Chapter 7. Working with Visuals

In the spring of 2020, the world was hit with an outbreak of novel coronavirus, the likes of which had not been seen since the Spanish flu of 1918. What were your reactions to the news of this global pandemic? Perhaps you were someone who didn't pay much attention to the news until it reached the United States. Perhaps you had been tracking the outbreak of COVID-19 as it spread country to country. Perhaps you cancelled a vacation or had graduation plans derail. Perhaps you made decisions based on what the news media was showing you. Many political messages at first were quick to try to enforce social distancing—staying home, keeping at least six feet between people when out in public—to try to decrease the chances of infection. Social media was quick to follow, propagating messages of best practices of handwashing and sheltering-in-place. One of the primary things that both kinds of messaging depended on was a particular graphic, shown in Figure 7.1, that showed the spread of the COVID-19 virus with and without the practice of social distancing.

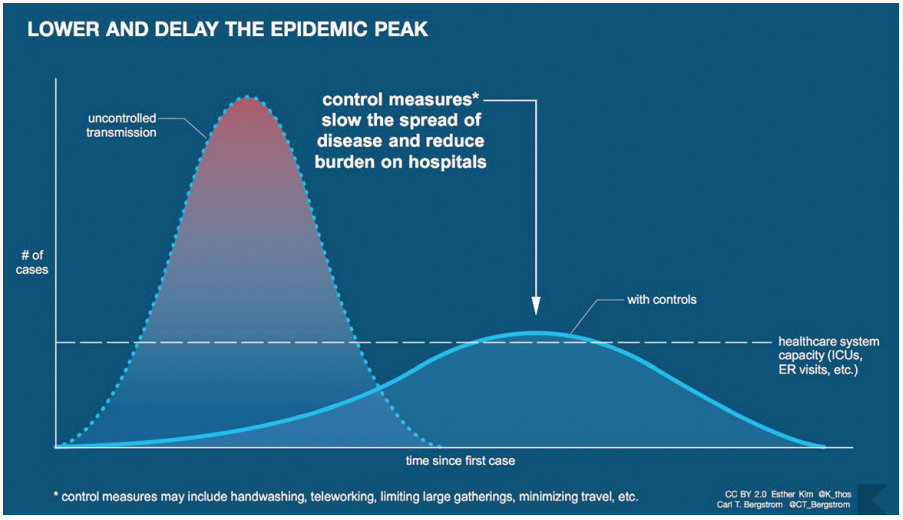

Figure 7.1. Infographic created in 2020 by Esther Kim and Carl T. Bergstrom: Flatten the Curve. Epidemic infographic created for the coronavirus disease 2019 epidemic, but generally applicable for any pandemic.

This visual led both politicians and media professionals around the world to circulate the call to "flatten the curve," referring to the change in shape of the parabola that represented the number of cases of COVID-19 with and without controls like social distancing in place. The hashtag #plankthecurve was used on social media by heads of state to try to encourage these safety measures. After a certain point, the visual itself no longer needed to be used to back up this call, and "flatten the curve" itself became the calling card for engaging in social distancing behavior to slow the pandemic.

This is just one example of the ways that visuals help us think and persuade differently and shows why they are a central method to helping us work with and think through data. Due to an ever-expanding variety of digital technologies for supporting the production of visuals, contemporary scholarly research tends to make greater and greater use of elements such as **photographs**, **graphs**, **tables**, and **data visualizations**. Photographs are realistic images captured with the aid of an instrument (camera) that translates light to a reproducible inscription. Graphs and tables are devices for visually rendering sets of numerical and textual data. And data visualizations is the term used to name other visual readouts or ways of presenting data through visuals, usually with the assistance of a computer.

What does it mean to slow down in the context of research for you? What areas of your work can afford to move slowly, and at what cost? How might you plan for slowing down parts of your research process?

Generally, as guiding principles, this chapter reinforces the following tenets:

1. **Slow down in the production and reproduction of visuals.*** Whether finding and selecting visuals made by others or producing your own, the choices we all have include common rhetorical considerations—such as audience and purpose—and design

Try This Together: Visuals that Persuade (30 minutes)

With a partner, come up with a list of five visuals that have been used in recent memory to persuade a public audience to take action. Together, answer the following questions:

- What are the major visual components used (photographs, graphs, tables)?
- What are the major textual components used?
- Where did the visual circulate?
- Why do you think the image circulated as it did?

considerations—such as size, placement, orientation, technical detail, and legibility. Photographers, illustrators, and graphic designers assume careful, reflective stances toward their production processes, and so, too, should you.

2. **Subject visuals to peer review processes much the same as you would with written prose.** The careful, reflective stance noted above often begins by creating a series of drafts and a set of possibilities. A photographer will take several more photos than they will use, then screen the photos, sometimes in consultation with a client, to select photos that depict most effectively the photo's subject. You can achieve the same effect by using a peer review of visuals to measure their effect for an audience.
3. **Develop visuals with attention to accessibility by providing descriptive text and nuanced captions.** Every figure, photograph, illustration, map, table, and graph must include a handle (e.g., Figure 1 or Table 1), a caption (a brief explanation of the visual), and, if you are working in an online environment, descriptive text (a lengthier, more detailed explanation of the visual) that will assure accessibility for assistive readers. We've developed this tenet with greater elaboration further along in this chapter, but we have included it here because it is essential to working with visuals.
4. **Think about the relationship between the visual image and the text.** When working with visuals, writers must decide whether the image is leading the text or the text is leading the image. This question is also known as the imagetext problem for its inquisitive premise: which leads, which follows? If the image is in the lead, its position is likely to be more prominent, perhaps opening the section or appearing at the beginning. If, on the other hand, the image follows, or merely reinforces the text, its position in the document corresponds. It's also possible for image and text to share significance and to work in tandem, each balancing or somehow lending deepened significance to the other. The point here is that when working with visuals, you need to think about the question of a relationship between image and text. Style systems, such as MLA, may require a sequence where the image only appears after it has been men-

tioned in the text. But we regard this as a judgment call that ought to be made in each situation. When image and text are used together, their arrangement and proximity are important to readers engaging with and ultimately understanding how they fit together.

5. **Consult design experts when possible or seek resources on specifications for the best possible display of visuals for print and for screens.** Many experienced artists, designers, and photographers have taken the time to share their wisdom online, preparing and circulating articles and modules on adjusting image size and resolution, positioning the subjects in images for desired effects, working with appropriate file types, and more. We mention this because, when beginning research, many decisions involving visuals you will make have already been made by others, and they can help you. We encourage you to search online for how-to guides, video tutorials, and workarounds for whatever you might encounter.
6. **Give images the same credit-giving citations that apply to textual sources.** When working with images, regard them as the property of the person who created them. Give credit where it is due (see Chapter 2 on ethics), usually in the caption or by-line, but if not, then in a works cited or references entry. Every image you re-use in your own work, whether you found it online or in printed form, must be accompanied by an attribution. While it's true that such attributions require time and attention to detail, they perform an important ethical function, honoring the source of the image and showing regard for the originator.

