images.
- Use undistorted images of the actual object.
- Use realistic numbering scales that display quantitative differences in context.

Size

- Strike a balance between making images large enough to see details but not so large as to waste space.
- Minimize images' file sizes, but avoid making the images grainy.

Cost

- Compare the cost of publishing images to your printing budget. Color pixels are free, but color ink is expensive, and projects that require a professional printer can be very expensive.

Sexy Technical Communication Home

Special ideas for editing websites

Technical editors are probably not going to code complete websites themselves. Even so, you may be asked to edit and possibly create web-based content, so you need to be familiar with the basics of web technology.

HTML and CSS

Hypertext markup language (HTML) is the backbone of internet content, and Cascading Style Sheets (CSS) are a vital part of how web programmers style that content. In short, HTML tells your browser what to put onscreen, and CSS tells the browser what it should look like.
This chapter cannot go into the details of how HTML and CSS work, but if you intend to edit websites, you need to be able to "read" basic HTML and CSS and understand how they work.

Many online tutorials for HTML and CSS exist; the W3 Schools website (www.w3schools.com) is one of the better ones.

**General web design principles**

Websites' layout, design, purpose, and function vary tremendously, but most websites follow a set of basic concepts that you can use to evaluate and edit them. Consider these ideas when you edit websites:

- Are words used consistently across the whole website? Are these words meaningful to the users? If not, what words would the readers prefer or understand?
- Are related activities close to each other onscreen and in a logical location? If not, where would the user like to see those activities?
- Do the pages have plenty of headings? If not, where would headings be useful and appropriate?
- Are the sentences and paragraphs short? If not, how and where could you break up long blocks of text into bite-sized chunks?
- Are there any paragraphs that can become lists?
- Are the typefaces and font sizes appropriate for use onscreen? If they're hard to read, how could they be improved?
- Are the hyperlinks easily visible?
- Do the hyperlinks' visible text and mouse-over text describe the items that will open? (In particular, rename links that say "click here.")
- Do the hyperlinks work?
- Do the navigation menus appear in the same place and look the same on every page?
- Do the navigation menus work?
- Does the website include a sitemap?
- Does the website have an internal search engine? Does it work?
- Is the website usable on a mobile device?
- Does the onscreen layout follow an F-pattern? (Most people read websites in this pattern: they look across the top, scan down the left side a few inches, read across, and scan down again.)
- How long would it take for a user to realize s/he ran into a problem?
- Can the user start over if a problem occurs?

**Accessibility**

One editing issue that you need to consider very carefully is website accessibility. Some issues with accessibility deal with physical or mental disabilities, while others deal with limits on users' expertise and access to technology.

A federal law called Section 508 requires all government agencies that receive federal funding to make their electronic and information technology accessible to people with disabilities. Government agencies also want to make their websites usable for people with limited resources.

Similarly, corporations want to make their websites accessible to the widest possible variety of customers, so corporate websites should incorporate accessibility standards to accommodate these broad audiences.

As a technical editor, you may be responsible for evaluating a website’s accessibility. Consider these ideas when you edit websites:

- Is the website usable by people with physical or mental disabilities? Examples include people who are
  - partially or completely blind
  - colorblind
- unable to focus their eyes well
- unable to see contrast
- partially or completely deaf
- easily distracted by noise
- unable to use a mouse accurately, or at all
- unable to use two hands
- unable to tolerate blinking lights
- dyslexic
- unable to form short-term memories
- unable to concentrate for long periods of time

Many of these users depend on assistive technologies such as screen readers and alternative keyboards. If the website does not work with these technologies, you should edit the website to make it accessible.

