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JOY

of

SEARCH

A Google Insider's Guide to Going Beyond the Basics

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The Joy of Search

A Google Insider's Guide to Going Beyond the Basics

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Contents

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tune. My goal is to help people understand the larger issues at play here: what it means to be a literate person now, and how to continuously learn to be literate as changes happen in the future.

Research is a skill that we all take for granted—we all use Google, and so we assume we're good at it. Yet online research is a critical skill for our future. As the nature of work and education changes (and that, really, is the only constant we have), we need to bring our students (and ourselves) up to speed on what it takes to be good searchers. As teachers, parents, and citizens, we need to give them the skills of the fourth R—**research**—and all the skills and knowledge they need to function effectively as learned searchers.

What's more, we're trying to equip them with skills they can use not just now but also for every information search problem that we confront now and in the future.

So what kinds of things do you need to know?

To start with, there's so much information available online that you might be forgiven for thinking it's all online somewhere. And it is truly amazing what *is* available with a quick Google search. We live in a time of fantastic information richness and depth. But it wasn't always like this. And what's more, you need to know where the limits are, and how to detect when you've hit them.

One of the great discoveries of my young life was when I learned that there are books with answers in them that could satisfy my curiosity and let me do research almost instantaneously. Since I was a curious child, I found that by just picking up a volume of an encyclopedia.[3] I could read about many wonderful things—Eritrea, Eisenhower, eggs (development of), Earth (planet), ecru (the color) … on and on. All these riches—and just in the volume of the letter "E." What mysteries lay in "F" or "G"? Why was there a volume "X, Y, and Z," and not "M, N, and O"?

That was then, this is now, and it's difficult to find any reference content that's organized alphabetically. Why would you, when it's so much faster to do a search for what you seek? Today we have vast resources online, indexed by search engines, or sometimes organized into websites and databases—all there for the questing mind to use.

All that information is out there, so it's frustrating to see books and articles that assert some piece of information is true, but don't tell you the source or how they know it's true.

I find it deeply frustrating to be told something about the world and then have it be unsubstantiated. I've always wanted to know how I could figure this out on my own.

This is especially true for books of trivia and fascinating content. You know what I mean—those books and websites that collect the biggest, longest, heaviest, or most unbelievable facts about the world. They're great, but I want to shout at them, HOW do you know that? WHERE did you find that morsel of information? (Or did you just make it up?) Even fact-checking websites and collections of interesting facts don't tell you the story behind the information. If you're lucky, they'll point to something else. But it's rare that they actually tell you how to figure it out for yourself. And that's only if you're lucky.

There are also a good number of books that tell you how to use online information resources. But there's a gap in those texts: they tell you the various things you can do, but not how to hook them all together to go from an initial question to a satisfying answer. This book, however, is about HOW to answer those questions yourself. It is about HOW to frame your questions and use the various online research tools that let you get the answers yourself, from the beginning of your curious question, to finding results via many different online resources.

And that's the point of this book: you too can ask, and answer, your curious questions.

Here I'll show you how to find things out by showing you the steps (and occasional missteps) that I've gone through while doing my own research. Each chapter is a story—one that documents how I've found the answers to questions I've had (or have been asked). Along the way, I'll tell you exactly *how* I did each search step, and *why*.

My work for the past thirteen years as a research scientist at Google has been to study how people use various kinds of online information sources to answer questions that they have. And it's been puzzling. The online world has an immense set of resources at hand, and yet I see that most people don't really understand how to use it effectively. It's as though we've all been given a Steinway, but we only know "Chopsticks." Or you just got a Formula 1 racing car, but nobody ever showed you how to take it out of first gear. We have these amazing tools that we just don't know how to use well.

For most simple queries—those in first gear—search engines (such as Google) work extremely well. Search engines' ability to quickly provide

answers to these queries is a remarkable testament to their power and scope as well as the advances in information engineering during the past few decades. But there's so much more these engines can do.

Clearly, search engines are different from traditional information sources; they're not at all like the encyclopedias of my youth. Need to know the population of Japan? The number of elementary schools in the United States? The signers of the Declaration of Independence and where they lived at the time? How about the distance from the Earth to the Sun? Ask, and you'll get the answer in the twinkle of an eye. With the rise of easily accessible online searches, anyone can answer these questions quickly, accurately, and at any time of day from their laptop, desktop, or phone. What's more, unlike the encyclopedias of yore, these information sources are up to date.