This chapter introduces working with visuals primarily through the use of photographs, reserving some discussion of graphs, tables, and data visualizations for the end, and concluding with guidance for developing an information graphic.

Photographs

With the rise of digital photography over the past two decades, high quality images have become a swift, everyday form of communication. Consider how,

from the start of the twentieth century until the rise of digital photography, film cameras required their users to very selectively take photos, carry the film to a development counter or send it to a processor, then wait a couple of days to see whether the photos yielded the desired results. Much scholarly contemplation of the medium of photography took place during the film-based era when development was slower and when photographs were costly and scarce. But contemporary digital photography now makes it possible to swiftly and relatively easily create photographs and incorporate those photographs into written research in mere minutes. This ease raises important questions about the ethics of photo manipulation (touch-ups), cropping, and a growing variety of image-based fakes, though practices of full disclosure head off these concerns for researchers who work with visuals.

Although much has changed for photography, many useful ways of thinking about photography have endured. For example, in his well-known book on photography, *Camera Lucida: Reflections on Photography,* Roland Barthes examined a series of photos that could be grouped generally into two sets: press photos and personal photos. Press photos were those circulating widely on the front pages of major newspapers. Personal photos circulated very differently in that they were oftentimes treated like family heirlooms, privately stored for safekeeping and only occasional viewing. Barthes' distinction between press photos and personal photos is still applicable today as a way to begin thinking about circulation. Many photographs hold value for the person who took them, but they don't bear out the same **rhetorical circulation**,* a phenomenon you might uncover in a visit to the archives. An important point to consider in this context is that just because you value a photograph personally doesn't necessarily mean it will be meaningful in a

Rhetorical circulation names the movement of discourse, taking into consideration materials, timing, and audience uptake. Such circulation is oftentimes mixed and uneven, occurring across digital and physical media, immediately and also with delay, and among intended and unintended audiences.

Try This: Personal and Press Photos (20 minutes)

From a social media platform where you have an account, choose one personal photo you have previously shared. Then choose one press photo used on the website of your city's main newspaper. Consider who has access to each of these photos and how they circulate. What do online spaces offer to our rethinking about the personal value of photos? What has the rise in digital handheld photography meant for re-defining the personal and the press photo?

research context. Writers (revising with input from audiences) establish that significance, usually with direct explanations.

As an analytical framework for describing photos and accounting for their meaning, Barthes introduced a useful vocabulary in his discussions of the terms **studium** and **punctum**. Studium is, generally, what many viewers of a photograph see. It may describe what the photo is generally about. The Big Picture blog from The Boston Globe (www3.bostonglobe.com/news/bigpicture) is an excellent resource for noticing studium. Consider, for example, a press photograph of a state fair. The studium, generally, would convey an impression of carnival games, regional agriculture, and festive crowds of people. Punctum, on the other hand, is a highly personal intensity, that which stings or captivates the viewer. Again, in the case of the state fair photograph, punctum is idiosyncratic. It could be the acute noticing of an especially pleasurable (or terrifying) ride, a memory of cotton candy, or a fixation on a mud puddle in the background that someone associates with a childhood visit to a local fairgrounds. In Barthes' influential work on photography, studium and punctum were terms he offered that were helpful for distinguishing between what is generally viewable (shared) in the experience of a photograph and what is only noticed in the visual field (mine alone). We have recalled these terms in part to remind you that terminology used to describe film photography can still be applicable to digital photographs.

Theoretical frameworks like the one Barthes introduced can be helpful as you begin thinking about how photographs connect with research projects. Among your first decisions about photographs will be whether you will be working with your own photographs or using photographs taken by others. Each scenario leads to a related set of questions and considerations:

Try This Together: Studium and Punctum (15 minutes)

Revisit the personal and press photos you chose in the prior activity. How do the concepts of studium and punctum operate in each one? As you talk through your photos with a partner, consider how your discussion helps you think about what is shared and what is singular in the experience of viewing photographs.

If You Are Taking Your Own Photographs*	If You Are Using Photos Taken By Others
• Consider technical features: lighting and positioning, orientation, size and file format, and number of photos. • Will the photos need to be resized for print or for display on a screen (or both)? Will they need to be cropped?	• In addition to considering technical features, make careful note about who took the photograph. • Where did the photograph come from? Is it part of a larger archive? Is it part of a series? Be sure to keep careful records about its context.

A photograph's orientation refers to its longest dimension. If vertical, the long dimension is up and down the page. If horizontal, the long dimension is side to side.

Try This: Working With Selfies (45 minutes)

In precisely what ways are emojis discursive? Discursive means language-like, so, in this sense, the question asks whether emojis are more like words and sentences (units of discourse) or more like images (non-discursive or extra-discursive units).

Choose three facial expression emojis. In only a word or short phrase, label the emotion you associate with the emoji. Next, take a series of selfies in which you try to match the expression of the emoji. Organize the emojis, their labels, and the corresponding photographs into a table. This work can be shared with a partner, a small group, or the entire class. After sharing, consider together some of the following questions:

- What is the relationship among emojis, language, and selfies?
- Are there expressive emotions inadequately conveyed in the current set of emojis?
- Scroll through your most recent text messages. How many emojis do you find in the last ten messages? How many photographs? How many words?
- If emojis are aptly communicative, should they be welcomed into academic discourse? Why or why not?

This final question has potential as a research project. For example, one could develop an interview or survey for students or teachers of writing that asks about attitudes toward emojis. Or, you could take a short piece of writing you've done and introduce emojis into it, then ask readers to describe their experiences reading it. Just by noticing a phenomenon and being curious about it, research questions (and potential projects) begin to take shape.

In certain cases, the subjects of the photos must give permission to be photographed, though this is not the case for what has emerged as a popular type of digital photography, the **selfie**. With a growing body of academic research about selfies and an ever-expanding trove of examples available online, it is increasingly clear that photographing oneself is a popular practice.

Cultural Implications of Photography

Research writers who take photos or who use photos must be fully aware of several ethical considerations. This is a significant part of most specialized training in photography, but it is easily overlooked by novices. We have addressed research ethics in more detail in Chapter 2. Here, however, we want to acknowledge that when taking photographs, researchers should always seek **permission**, as it would be a trespass against individual sovereignty to presume approval without asking. In addition to being careful when working with protected groups, as noted in Chapter 2, researchers should remember that cultural values relating to photography vary and must be honored at all times. When someone's worldview (cosmology) differs from your own, you must seek explicit consent before taking photographs of people, sacred sites, ceremonies, or rituals, including all variations of performance (dance, worship) and making (weaving, cooking). When signs are posted that no photography is allowed, these community standards must be respected and followed.