- Is the website usable by people who have limited experience with computers? Examples include
  - senior citizens
  - people from rural areas
  - people in developing countries

- Is the website used by people with limited or modified technological resources? Examples include people who have
  - dial-up internet connections
  - older computers
  - small or non-widescreen monitors
  - lack of access to computers other than mobile devices
  - lack of access to mobile devices
  - no software to open downloaded files
  - older web browsers
  - text-only browsers
  - disabled speakers
  - disabled cookies
  - disabled Javascript
  - disabled Javascript
  - ad-blocker programs
  - pop-up blockers

A detailed discussion of accessibility issues and goals is available online through the Web Accessibility Initiative section of the World Wide Web Consortium (W3C) website: wwww.w3.org/WAI/

The W3C also hosts a page with an extensive and frequently updated list of accessibility checkers. You may wish to use them when editing a website for accessibility: http://www.w3.org/WAI/eval/Overview.html

**Website markup strategies**

You have multiple options for how to mark up websites. None are innately better than the others, so choose the method(s) that best fits the project and your client's needs.

- Edit a website's unpublished text in a word processor as you would any other text document.
- Copy-and-paste a published website's text to a word processor, and edit it as you would any other text document.
- Capture and print screenshots, or print formatted web pages with your browser's "Print" function, then mark them up as you would any other hard copy documents.
- Capture screenshots, open them with a graphics program such as Photoshop or MS Paint, and mark them up with the program's drawing and/or text-creating tools.
- Export website pages to PDF and edit them with Acrobat or Acrobat Reader markup tools.
- Type a separate comments file.
- Directly edit the HTML and CSS code.
  - Use either a web-development program or a plain-text editor. Never use MS Word.
  - Tag your edits with highlighting, colored text, and/or comment codes (<i>-- commentgoeshere --</i> for HTML, and /* commentgoeshere */ for CSS).
- Export the website's code or text to a collaborative online space such as a wiki or Google Docs, and edit it online, using the program's tools.
Chapter Goals and Objectives

At the end of this chapter and the practice activities, readers will be able to:

- Goal 1: define HTML and identify what it stands for
- Goal 2: build a simple web page using HTML coding
  - Objective 1: identify and use common HTML tags
  - Objective 2: explain and apply basic tag rules
  - Objective 3: explain attributes and use them to stylize text and images
  - Objective 4: embed videos and other embeddable items into HTML web pages
- Goal 3: identify websites where readers can learn more and practice their HTML skills

Introduction

There is a high probability that the readers of this chapter have at least heard the acronym HTML, although many may only know its most basic meaning: HTML is a code that makes web pages. You are not wrong, but there is a bit more to it. For example, did you know that HTML is actually a language with rules, just as English is? Or, perhaps, did you know that HTML actually stands for something, and is not just an all-caps name? Let's start from the beginning.

Before we begin our adventure into HTML, hover your mouse over this text. Any time you see bolded blue text, it means that there is a text-popper there. If you hover over it, you'll get more information about the indicated item.

HTML stands for HyperText Markup Language. HTML is a coded computer language that, when read by a web browser, displays the web pages you see every day when exploring the Internet.

Don't believe me? See for yourself: In Mozilla Firefox, right click on a web page and click "Inspect Element." The code of the page you are looking at should appear at the bottom of the page. This code is what Firefox reads to show you the page you are seeing in your browser. Pretty cool, huh?

HTML is the baseline coding of every web page you see out there, and when combined with CSS, JavaScript, and other languages, it can create cleanly-constructed and functional websites.

Tag Rules

HTML is a language, and it, as all languages do, has rules that make it make sense to the web browser. Just as the English language doesn't make sense when you break grammar rules, neither does HTML when you break tag rules. The difference is, most English speakers will still understand what you are trying to say when you break a grammar rule; the web browser will not understand when you break a tag rule. So let's look at some of these rules.

When you look at a line of HTML, you'll see information enclosed in brackets `< >` throughout the code. This denotes a tag. A tag is what tells web browsers what each item on the page is; it tells the web browser how to classify that information. For example, a paragraph would be classified by a `<p>` tag.

Rule #1

Most tags have an opening tag and a closing tag that surround the information it is classifying or effecting. An opening tag is just the brackets with the tag enclosed, like so: `<p>`. A closing tag is the same thing, except there is a forward slash at the front of the tag, like so: `</p>`.