And yet if you know just a little more about searching, if you realize the depth of information processing available to you, if you learn a touch of sleuthing and take advantage of your new ability to shift ordinary memory tasks to the machine, search engines can become more of an intelligence amplifier for you than just a simple collection of data. That power is not only truly *fun* to have, but also gives you the ability to understand how things work and see more deeply in the world.

Through online search tools, the world is your information oyster, at your disposal twenty-four hours a day, seven days a week. Those who are fluent in search and retrieval not only save time but also are far more likely to find higher-quality, more credible, more useful content. They can ask questions that were impossible just a few years ago. They can think faster and find solutions more easily. They can quickly get to the bottom of that wild news story they read and the top of their career ladders too. Whether they're students, professionals, or stay-at-home parents, those who are good at doing online research have a real advantage over those who aren't.

Even though "research" is often thought to be what professional scientists do, the truth is that it's something we all do every day. My mission—the mission of this book—is to help you become better at it, go beyond the basic skill of typing something into Google and learn how to ask a search engine a good question, and understand what it means to be a literate person today and in the future. My goal is to show you the marvelous depth of knowledge at your fingertips, and my hope is to share with you the great joy of finding out.

I'll also talk about the attitudes and research styles that will make you more productive and accurate. For instance, a common misconception is that you can search and learn about anything, starting with nothing. The reality is that many research quests are foiled by not knowing enough about *how* to search. There's a bit of a skill here that we'll talk about. I'll talk about how to start learning something in an area about which you know almost nothing. Unsurprisingly, to learn something, you have to begin with something. But how do you do that when your knowledge is at zero? *Chance favors the prepared mind.* Why is that true? And how can you prepare your mind?

There are skills and attitudes to learn from this book. My goal is to teach both: the skills to let you be an effective researcher, and a person with research-y attitudes. Both are important.

Mostly, I HOPE to make you curious about the world and help you learn some of the skills it takes to successfully do online searches to get to good, high-quality, believable answers.

How to Read This Book

This book is composed of sixteen stories about how I answered some questions that came up for me during the course of my life. These chapters walk you through my stories of discovery, laying out the journey I went through to find out the answers to some particularly interesting questions. Along the way, I'll show you just how I solved them, and how you can do the same kind of thing.

The first half (chapters 2–9) are primarily about tactics—that is, the individual steps you need to know to work with online resources. In these chapters, I'll use a variety of different resources along with some of the tips and tricks that make searching these easier.

In the second half (chapter 10–18), I'll talk more about the strategies I used to guide my search process. When should you keep searching? When should you stop? How do you decide when a particular research path is leading you to a dry hole?

In each chapter, I'll start our investigations with a **research question**, using this as a way to be careful about what we're searching for. You'll see each research question separated out in the text. For example, "Where was this photograph taken?" Or the research question might be some curiosity

about some observation in the world—such as "Why do lakes sometimes explode?"—that seems utterly bizarre, and when you follow your curiosity, you'll find out where, why, or how this thing can be answered.

Even though it's a simple thing, just writing down the question has the side benefit of helping to *frame* what you're about to do. I know, it sounds too simple to actually work, but it's true. If you take ten seconds to write down your question BEFORE you start your research process, you'll find your process will be much, much more effective. It's almost magical; you have to figure out (a) what you're really asking, (b) what terms you'll be searching for, and (c) what kind of answer will satisfy you.

That's what I do in each chapter: I write down the questions, and then walk through the steps I took to find the answer. Instead of just *telling* you the answer, I'm trying to make it clear exactly how I went from *really interesting question* to an answer that I believe.

As you read these stories, I'll point out how I use each of the tools and information resources along the way. Every so often you'll see some text in square brackets like this: [exploding lakes in Africa]. That's a query. The text in the brackets is what I searched for in order to answer a particular question. But note that you shouldn't include the brackets in your search; they're just there to show you where the actual query starts and ends. Every chapter has the online searches I used along the way.

At the end of each chapter is a set of research lessons that summarize the things you should have picked up during the story. These are the insights that you can use in answering your own questions.

I've also added a bunch of "How to Do It" notes at the end of each chapter. When you see bolded text that has a superscript letter—such as this example of how to make a good query for **searching**[A]—you'll find a short note at the end of the chapter telling you how to do this particular step of the research process. (And of course, if that's not enough information for you, you could always do another search to get even more details!)