Six Specific Types of Photographs Researchers Use

Researchers may use several types of photographs for different reasons, and in this section, we'll expand briefly upon a few. We've associated the types of photographs we discuss and the reasons for using them with example photographs taken along the Lake Michigan shoreline at Ludington State Park in Ludington, Michigan, a place that lends itself to a range of research questions, the most central being, *What are the implications of rising Great Lakes water levels and a resultant disappearing coastline?*

Memory (Recall)

Photographs can help researchers remember details, collect visual samples, and build a record of the context for the samples they collect. For an everyday example, consider the research involved with finding an apartment. Sure, rental companies may provide generic photos online, but taking photos as you look at a series of three or four apartments can help you recall and distinguish their key features. Which one had the purple front door? Which one had an accessibility ramp still being built? These are not usually photos that will be featured in published research, but they nevertheless operate as a potent form of note-keeping. Such photos can also be paired with field notes to help create a more detailed picture of a field site. In addition to being useful for note keeping, photographs can be an aid to invention, helping us notice phenomena in the world that help us generate researchable questions.

For example, consider Figure 7.2, a photograph taken at the edge between the forest and the dunes in Ludington State Park along Michigan's western coastline. The photograph documents a well-trafficked transition point where the wooded overgrowth changes to an open, rolling vista of sandy grasslands. The photograph records this location as data, aiding the recall of a hiker who will want to find the trailhead again on the return hike.

Scene-Establishing (Locative)

As an extension of the field work and site-based observations introduced in Chapter 6, on-location photographs can reveal surrounding factors affecting a great variety of people and issues in the world. A simple photograph of a roadway, for example, can reveal to civil engineers key features of a site study for a prospective project. The same photo can spotlight for an environmental biologist the profile of plants and animals in the immediate vicinity of the road project. It can also pinpoint other seemingly mundane but highly relevant details about signage, sign placement, and visibility. **Scene-establishing photographs** help us list and record what is at a designated location. Paired with other instrument-oriented information, such as soil sample analyses or surface slope measurements, scene-establishing photographs can provide insights into a wide variety of problems, from road hazards to environmental impact.

Figure 7.2. Forest-dune transition at Ludington State Park, Michigan. As the woodlands change over to dunes alongside Lake Michigan, a steep, sandy embankment functions as a trail for hikers to travel. Recording a location like this with a photograph can aid memory. (Image credit: Derek Mueller)

In some fields, scene-establishing photography has taken to the sky and now includes satellite and drone imagery. From these wide scope vantage points, researchers can observe patterns affecting entire regions. Figure 7.3, for example, shows a view of the Lake Michigan coastline facing north from the Big Sable Point Lighthouse in Ludington State Park. The vantage point provides perspective on a changing landscape, as water levels in the Great Lakes have in recent years been rising, resulting in coastal erosion and pooling water inland, both of which impact everything from species habitats to recreation.

Figure 7.3. Lake Michigan's changing coastline. At what rates do the water, sand, and foliated ground shift, and which encroaches on the other over time? This view facing north from atop the Big Sable Point Lighthouse in Ludington State Park in Michigan sets in relationship landform variations where water and land meet. (Image credit: Derek Mueller)

Schematic/Technical

In research contexts, **schematic photos** provide plain views useful for assembling complex objects. Schematic photos may help explain the relative sizes of one piece

of equipment and another device, or they may, with labeling, provide a guide for quickly reconnecting something like a portable sound system, a desktop telephone, or a computer. Schematic photos are especially common as aids to technical illustration and user documentation for technical and professional writers.

The schematic/technical photo featured in Figure 7.4 (on the next page) includes in it crucial details about a specific product made by Sealite, a marine equipment company, complete with model number and inspector decals. The image shows a highly technical device essential to waterway shipping safety.

Artistic/Aesthetic

Artistic/aesthetic photographs can also be selected and incorporated into research publications to focus the audience on a particular association and to impart a lasting impression—whether by interestingness, color scheme, or subject.

An artistic or aesthetic use of photographs is usually chosen because they look appealing, because they attract attention to a project, or because they set a mood or elicit a particular feeling, association, or desire. **Artistic/aesthetic* photos** are commonly featured in the slide decks used to present research. For example, a presentation about research on the uptake of ideas, or how ideas catch on and spread, might use as a metaphor for such a process a photograph of a mature dandelion about to be carried off in the wind.

To decide on appropriate artistic/aesthetic photos, consider making a list of concepts or themes that resonate with the research you are doing. These can be metaphors, but you should be careful not to choose metaphors that are overly familiar. Doing so can create an impression that the ideas illuminated by this work rely on tired or long-established commonplaces rather than introducing new and distinctive ways of knowing. The list of concepts or themes you generate provides you with keywords to search for photographs online. Notice how the meaning of Figure 7.5 would change if the image were paired with a tired pun ("Life's a beach") rather than a catchy and inviting tourism catchphrase in a public relations campaign context ("Wander specific") or a more stark and ominous forecast in an environmental sustainability context ("Michigan's vanishing shoreline").

Try This: Working with Images and Metaphors (45 minutes)

Returning again to your own research question(s), take or locate a photograph that engages your study metaphorically. What metaphors connect your research to ideas you believe will be engaging to your audience? How clearly and compellingly do you think the photograph elicits these associations? Why?