When tagging a paragraph with the `<p>` tag, it would look like the example in Figure 1.

---

**Figure 1:** Opening and closing tags

http://distanceed.hss.kennesaw.edu/technicalcommunication/chapters/10HTML/10HTML_print.html
This is a paragraph about how to properly tag a paragraph. To tag a paragraph, you have to start with an opening paragraph tag, type the paragraph, and then end with a closing paragraph tag. This is how most sections of simple paragraph text are tagged.

Rule #2

Rule #1 does not always apply. Not all tags have to have a closing tag, and you just have to remember those. We will learn about some basic tags in the next section, where we talk about a few that do not require a closing tag.

Rule #3

Opening and closing tags must be nested to work. That is, the last tag you open should be the first tag you close, as shown in the example in Figure 2.

Figure 2: Nested tags

```html
<body>
<p>This is a paragraph in the body of the webpage. As you see, I opened the body tag first, and then the paragraph tag; if I am nesting the tags, then I have to close the paragraph tag first, and then close the body tag.</p>
</body>
```

Basic Tags

There are tons of tags, and it's almost impossible to memorize them all. Luckily, we have the Internet, which means we don't have to memorize them. In this section, you'll learn about some of the basic tags that are needed in almost every web page.

Beginning tags and the <head>

Every HTML web page starts with a `<doctype html>` tag, with no closing tag. This is what tells the web browser what version of HTML the page is written in. The `<doctype>` tag used to have several options in the old HTML, but in HTML5, there is only one: `<doctype html>`.

After the `<doctype html>` tag, there is an `<html>` tag, which is also required for every HTML document. Unlike the `<doctype html>` tag, the `<html>` tag does require a closing tag of `</html>`. For nesting purposes, the closing `<html>` tag will always be the very last thing in your document.

Once the `<html>` tag has been opened, the page then has its head information in the `<head>` tag, which also has a closing tag of `<head>`. The `<head>` tag includes information that does not show up on the page, but is vital to the look and feel of the page. There is always a `<title>` tag with a closing `<title>` tag that encloses the information on the tab of the web browser, as shown in Figure 3. Users who are including CSS information in their document might also include CSS coding in the `<head>` tag.

Figure 3: A browser tab with title information

The `<body>` tag and other common tags

After the `<head>` tag has been closed, the next tag to open is the `<body>` tag. This denotes the information that you actually see on the page when looking at a web browser. Everything you see within the browser window appears after the `<body>` tag and before the closing `<body>` tag.
For common tags used within the `<body>` tag and their purpose, see Table 1. Unless otherwise noted, all tags in the table below require a closing tag.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;em&gt;</code></td>
<td>Defines emphasized text. Text enclosed in an <code>&lt;em&gt;</code> tag will appear italicized.</td>
</tr>
<tr>
<td><code>&lt;strong&gt;</code></td>
<td>Defines important text. Text enclosed in an <code>&lt;strong&gt;</code> tag will appear boldface.</td>
</tr>
</tbody>
</table>
| `<img>` | Defines an image. This tag requires an attribute that defines what image it shows. This attribute is called `src`. The `<img>` tag does not require a closing tag, however it does end differently. Instead of the usual closing tag, an `<img>` tag is closed by ending the opening tag with a space and then `>`. For example: `<img src="logo.jpg" />
| `<a>`  | Defines a link. This tag requires an attribute that defines where the link goes to. This attribute is called `href`. |
| `<ul>` | Defines an unordered list. This will start a bulleted list. |
| `<ol>` | Defines an ordered list. This will start a numbered list. |
| `<li>` | Defines a line in a list. This tag applies to both unordered and ordered lists. When you start a list, you must use `<li>` tags to open and close each line separately. See Figure 4 for an example of how a list looks in HTML. |
| `<table>` | Defines a table. This will start a table. |
| `<tr>` | Defines a table row. This will start a row in a table. You must have a `<tr>` tag for each row of a table. |
| `<td>` | Defines a table column. This will start a column in a row of a table. You must have a new `<td>` tag for each column of each row of the table. See Figure 5 for an example of how a table looks in HTML. |
| `<br>` | Defines a line break. This tag does not require a closing tag. |
| `<h1>`- `<h6>` | Defines headings. There are six HTML heading levels: `<h1>`, `<h2>`, `<h3>`, `<h4>`, `<h5>`, and `<h6>`. They each define headings of their specified order (`<h1>` being the first order heading and `<h6>` the sixth order). |
| `<p>` | Defines a paragraph. This is how most sections of text are tagged. |