As you read you'll also see URLs that look like this: bit.LY/TJOS-1-1. These are links to online web pages that are easier to type than a full URL, which are often long and full of strange characters that nobody can transcribe correctly. But the **bit.LY** links are short and easy to type. This is a nice solution to the perennial problem of "How do you put links to online resources in a print document?" Note that these links are case sensitive. TJOS-1–1 is not the same as tjos-1–1! Be sure to use all capital letters.

2   Finding a Mysterious Location Somewhere in the World: How to Use Multiple Information Sources to Zero In on a Resource

Where in the world is this? How can you figure it out? A few tips to get started on doing really surprising searches.

If you work at Google, you end up attracting all kinds of questions. Some are just requests for help, often in a panic ("Can you find this kind of data for me … by 5:00 p.m.?"). But sometimes you get little puzzles ("Bet you can't find …") or pictures of someplace in the world with the question, "Where's this?"

Here's a picture that a friend sent me, asking not just where in the world this office tower is, but also an apparently difficult question to answer just from the photo; that's the question for this chapter.

Research Question: *Where was the photographer standing when he took this photo?*

This seems impossibly hard, but with a little ingenuity, it's quite possible. In under five minutes, I was able to go from just this photo to his location (and for extra credit, I was able to find the phone number of the office where he was standing).

There are several ways to do this, but the simplest one is to start with clues you find in the photo itself. First, ask yourself, What do you see in the photo?

In a case like this, you have to start with what you have. Look at the image carefully, noting what you might use to crack this where-in-the-world challenge.

Figure 2.1
A mystery picture sent by a friend, who asks, "Where was the photograph taken from?"
Credit: Daniel M. Russell

There are only a few things that you can really begin with in this picture. Notice that two buildings have logos that might be useful, and there's a flag in the lower-left corner. If you look *very* closely, you'll see it's actually a mural of a postage stamp with a cancellation mark (figure 2.2). Here's what that looks like when you **zoom in**[A]. (As mentioned earlier, when you see bolded text that has a superscript, it's telling you that there's a short summary of how to do this at the chapter's end. Check it out; at the end of this chapter is a how-to about ways to zoom in on an image.)

Otherwise, it's a fairly ordinary urban scene.

A quick check of the flags of the world (just do a quick search for [flags of the world] in Google Images, and you can quickly get a lovely diagram with all the world flags). (See figure 2.3.)

You can click on any of these and without much trouble find that this is an oddly cropped Egyptian flag. Is this somewhere in Egypt? A quick visual inspection of the buildings and lay of the city tells me this surely isn't Cairo

Figure 2.2
Zoom in on postage stamp in Warsaw.
Credit: Daniel M. Russell

or anywhere else in Egypt, so that's just a false lead.[1] So let's ignore the flag for the moment and go looking around in the image for more clues.

Let's try searching for one of the two logos. I searched first for the closest and most obvious logo atop the building labeled "TP." (I ALSO chose this because the building is clearly pretty new and pretty much a trophy building. I figured there would be a good chance that someone would have put up a web page on it.) I tried queries like [tp logo], but didn't have much luck until I modified the query just a bit with a *description* of what I was looking for.

Copyrighted Image

Figure 2.3
A search for [flags of the world] in Google Images gives many grids of flags from around the world.
Credit: Google and the Google logo are registered trademarks of Google Inc., used with permission

I searched for [tp office building] and voilà! This is pretty clearly the Telekomunikacja Polska building in Warsaw, Poland. The first result on the search page was to a site that had all the skyscrapers of Warsaw labeled, and this is clearly that building. A quick Wikipedia search for confirmation, and you'll see all is lining up; this is the TP building, which is now called the "Spektrum Tower (formerly TP S.A. Tower)." (See figure 2.4.)

You can also figure this out by doing a Google Images search for the name of the company [Telekomunikacja Polska]. The TP logo shows up on the first page of Google Images results, and that leads you to the Telekomunikacja Polska website.

Knowing this, I could easily get the street address for the TP building: 14/16 Twarda Street, Warsaw (figure 2.5).

Of course, there are always multiple approaches to finding the location of a photo, and cityscapes are full of clues.

If you look carefully at the building behind the TP skyscraper, you'll see another building with another logo—PZU. A quick search for [PZU] or

Figure 2.6
Flying around in Google Earth, I was able to find the location in Warsaw where the Google Earth view with the 3D buildings view mode looks nearly identical to the original image.
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a)   b)

c)

Figure 2.7
a) The original photo cropped down to just the blobby reflection in the window. b) If you flip that image horizontally (as though looking at it in a mirror), a word appears. c) Zoom in a bit and then enhance the contrast, and it's clear what the logo is.
Credit: Daniel M. Russell

This looks suspiciously like backward writing. At this point, I needed to play around with the image a bit to see if I couldn't squeeze some more information out of it. So I opened this subimage in my favorite image editor and **flipped it around the vertical axis**[D] (in this case, I used Adobe Photoshop, but nearly all image editors can do this).