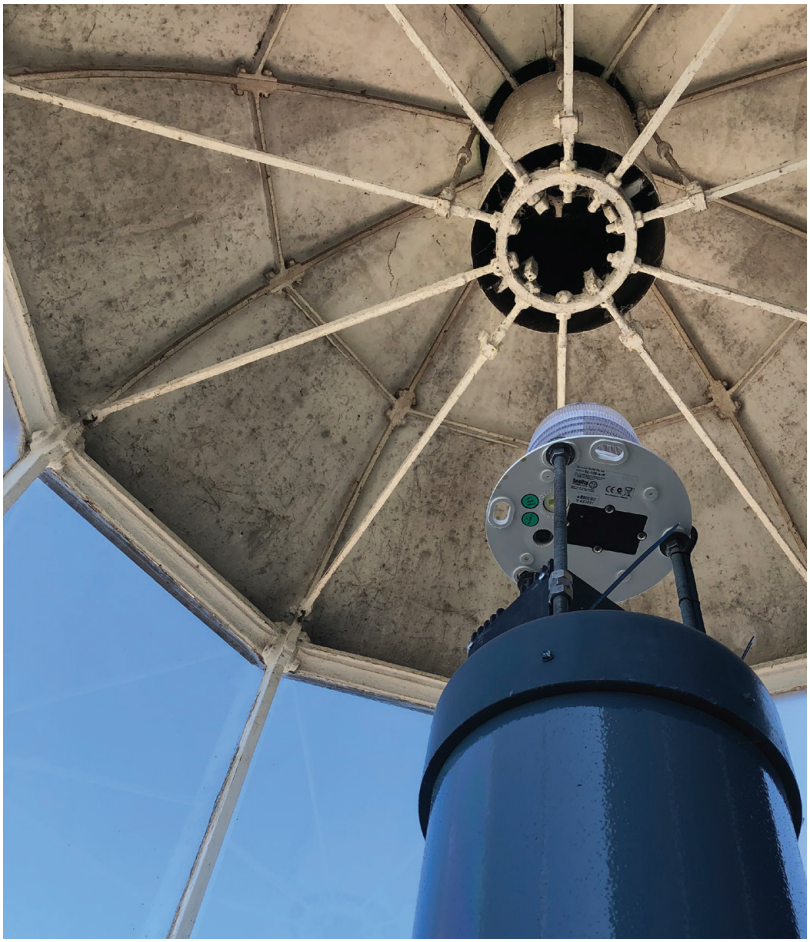

Figure 7.4. New LED lighting technology in use. Although the Big Sable Point Lighthouse located in Ludington State Park in Ludington, Michigan, was built in 1867 and has illuminated night skies at Michigan's western shoreline for more than a century, the sources of light are smaller today than they once were due to light emitting diodes, or LED lighting. Here, atop the lighthouse, the mismatch of new, smaller technology and older infrastructure is visible only up close; freighters navigating the coastline after dark experience the light's guiding twinkle much as they did before. (Image credit: Derek Mueller)

Figure 7.5. Big Sable Point Lighthouse, Ludington, Michigan. The lighthouse is framed in this case as an attention-getting device, and an aesthetic photograph like this one could be used to express everything from serene themes—such as summertime recreation, beaches, and hiking—to more serious themes—such as historical restoration, the disappearing coastline due to climate change, and the environmental impact of tourism. (Image credit: Derek Mueller)

Interaction

Interaction photographs seek to capture moments or events where **interaction** is visible and observable. We welcome you to consider a great range of possible interactions that are relevant for a research project. For example, an interaction photograph could feature two trees, thereby calling into question how they interact, share resources, and connect underground where their root systems and fungal networks make contact. Another example of an interaction photograph could be a picture of a pair of barn swallows, a species of birds noted for their distinctive relationship patterns and habitats. Perhaps most obviously, interaction photographs can also feature humans. In the social sci-

ences, especially, photographic evidence of human interactions sets in sharp relief the intricacies of physical and material surroundings, expressions, and embodiment. Consider Barbara Rogoff's study of children and how they learn by observing and interacting with older children and adults. In the book she wrote about this study, *Apprenticeship in Thinking: Cognitive Development in Social Context,* she included many interaction photographs. This is but one example of many where photographs spotlight interactions and thereby lend insights into the social nature of learning.

Continuing the inquiry into the photographic data available for understanding changes at Ludington State Park, Figure 7.6 spotlights symbiotic interactions at the water's edge and in the precarious zone between the lake itself and the forest.

Figure 7.6. A Monarch butterfly interacting with milkweed plants. Acres of protected greenspace along Lake Michigan's shore in Ludington State Park in Ludington, Michigan, provide habitat that sustains essential interactions between Monarch butterflies and milkweed plants. Milkweed contains a poisonous, milky substance that the Monarch can digest, though this makes the Monarch poisonous to its predators, thereby protecting it from predation. (Image credit: Derek Mueller)

Time Series

Photographs have also been used in conducting and presenting research to indicate a **time series**, or changes in a variety of subjects over time. Perhaps the best-known example of this comes from advertising, where before and after photographs of human subjects attest to the validity of some product, usually a diet plan or anti-aging cream. Aside from these commonplace examples, however, researchers have used photographs to study change at intervals. For example, as Marta Braun detailed in her book, *Picturing Time,* French physiologist Étienne-Jules Marey used time series photography to study the phase by phase movements of several subjects, such as a pelican and a human runner. His inquiry into physiological time series also led to early instrumentation now used for measuring heart rate, a development that created a foundation for modern Western medicine. Time series photographs can also illustrate environmental change, showing, for instance, how farms fluctuate over time, how forests manage their shared resources (with and without human involvement), or how rivers change course due to flooding, drought, and irrigation. Photographic evidence can powerfully augment written accounts of a particular question or phenomenon. In the case of Figure 7.7, the photograph is not yet paired with a before or after shot, but as a form of data, it lends time and location-specific evidence of trail flooding in late June at Ludington State Park. How long does this inland flooding last? How many of the last five or ten years has the trail been flooded during the tourism season? A time series photograph would establish data connecting the location to different moments in time, thereby helping us inquire into patterns of interest to park rangers, legislators, tourists, taxpayers, environmental biologists, and more.

Positioning, Captioning, and Organizing Images

As a general design principle, unless otherwise designated by a formal style system, such as MLA or APA, or by a set of explicit instructions, you should position images adjacent to the text that makes reference to them. Every figure or image, inclusive of photographs, should be accompanied by a **figure reference**, also known as a handle, and a caption, as we have done throughout this chapter. An example is provided in Figure 7.8. The figure reference, or handle, is a necessary

short-form reference that makes it possible to refer to the image from the text. Images lacking a figure reference, or handle, lack an address and therefore can lapse into a faint, inexact relationship with what's written about them.

Figure 7.7. An underwater trail marker. According to park rangers, inland pooling has in recent years become more frequent, creating challenges for maintaining safe and sure hiking trails between the lighthouse and the campground. (Image credit: Derek Mueller)

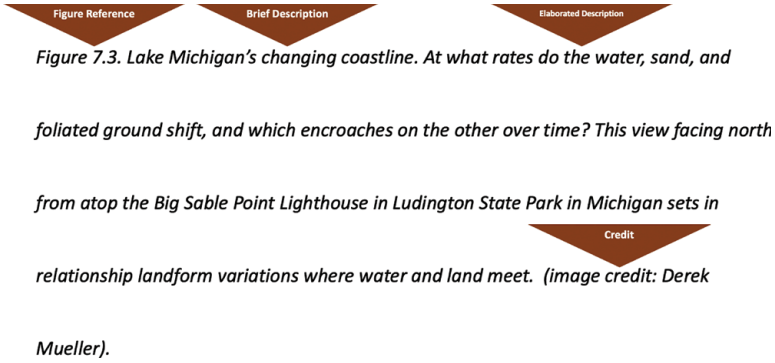

Figure 7.8. Key parts of a caption.