**Figure 4: Ordered and Unordered Lists**

<table>
<thead>
<tr>
<th>HTML</th>
<th>Preview</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;ul&gt;</code></td>
<td></td>
</tr>
<tr>
<td><code>&lt;li&gt;</code> Item 1&lt;/li&gt;</td>
<td>• Item 1</td>
</tr>
<tr>
<td><code>&lt;li&gt;</code> Item 2&lt;/li&gt;</td>
<td>• Item 2</td>
</tr>
<tr>
<td><code>&lt;li&gt;</code> Item 3&lt;/li&gt;</td>
<td>• Item 3</td>
</tr>
<tr>
<td><code>&lt;ul&gt;</code></td>
<td></td>
</tr>
<tr>
<td><code>&lt;li&gt;</code> Item 1&lt;/li&gt;</td>
<td>1. Item 1</td>
</tr>
<tr>
<td><code>&lt;li&gt;</code> Item 2&lt;/li&gt;</td>
<td>2. Item 2</td>
</tr>
<tr>
<td><code>&lt;li&gt;</code> Item 3&lt;/li&gt;</td>
<td>3. Item 3</td>
</tr>
</tbody>
</table>
Basic Attributes

HTML attributes provide more information for tags or apply stylistic features to them that are not the default. For example, an `<a>` tag requires more information to know where it should link to, and a `<p>` tag can have a different font color than the default if you want it to. Let's take a look at some common attributes and what they do in Table 2 below.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>What it does</th>
<th>What it looks like in HTML</th>
</tr>
</thead>
<tbody>
<tr>
<td>href</td>
<td>The <code>href</code> attribute belongs to the <code>&lt;a&gt;</code> tag and defines where the link will go to.</td>
<td><code>&lt;a href=&quot;http://distanceed.hss.kennesaw.edu/technicalcommunication&quot;&gt;This is a link to the textbook website.&lt;/a&gt;</code></td>
</tr>
<tr>
<td>src</td>
<td>The <code>src</code> attribute</td>
<td><code>&lt;img src=&quot;logo.jpg&quot; /&gt;</code></td>
</tr>
<tr>
<td>Tag</td>
<td>Description</td>
<td>Example</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td><code>img</code></td>
<td>Belongs to the <code>&lt;img&gt;</code> tag and defines where the tag will pull the image from. This can be an image site or a file path from within the server.</td>
<td><code>&lt;img src=&quot;logo.jpg&quot; width=&quot;300px&quot; /&gt;</code></td>
</tr>
<tr>
<td><code>width</code></td>
<td>The <code>width</code> attribute can be applied to images, <code>iframe</code> elements, tables, or other elements with a numerical width. It defines how wide the item will be.</td>
<td><code>&lt;img src=&quot;logo.jpg&quot; width=&quot;300px&quot; /&gt;</code></td>
</tr>
<tr>
<td><code>height</code></td>
<td>The <code>height</code> attribute can be applied to images, <code>iframe</code> elements, tables, or other elements with a numerical height. It defines how tall the item will be.</td>
<td><code>&lt;img src=&quot;logo.jpg&quot; width=&quot;300px&quot; height=&quot;300px&quot; /&gt;</code></td>
</tr>
<tr>
<td><code>style</code></td>
<td>The <code>style</code> attribute allows you to add inline styles.</td>
<td><code>&lt;p style=&quot;color:blue;&quot; &gt; This is blue text.&lt;/p&gt;</code>&lt;br&gt;<code>&lt;h1 style=&quot;font-size:24px;&quot; &gt;This is a 24pt font heading.&lt;/h1&gt;</code>&lt;br&gt;<code>&lt;a href=&quot;http://distanceed.hss.kennesaw.edu/technicalcommunication&quot; style=&quot;font-family:Arial; font-size:12px;&quot; &gt;This link to the textbook website</code></td>
</tr>
</tbody>
</table>
CSS elements to your tag. A few common ones are color, font-size, font-family, and text-align. You define a style element the same way as other attributes, however you then have to define the value of the style element. View the examples to the right to see how these style elements are defined.