Since it looked backward, I first did a flip horizontally so I can see what it could be (figure 2.7b). At this point, not only does it look suspiciously like writing, but it looks suspiciously familiar. Still, I wasn't 100 percent sure. I needed a better look.

Just to be sure, using my image editor I enhanced the contrast a bit and zoomed in so I could see the details (figure 2.7c). This is definitely the Google logo.

And then I had my AHA! It's the Google logo! (Surprise!) Obviously, my friend was in the Google office in Warsaw when he took the photo. Offices often have large logos of their company, so this isn't that surprising. (But now I get the humor: my friend doesn't work at Google, and so this was a bit of a "look where I'm at now!" kind of inside joke.)

From there, it's not hard to do a search for [Google office Warsaw] and find the Google offices in the Warsaw Financial Center on the Google offices web page. That page tells us the exact floor (tenth) and phone number.

Search [Google offices Warsaw] to find that the information is at the Google corporate offices website: www.google.com/about/locations/.

Google Warsaw
Warsaw Financial Center
Emilii Plater 53
00–113 Warszawa
Poland
Phone: +48 22 207 19 00
Fax: +48 22 207 19 21

And once you have THAT information, it's pretty straightforward to figure out that the Google offices are on the tenth floor.

Research Lessons

1. *Sometimes clues can be misleading (such as the Egyptian flag in the image).* It's important to NOT get bogged down in dead ends but instead be willing to change your strategy on the fly.

2. *Google Earth is a valuable search tool when you're looking for objects in landscape photos that you can't identify otherwise*. In this case, I was able to line up the photo with the 3D buildings and literally work backward to identify the Warsaw Financial Center.

3. *Sometimes clues are hidden in the details and reflections*. In the case of the Google logo appearing reflected in the glass, it becomes apparent once you isolate that part of the image, magnify it, and reflect it around the horizontal axis. That one clue then lets you figure out the exact location. Reflections are often incredibly useful clues in images (although you need to have an image editing tool to magnify the details, transform the image, or enhance the contrast).

Above all, you just have to think like a detective, working from the clues you have (logos and the reflection on the glass) and then using the tools you know about (such as Google Earth) to work from evidence to the complete answer.

How to Do It

A. Zoom in.   To *zoom in* on a photo, you can zoom in on an image by using the browser itself. Just type a control-+ (that is, hold down the control key and press the + symbol) to zoom in and then control-– (the control and minus keys). On a Mac, it's similar, but use the command key instead of the control key (that is, CMD-+ and CMD-–).

If you need even more zooming, you can download the photo from the website and then use an application to magnify the image. For most browsers, you can right-click on the image (or control click on a Macintosh) and then save the image to your computer. Then once you've done that, just double click on the image, and your computer will open it in an image editing program like Apple's Preview or Microsoft's Photo Viewer. No matter what your image viewing application is, there will be an option to zoom in, scroll around, and zoom out. Often the zoom-in tool looks like a small magnifying glass, frequently with a plus sign in it. Click on that to zoom in. (And if it's not there, it will be hidden under the menu item "Tools." Look there as well.)

Figure 2.8
© 2017 Google

B. Google Street View.   Using Google Street View is the way you can "look around" on a street location when you use Google Maps. To do this, just pin Google Maps on your browser in whatever location you'd like to check out. Here I've opened it up to Manhattan, New York (figure 2.8).

You use Google Street View by clicking and holding the small yellow man figure in the lower-right corner. Once you do this, you'll see that you can drag that icon onto any of the blue lines that appear on the map (figure 2.9).

If I drag the icon to the corner of East Forty-First Street and Fifth Avenue, and then drop the icon at that map location, I'll be able to see the front of the New York Public Library (figure 2.10).

You can then click and press on the image to change the view by dragging the view left, right, up, and down. (Try it!) Much of the world's streets are visible this way. (Check out your home street, or try someplace you might want to visit but can't get to at the moment. 1600 Pennsylvania Avenue in Washington, DC, is popular, but you can also check out the Google Street View of a place like the Eiffel Tower in Paris, France (figure 2.11).