When incorporating more than one image, include sufficient space so that the images and their captions are grouped visually. It should be clear which caption belongs to which image. For reasons of contrast and comparison, it is common for photographs to appear in pairs, especially time series photographs. When presented this way, photographs can prove generative for their striking differences. **Juxtaposition** names the relationship between two photographs intentionally selected for their strongly pronounced differences. The pairing can point sharply to a key concept or theme, commanding attention and setting a lasting impression.

When developing **captions** for photographs you have taken or images you have composed, remember they are authored elements that require careful writing, revision, and proofreading and that they require particular elements that become an essential part of preparing a document that is maximally

Try This: What are Other Uses for Photos? (30 minutes)

Research contexts vary greatly, and we recognize there are uses for photography in research beyond the six types we have sketched here. This observation lends itself to a researchable question: How do researchers use photography or photography-related instrumentation (e.g., video, satellite imagery) in an area of study that interests you? How could you learn more about the possibilities or limitations of photography in your area of research interest? Having followed these lines of inquiry, even provisionally, are there any types of photographs you think should be added to the six types we have introduced?

accessible. We've already mentioned that every figure should begin with a figure reference, or handle, such as Figure 1, which is one of these elements needed for accessibility. After the handle, the caption should include a brief description. The language from this description is also appropriate for the image's alternative text when developing online materials, websites, and so on. After the brief description, an additional sentence or two can detail what appears in the image and address the image's purpose. Think of this as an elaborated description and rationale. Finally, depending on the style manual you are following, you might need to include an image credit. With these four elements (**figure reference**, **brief description**, **elaborated description and rationale**, **credit**)* captions will reflect the ethical regard of a researching writer who has honored every reasonable standard for this essential element. All of the captions up to this point include each of these essential elements.

Many contemporary photos online in various places (social media, blogs, some news sites) fail to include all four of these elements in their captions. What do these absences tell you about the ethos of the photographer?

Although we have focused primarily on the use of photographs and their relationship to words in a text, we invite you to consider other multimodal elements that might enhance your composition, such as graphs and tables. Although figures and tables require different in-text citation, similar recommendations for considering the image-text, graph-text, or table-text relationship apply. A final consideration when working with figures, graphs, and tables is organization and **file naming**. Usually original image files are stored separately, outside of the document where you are writing. With this in mind, we recommend creating an online folder for the entire research project where you can store figures and tables in their original format. Research writing with images or tables usually doesn't become too snarled with complexity when there are only one or two visual elements. But because projects like these can

Try This: Understanding Juxtaposition and Captioning (30 minutes)

Using an online image search database, locate two images you find intriguing, compelling, or otherwise generative for reasons you can explain that also reflect a quality of juxtaposition, the condition of inventive spark due to contrastive pairing. Write captions for both images. Then develop a paragraph using appropriate figure references, or handles, to account for how you understand the juxtaposition to be working. What effects, specifically, does this pair of images elicit? Include the vocabulary of "studium" and "punctum" if you find it helpful for discussing the photographs and their significance.

expand to upwards of dozens of images, we recommend exercising care with file naming to stay organized. We encourage you to include basic, consistent information in your file naming as follows: 1) chapter, section, or page number where the visual appears, if applicable; 2) figure or table reference with number; 3) an abbreviated descriptive name; and 4) if you are collaborating with others or working in multiple sections or chapters, some way of identifying yourself with the file.

For example, the file name for the second figure in this chapter would best be presented in the order of chapter, figure reference with number, description, and contributor last name, or 7-fig2-memory-mueller.jpg. If the original file was saved in a special format, it would also be advisable to retain that file as a base version, such as 7-fig2-original.psd. The base version should be off limits to modifications. To make a change, create a copy of the file and adjust the new version. The integrity of the original file can prove vital at later stages of a project's development, such as when publishing.

Working with More Visuals

Graphs and Tables

Just as with photography, graphs and tables are prone to being underexamined, hastily applied elements even though they are highly specialized elements justifiably associated with quantitative research, statistics, and data analytics. Quantitative research usually undertakes knowledge-making from the standpoint of numbers-driven ways of understanding the world. Quantitative researchers, in other words, use counts of things (measurements, tallies, counts of responses) to express knowledge about phenomena in the world. Therefore, graphs and tables, as common expressions related to quantitative research, also play an important part in qualitative research. Our point in mentioning this is to acknowledge that all researching writers may have cause to introduce graphs or tables for displaying information useful to a research project. You do not need specialized training in statistics or data analytics to incorporate graphs and tables into your research; although, with that said, an introductory

course in statistics can help researchers in all fields understand more comprehensively a wide variety of ways of knowing along a complementary, continuous spectrum. It is important to note that though they may portray similar kinds of data, graphs and tables are often handled differently in style manuals. For example, in MLA style, tables are numbered and include a title above the table, while figures, including graphs, are numbered and include a caption below the figure.

Graphs and tables have in common a basic orientation to numerical and arrayed (or list-like) data. Tables, such as the one shown in Table 7.1, show data sets as labeled rows and columns convenient for specific look-ups. Note also how the title precedes the table, while graph titles are located below, as with other figures. Graphs, such as the one in Figure 7.9, organize such data into models that lend themselves to discerning comparisons using basic lines and shapes positioned on a grid. Graphs typically rely upon a strict system of reference (the grid) so they can present with accuracy and consistency positions of values (i.e., addresses) and proportions of geometrical shapes or lines indicative of value. It is quite common for tabular, or table-based, data to also be presented as a graph. Why? The varied forms alter perspective and can thereby heighten attention to meaningful, significant dimensions of the data. Whichever form the data takes, graphs and tables are different possible expressions of data designed with an interest in effective communication. Researching writers who rely upon graphs or tables oftentimes pair these graphical elements with textual accounts in the form of captions and textual passages. This premise is vitally important for researching writers who work with visuals: the image (photograph, graph, table) and text (caption, surrounding discussion)—when developed effectively—are complementary and interdependent. Each needs the other to compel understanding, assent, and action in response to the research.

Extending from the example of the campus tree inventory in Chapter 6, Table 7.1 presents a series of three annual tree censuses from one Midwestern public university. The table shows accurate quantities in rows and columns that aid quick reference. It also raises questions it does not answer. For example, although the adjusted figures (in parentheses) show a net gain, the table does not include details about how many trees were planted or removed.