Embeddable Items

YouTube is the most popular video repository in America, if not the world. What if you want those videos on your web page? Perhaps you posted a video of a project you've been working on, and you want to show that video on your online portfolio. The answer is simple: embed codes. Most sites with hard-to-code items have an embeddable feature to them, and it essentially puts the information in a frame of one website into a frame on your own website. You can usually find the embed codes in the share functions of items. The nice (and easy!) thing about embed codes is that they don't require you to add anything to them. You simply paste the code into your HTML page, and in that spot you will see the video or other item when you preview it. However, you can edit them. Let's analyze a YouTube embed code in Figure 6 below. Just hover over the words to see the different comments.

Figure 6: A YouTube embed code

```
<iframe width="420" height="315" src="https://www.youtube.com/embed/zw_M-sWrDfc" frameborder="0" allowfullscreen></iframe>
```

Watch the video below to see tags, attributes, and embed codes in action!

Organizing Your Web Page
Web pages are a series of pages connected by hyperlinks, and they have unique needs. Let's think about it this way: you have a small child whom you keep in a playpen. In the playpen is a tiny toy box with a ball, a block, and a fire truck. You play a game where you tell her to show you the ball, and she points to the ball. You tell her to show you the block, and she points to the block. You tell her to point to the fire truck, and she points to the fire truck. This game works very well.

But then you take her into another room and put her in another playpen, and there's a pillow, a rattle, and a dolly. You tell her to point to the fire truck, and she looks around and shrugs her shoulders. Her mind is not advanced enough to understand that you wish her to point through the wall into the other playpen. And she does not have the physical ability to get out of the playpen, walk to the other room, and retrieve your fire truck for you. This game will not work.

You then try again. You put her back in the original playpen, but you take the small box of toys and scatter them around the house. You put the ball under the couch. You put the block in the bathtub. And you put the fire truck in the trunk of your car. You return to the playpen and ask the child to show you the fire truck. Again, she shrugs her shoulders. This game will not work.

Why does the first game work, but the other two do not?

What if you change the game by taking the child, playpen, toy box, and all into the next room and again ask the child for the block? Unless something distracts the child, the game will work! The child knows the block is in the box, and all functions as normal.

Your web page is the child, and its name is index. Your main folder is the playpen, and your subfolders are the toy boxes.

To be more clear, when you make the homepage of a website, you'll want to name it "index.html" and put it in a folder. In that folder, you can then put any pictures, documents, videos, or other HTML files that you might link to. You can also organize further by putting those things into subfolders. But no matter what, everything that is not already online must be put inside that main folder to be then posted online.

Where to Practice and Learn More HTML Skills

- codecademy.com
- w3schools.com
- lynda.com
Examples, Cases & Models

An example is worth half a thousand words

The following are links to the examples and models of the kinds reports, letters, and other documents discussed in this book. (Some of the items are excerpts.) True, many of these examples are as much as twenty years old. However, the point here is technical writing, format, organization, style—not up-to-date technology. Even so, why not write a technology update on blood glucose monitoring systems, voice recognition software, laptop computers, wind power systems? (And then send it to us at treardo2@kennesaw.edu)