C. Google Earth.   Google Earth is a free application that you can download from Google. (I could give you the URL, but a better way to find it is for you

Copyrighted image

Figure 2.9
© 2017 Google

Copyrighted image

Figure 2.10
The Google Street View of the New York Public Library.
© 2014 Google

Figure 2.13
A view in Google Earth of the River Thames, Big Ben, the Houses of Parliament, and Westminster Abbey. To get here, search for [Parliament London UK] with the 3D buildings layer activated.
Image © Google. Map data: Landsat/Copernicus/IBCAO

In the case of the photo featured earlier in this chapter, I wanted to make it possible for me to recognize the image that was faintly visible in the window. To "undo" the effect of the reflection, I had to do a flip horizontally in order for it to show up in the right way.

In this particular case, I used the "preview" application on the Macintosh (but again, nearly all photo viewers have this capability).

To really understand this, I highly recommend that you open an image on your computer and play around with the flip function (and the rotate function, if you have a couple of minutes) to really understand what's going on here. Trust me, this will be useful for you in the future.

Figure 2.14
The upper left shows the original picture, before any rotating or flipping, and then various orientations.
Credit: Luc Nikiema

Try This Yourself

Here's a lovely picture I took of the Notre-Dame Cathedral in Paris, France. As you can see, it's a beautiful spring day with clouds and birds, and a bridge crossing the river. Imagine that you have an incredibly romantic episode in your life that happened on that bridge and that now—years later—you'd like to do a little research about the bridge. You know the name of the cathedral in the background, and probably know the name of the river, but how would you figure out the name of the bridge? (Hint: use Google Street View.) Can you search it out?

Figure 2.15
Credit: Daniel M. Russell

3 Do Lakes in Africa Sometimes Explode? How to Focus Your Search with "site:" and Using Specialized Terms

Can some lakes erupt and kill thousands of people? How would you find out?

Not long ago I was reading about a strange lake. I know what you're thinking: How strange can a lake be? A lake's a lake, right? In this case, the lake I'm thinking of seems not just strange but also deadly.

In particular, the lake I'd been reading about directly caused the death of a lot of people. The people didn't drown, and their deaths weren't due to something obvious (like a dam bursting) but rather were from something intrinsic to the lake itself.

This is the kind of article that makes me start doing research. It's a fascinating topic, but the article itself was heavy on fluff and light on details. It had lots of exclamation points and adjectives like *amazing*, *stunning*, *deadly*, and *awesome*. There's nothing wrong with these in general; they just don't help me to understand what's really going on here. I wanted to know if this was a real thing, and if so, how could a lake actually kill so many people?

As I read, it became clear that this strange lake is nothing like what you think about when you think of a lake. When you think of a "lake," you probably have something like the following in mind (figure 3.1).

But there *are* deadly lakes. It's not a poisonous lake (that is, you can go swimming in it without any harm coming to you), and it's not a boiling lake, like this one in Yellowstone National Park.

So I had to think carefully about what such a "deadly lake" would be. Here's the research question I wrote down to get started.

Copyrighted image

Figure 3.1
A generic lake, quiet, serene, and probably not dangerous.
Credit: Daniel M. Russell

Copyrighted image

Figure 3.2
Falling into this lake at Yellowstone National Park is a bad idea.
Credit: Daniel M. Russell

Figure 3.4
Search results for Lake Nyos that come only from USGS.gov; here I used the site:
operator to limit the results to those from the USGS website.
© Google

This leads to several technical reports on the lake's CO_2 eruption. There's
a USGS final report with as much detail about the eruption as a geologist
might want to read. (If you're interested, I highly recommend this.)

After reading about this event for a bit, I learned that the technical term
for this kind of sudden bubbling up of CO_2 from a lake is a "limnic erup-
tion." I had no idea what a limnic eruption really is or how it works, so a
quick search for this specialized term teaches me a good deal:

[limnic eruption]

Google gives me a bit more detail: a limnic eruption, "*also referred to as a
lake overturn, is a rare type of natural disaster in which dissolved carbon dioxide*

Figure 3.5
Lake Nyos shoreline that's been washed away by a large wave(s).
© US Geological Survey

(CO_2) suddenly erupts from deep lake waters, forming a gas cloud that can suf-focate wildlife, livestock, and humans." This is starting to make sense; I'm finding multiple sources of information that are telling me the same things.

Now what about that wave?