Table 7.1 Campus Tree Census Table

	2019 Census	2020 Census (Adjusted)	2021 Census (Adjusted)
Deciduous	1479	1790 (+311)	1831 (+41)
Coniferous	3621	4096 (+475)	4211 (+115)
Total survey	**5100**	**5886 (+786)**	**6042 (+156)**

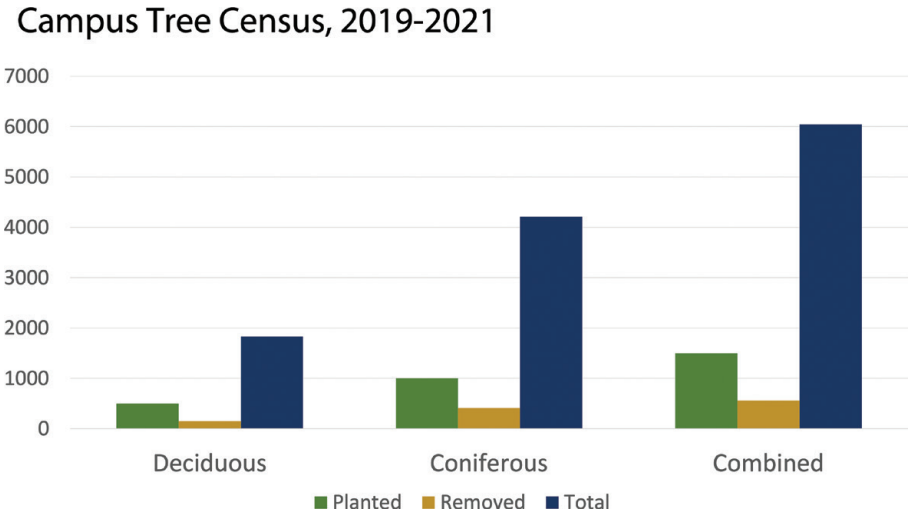

Figure 7.9. A sample bar graph.

It can feel like twice the work to have both image and text operating in tandem, but these echoes and iterations supply readers with depth and dimension that form the basis of research writing.

Tables and graphs often work in tandem with one form, the table, providing granular and specific information, and with the other form, the graph, presenting a visual argument based on a synthesis of the data that may also indicate evidence for trends, clusters, or other patterns. In this case, the tree census data from the table in Table 7.1 is aggregated, or combined, across all three years. The added variable (trees removed) allows viewers to compare how many trees were planted, how many were removed, and where the overall

census stands in 2021. A graph like this might be useful for a presentation to a decision maker about the goals for the next three years.

When you choose to work with graphs and tables alongside textual accounts, we recommend seeking a balance between the explanatory power of each. In certain situations, it may be best to adopt with purpose an imbalance, whereby the textual account leads into the graph or table, or, perhaps the opposite is better, whereby the graph or table leads into the textual account.* Whichever the arrangement, you should notice this as a deliberate design, because you, as a researching writer, have command over the sequence.

Data Visualizations

Data visualizations is a term used for a large set of graphical forms for displaying data, usually (but not always) with the assistance of computers. Technically, the graphs and tables featured in the previous section are long-established and relatively stable types of data visualizations. Tables visualize data, relying on labeled rows and columns to aid the lookup and cross-referencing of multivariable datasets. Graphs also present data visually, translating numbers into shapes, plots, trend lines, and more. As online tools bloom for presenting data visually, researching writers are presented with a vast number of possibilities for using programs, platforms, and applications to elicit patterns. We urge care and caution when adopting data visualization processes. They can add value, but they can also downplay key details or bury the processes by which they are made. When using a computational process to visualize data, it is the responsibility of

Try This: Graphs and Tables (45 minutes)

Locate a contemporary image of data that has been graphed in your local newspaper. Spend 20 minutes reconstructing that data into a table, giving it an appropriate figure reference and caption. In a paragraph, reflect on what, if any, differences you perceive by changing the data's presentation in this way. Is such a change possible when you aren't working with data from your own, original research? Is the data more or less compelling after the change? Do you think the media outlet responsible for the publication considered multiple ways of presenting the data before it decided to publish the version you've worked with?

the researching writer to learn about how the visual is made and to disclose that process before celebrating what can be a spectacular readout.

Think of the growth of data visualization tools today as motivated by the same questions that inspire tables and graphs. What patterns are brought to light by a particular treatment? Why and for whom are these patterns meaningful? In effect, data visualizations should bridge data and the stories you, the researching writer, consider to be at the heart of insights into your research questions. Data visualizations can help writers tell their stories, either deepening patterns or revealing anomalies (breaks from patterns) and their significance. Let us illustrate through three examples ways data visualizations have influenced how we think about specific research questions.

Figure 7.10 is the work of three researchers who collected and coded 154 timely warning crime bulletins circulated at one university over eight years. As required by the Clery Act, also known as the Jeanne Clery Act, all United States

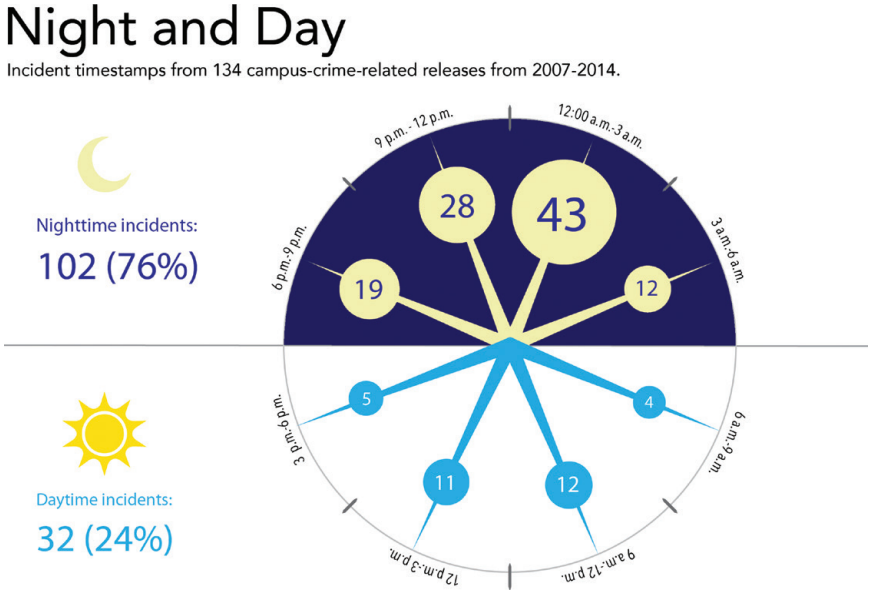

Figure 7.10. Night and Day. A radial diagram displays eight three-hour blocks of time using differently sized circles at the tip of each to indicate the number of crime-reported instances corresponding to each marked off timespan.

colleges and universities must promptly disclose criminal activity in official channels of communication. The research team coded the collection of documents (see Chapter 4 for more on discourse analysis), noting the days and times of the incidents as compared to the days and times of the reports sent out by the university, and as they worked, questions about timing and its effects began to emerge. A vast majority of crime incidents occurred between 9 p.m. and 3 a.m., but the news of these events was distributed during daytime working hours when the university's public relations office opened, resulting in something like an echo effect, whereby the events themselves and the news of the events played around the clock. The research team also coded for the ways the alleged assailants were described in the timely warnings. Here, too, patterns emerged. The patterns were compelling, indicating that 72 percent of the timely warnings attributed criminal activity to a vaguely described assailant whose description was nevertheless associated with race, as shown in Figure 7.11. The full study, these findings, and the discussion of consequences related to these patterns are available online in *Present Tense: A Journal of Rhetoric in Society* (see Pantelides, Mueller, and Green, "Eight Years a 'Wooden Opponent'").