Resumes

Veterinary assistant
LAN system administrator
Maintenance technician for high-tech systems
Science writer, editor, researcher
Computer service and sales representative
Case management nurse
Technical writing intern

Curriculum Vitae

Instructional designer

Application Letters

Technical writing intern
Science editorship
Database programmer
Quality assurance manager
Programmer/analyst

The Ghost of Milagro - used with permission from Melanie Sumner, author of How to Write a Novel

Complaint Letters

Microwave problems
Printer problems
Cosmetics problems
Digital multimeter problems
Garden polymer sprayers

Adjustment Letters

Compensation for damaged freight
Archaeological bad news. True, this is not an answer to a direct complaint.

Olivia's Rose Garden Boutique

Inquiry Letters
Questions about blood glucose monitoring systems
Questions about hardware support for Red Hat Linux

**Order Letters**

Office equipment purchase

**Proposals**

Employee Wellness Program
Proposal to Write the Operation and Maintenance Manual for the M-16A2 Rifle
Academic Proposal
Nursing Staff Handbook on Communication and Swallowing Disorders in the Elderly
Corporate Standards Manual
Student Guide for Solving Engineering Mechanics Problems

Remote Desktop Access at KSU

**Progress Reports**

Construction handbook for a mycological growroom (annotated PDF)
Database development
Debugging techniques with Scheme
Quartz etch rate project
Therapeutic Electrical Stimulation Therapy (TES) for children with cerebral palsy (annotated PDF)

**Instructions, Policies and Procedures, Standard Operating Procedures**

Using WS_FTP Pro for Windows
 Beginner's Guide to Eudora Lite for Windows
Operating the Minolta Freedom 3 Camera
How to Raise Potatoes in the Home Garden
Instructions for a Simple Window Curtain
Hand-washing policies and procedures for health care personnel
Accounting policies and procedures
Standard operating procedures: pouring dental impressions Thanks to Melissa Burke for making this SOP available.

**User Guides**

GIMP User Guide
Parallels User Guide

**Recommendation & Feasibility Reports**

Sport Utility Vehicles
Laptop Computers (annotated PDF)
Fire Ant Control
Blood Glucose Monitoring Systems
Uninterruptible Power Supply (UPS) Systems
First Telescope Purchase
Voice Recognition Software

**Formal Technical Reports (annotated PDF)**

DVD Technology and Applications
Cerebral Palsy and Its Treatments
Effects of Increased Atmospheric Carbon Dioxide
Report on Light Water Nuclear Reactors
Handbooks

Film production
Amazon
Asthma
Avian flu

Primary Research Reports

Trout Spawning Cycles
Bats Roosting in Deciduous Leaf Litter

Technical Specifications

Design and Construction of a Single-Story Purple Martin Birdhouse
Specifications: (a) Metal Doors and Frames, (b) Cassette Deck
Mazda 787B

Oral-Report Scripts

Patient Seminar on Physical Therapy
Presentation on Automobile Airbags for Sales Representatives

Report and Section Instructions

Introductions to Brief Instructions
Introductions to Brief Reports
Report Introduction from a Report on Nuclear Reactors
Report Introduction from a Report on the Ames Municipal Solid Waste Recovery System
Section Introduction Occuring in a Report on Wire-Line Logging Technology

Descriptions

Rayovac Workhorse Flashlight
Mars Exploration Rover
Primitive Stone Scraper
Littman Stethoscope

Comparison

Wind Electrical-Power Generators
Comparison of Nuclear Reactors

Classification

Industrial Robots
Types of Solar Water Heaters

Causal Discussion

Effects of a Nuclear Attack
Lunar Organic Matter

Definition
Sickle Cell Anemia
Stratospheric Ozone Depletion and HVAC Refrigerants
Superconducting Quantum Interference Device

Process Discussion

Cardiac Cycle
Wind Turbine Power Generation
Shock

Persuasion

In Favor of Recycling
Opposed to Recycling

Graphics

Map of Hellbent - used with permission from Melanie Sumner, author of *How To Write a Novel*