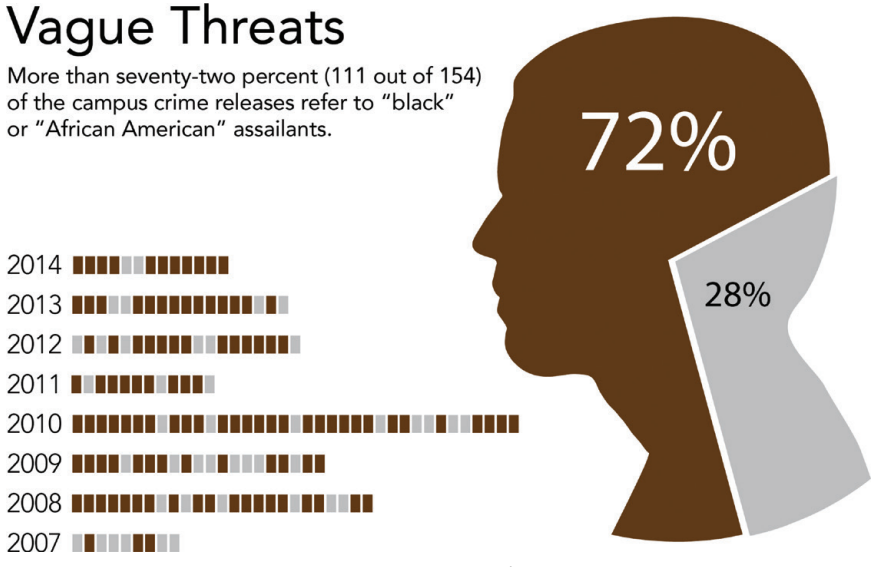

Figure 7.11. Vague Threats.

The data visualization shown in Figure 7.11 reflects prominent sources of data. The first, on the left, introduces a year-by-year count of timely warnings that make reference to an assailant identifiable on the basis of race. The second, on the right, aggregates the year-by-year data, applying it to a human profile color-coded and divided to indicate the disproportionately high rate of timely warnings naming black or African American assailants.

Because Figures 7.10 and 7.11 appeared in a published article, the data visualizations evolved slowly with input from reviewers and editors. Through several drafts and revisions, the versions you see here were made. These visualizations spotlight relationships among quantitative data, emergent patterns, and design choices. In each case, the visualization amplifies data-backed assertions that inform the key conclusions advanced in the full article.

Data visualizations aid researching writers and their readers focus on the most salient, striking insights arising from careful work with data.

The next example of a **data visualization**,* Figure 7.12, is a census pictograph tied to an inventory of trees on campus. Much like Table 7.1 and Figure 7.9, creating this data visualization helped us develop our research questions. Working with an online report online, students translated the data into a pictograph using two tree type icons in different colors to show the proportion of deciduous trees, coniferous trees, diseased trees, and newly planted trees on campus grounds. Developing a data visualization like this might seem too obvious or boring; however,

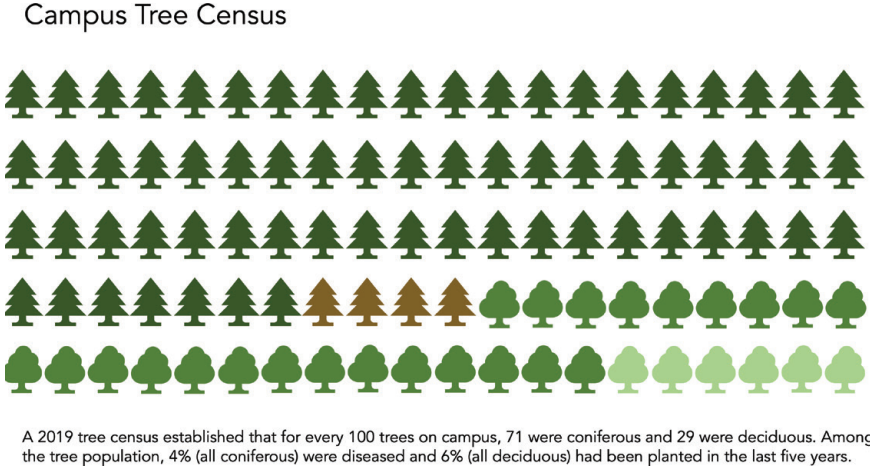

Figure 7.12. Campus tree census.

working with visuals this way adds a striking visual impression to quantitative data. In Figure 7.12, two types of tree icons are color-coded to reflect the percentage of deciduous and coniferous trees on campus, as well as the proportion of diseased trees and newly planted trees corresponding to each major type.

Census pictographs such as Figure 7.12 blend conventional graphing formats, such as bar graphs or pie charts, with **icons** to create a layered visual readout at the juncture between the abstract and the concrete. They communicate neither purely numbers nor purely objects. Instead, in the blended format, quantitative data is brought nearer to the world in which it matters tangibly or in which it applies. This connection between the abstract and the concrete can help us notice important patterns, put a fine point on the implications of research findings, and generate new research questions. Census pictographs can be applied extensively, but they are especially impactful in the context of surveys (see Chapter 5), such as when collecting results from a social media survey, a poll of your classmates, or set of questions you develop that are IRB-approved and that you circulate.

Because time management and accountability for time is a great challenge upon your arrival at college or university, our third and concluding form of data visualization relates to **time use diaries**. An example of this sort of visualization is show in Figure 7.13.

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8:00 - 8:30 AM		BREAKFAST		BREAKFAST		BREAKFAST	BREAKFAST
8:30 - 9:00 AM		BIOL 130		BIOL 130	FR 151 TUTORIAL	FITNESS	FITNESS
9:00 - 9:30 AM	BREAKFAST		BREAKFAST		BREAKFAST		
9:30 - 10:00 AM							
10:00 - 10:30 AM		READ/STUDY FR 151		READ/STUDY FR 151		READ/STUDY BIOL 130	READ/STUDY CHEM 120
10:30 - 11:00 AM	CHEM 120		CHEM 120		CHEM 120		
11:00 - 11:30 AM		LUNCH		LUNCH		LUNCH	LUNCH
11:30 - 12:00 PM	FR 151	HLTH 101	FR 151	HLTH 101	BIOL 130 TUTORIAL		
12:00 - 12:30 PM						READ/STUDY HLTH 101	READ/STUDY FR 151
12:30 - 1:00 PM	PHYS 111		PHYS 111	DAILY REVIEW	PHYS 111		
1:00 - 1:30 PM	LUNCH	HLTH 101 TUTORIAL	LUNCH	PHYS 111 ASSIGNMENT	LUNCH		
1:30 - 2:00 PM	DAILY REVIEW		DAILY REVIEW				
2:00 - 2:30 PM		DAILY REVIEW		CHEM 120 LAB	PHYS 111 TUTORIAL	READ/STUDY PHYS 111	PHYS 111 ASSIGNMENT
2:30 - 3:00 PM					DAILY REVIEW		
3:00 - 3:30 PM	READ/STUDY BIOL 130	READ/STUDY PHYS 111	READ/STUDY BIOL 130		READ/STUDY CHEM 120		
3:30 - 4:00 PM			READ/STUDY FR 151				
4:00 - 4:30 PM	PREP FOR BIOL 130 LAB						
4:30 - 5:00 PM					DINNER	DINNER	DINNER
5:00 - 5:30 PM	DINNER	DINNER	DINNER	DINNER			
5:30 - 6:00 PM					READ/STUDY HLTH 101	SOCIAL/FAMILY	READ/STUDY BIOL 130
6:00 - 6:30 PM	SCISOC MEETING	READ/STUDY CHEM 120	READ/STUDY CHEM 120	PHYS 111 ASSIGNMENT			
6:30 - 7:00 PM							PREP FOR TOMORROW
7:00 - 7:30 PM		BIOL 130 LAB		SOCCER INTRAMURALS	SOCIAL/FAMILY		
7:30 - 8:00 PM							PLAN FOR THE WEEK
8:00 - 8:30 PM	FITNESS		FITNESS				
8:30 - 9:00 PM							
9:00 - 9:30 PM							
9:30 - 10:00 PM							
10:00 - 10:30 PM	PREP FOR TOMORROW	PREP FOR TOMORROW	PREP FOR TOMORROW	PREP FOR TOMORROW			
10:30 - 11:00 PM							

Figure 7.13. Time use diary of a science major. Weekly time is divided and color-coded by class subject, meal times, study time, and personal time.

A time use diary enables a bird's-eye view of how a person spends time that does not depend on the same level of detail as found in a daily to-do list (which might include exactly which books you have to read as you study or which food items you ate for breakfast) or a yearly calendar (which might block out special days like holidays, birthdays, or anniversaries). Time use diaries show a snapshot of time and allow you to code and understand, from a middle view, where your time goes.

Try This: Developing a Pictograph (45 minutes)

Plan a draft of a census pictograph based on credible statistical data you locate online. The data could be related to any field or specialization you wish (possibilities include bee ecology and hive health rates, small business startup success rates, publication acceptance rates for journals in your area of study, and much, much more). Hand-draw the pictograph. What design choices, colors, and icons would best suit the data and why? Reflect in a paragraph why you made the choices you did and what might have to change or adapt when revising a hand-drawn image into a digital version.

Try This: Developing a Time Use Diary (60 minutes plus 1 week)

For this activity, begin with a simple spreadsheet or table for recording hours of the day and days of the week. Then, complete the following steps:

1. Develop a system for entering into each cell how you **plan** to spend the time. What labels will you choose, what colors, what symbols, and what will they mean?
2. Using a copy of the same grid, enter into each cell a note or symbol accounting for **how you actually spend time** as the week proceeds. Color-code the cell to indicate simply whether your planning matched with the actual activity.
3. Write vignettes about the system, noting particular hours that were or were not harmonious with your planning.

Over a week, you will have developed an insight into how well-aligned, or felicitous, are your plans and your activities throughout the week.

Looking Again at Working with Visuals

In this chapter, we have introduced a few of many possibilities for working with visuals. We have done so in a way that we hope underscores opportunities for research about and with visual rhetorics as well as for the creation of research documents that feature visual elements, such as photographs, graphs, tables, and data visualizations. As you work with visuals and explore those possibilities, we encourage you once more to return to the list of key principles established at the beginning of the chapter:

- Slow down with the production of visuals.
- Subject visuals to peer review processes much the same as applies to the development of written prose.
- Develop visuals with close attention to accessibility by providing descriptive text and detailed captions.
- Think about the relationship between the visual image and the text.
- Consult design experts when possible or seek resources on specifications for the best possible display of visuals for print and for screens.
- Apply the same level of credit-giving citation practices to images that apply to textual sources.

Focus on Delivery: The Photo Essay

A photo essay includes a series of photographs that are used to tell a particular story. These essays can be photo-heavy, using only figure references and brief captions to tell a story, or text-heavy, balancing images with paragraphs of explanations. Either way, a photo essay has a narrative arc, or storyline, that informs a reader of a particular message that they should interpret from the images used.

Using your research question developed throughout Chapter 1, create a photographic essay that brings your research question and some possible leads for inquiry into view. You and your instructor can choose to what degree you want this essay to balance image and text. Some options for blending your

research question and images for the photo essay follow:

- Pull a set number of images (with careful attribution) from online databases, and order them in a particular way that lends insight into your researchable question, giving you a few directions or leads to help you move it forward.
- Blend online images with those that you yourself take to reflect your research process or data you've begun collecting.
- Create a photo essay made completely of photographs you take that reflect one or more stages of your research.
- Compose a photo essay featuring photographs of all six types detailed in this chapter that have to do with your research question.

Select just one type of research photograph and then create or find six photographs of that type that shed light on your research topic.

Works Cited

Barthes, Roland. *Camera Lucida: Reflections on Photography.* Translated by Richard Howard, Hill and Wang, 1981.

Braun, Marta. *Picturing Time: The Work of Étienne-Jules Marey (18230-1904).* University of Chicago Press, 1995.

"The Jeanne Clery Act." *Clery Center,* clerycenter.org/policy/the-clery-act/.

Pantelides, Kate, Derek N. Mueller, and Gabriel Green. "Eight Years a 'Wooden Opponent': Genre Change (and its Lack) in Campus Timely Warnings." *Present Tense: A Journal of Rhetoric in Society, vol. 5, no. 1, 2016,* www.presenttensejournal.org/volume-5/eight-years-a-wooden-opponent-genre-change-and-its-lack-in-campus-timely-warnings/.

Rogoff, Barbara. *Apprenticeship in Thinking: Cognitive Development in Social Context.* Oxford UP, 1991.