This search takes us to several more research reports, including ones that tell us about the wave. The *Washington Post* reported it as being 80 feet high (bit.LY/TJOS-3-3), while a report from Duke University claims that the resulting wave was a "water surge 6 m high [that] flowed over the spill-way at the northern end of the lake, and a fountain of water or froth had splashed over an 80-m-high rock promontory on the southwestern shore."[3] You can see the washed-away vegetation in this picture from the USGS.

If that barren promontory is the same one that was denuded by the post–limnic eruption wave, then it likely was an 80-meter wave, and not 80 feet. (It's difficult to actually know without a better image or a topographic map to tell us the exact elevation, but if those are trees in the foreground, it well could be 80 meters.) And of course, this leads to another question.

Research Question 3: *And how high did the eruption blow water into the sky?*

To answer this question, I turned to **Google Scholar**[A] for a few reports written on the Lake Nyos eruption using the query (yes, the same query as before, but this time using just Google Scholar rather than the more general Google Web search):

[limnic eruption]

I quickly found a paper with the title "Dynamics of CO_2-Driven Lake Eruption."[4]

When you look up the author, Youxue Zhang, you'll find that he's in the University of Michigan geology department, and this paper was published in the science journal *Nature*. (Just so you'll know, it's quite hard to get things published there. So this is probably correct, at least to the best of our current knowledge.)

In this paper, Zhang creates a mathematical model of what happened in August 1986. And although he doesn't have a picture of the event on that fatal day, his reasoning is pretty compelling, and he made the following diagram to show what probably happened (figure 3.6).

This shows that the limnic eruption caused a shower of lake water roughly 300 meters into the air. (Note also that Zhang has indicated a promontory height of 80 meters.) The water would have shot up from the lake surface at a top speed of around 199 miles per hour (or 320 kilometers per hour), which is incredibly violent. You would not want to be nearby when this happens, not just because of the high velocity water jet and rain

Figure 3.6
The pattern of the explosion on Lake Nyos. (Redrawn after Zhang's illustration in "Dynamics of CO_2-Driven Lake Eruptions.")
Credit: Daniel M. Russell

Copyrighted image

Figure 3.7
The degassing fountain that runs continuously, powered only by the pressure of expanding gases as the water flows from two hundred meters below to the surface of Lake Nyos.
© US Geological Survey

of carbonated water, but because that's when all the CO_2 is released into the air. It's probably a spectacular sight, but one that you'd want to watch from a safe distance.

So what's going on with Lake Nyos today? It's still dangerously full of high-pressure CO_2, but there has been an effort to depressurize the lower levels of the lake by dropping a 200-meter tube from the surface to the lower part of the lake. As you might expect, when you make a connection between the surface and the pressurized bottom of the lake, you get a fountain, which they hope is removing the pressurized CO_2 fast enough to prevent a similar disaster from happening in the future (figure 3.7).

But of course, where there's one maar waiting to turn over, there might be others. Nearby, Lake Kivu could be another such lake with a huge CO_2 reservoir just waiting for the right trigger to overturn and release its CO_2 contents into the atmosphere (based on the USGS report on this hazard). If this happens, it could easily kill many more people, as there are around two million people living nearby.

Research Lessons

There are a few lessons here.

1. *Short and obvious searches often work well.* Much to my surprise, a query like [killer lake] actually led instantly to Lake Nyos. This startled me; there really haven't been other killer lakes? Apparently not. The biggest lesson I pick up from this is that obvious queries work—but only if you have some kind of target in mind. (That is, [killer lake] isn't the kind of query any normal person would do unless they were looking for something like the story behind Lake Nyos.)

2. *Checking a known expert site (e.g., USGS.gov) is a great strategy for getting in-depth articles.* While it's easy to find lots of articles on Lake Nyos, scholarly ones are best when they come from a known source that does a lot of work in this area. In this case, I happened to know about the USGS in advance, so I just restricted my search to the articles and papers inside USGS.gov by using the **site:** operator. (This is probably the single operator that I use more than any other to limit search results to just those from one site.)

3. *Specialized terms, when you learn them, are great!* This is a lesson we've seen a bunch; when you see these special terms (or phrases, such as limnic eruption), use them for your search terms. (But be sure you know exactly what they mean or you might end up doing some time-wasting searches. And be sure to get your spelling right: a search for a **limbus eruption** will tell you a lot about diseases of the eye, and nothing about savage geology; that would be a **limnic eruption**.)

4. *Triangulating multiple sources is a requirement when you're doing research.* As you see, there are reports of the tsunami being eighty feet … or eighty meters. That's a huge difference. When you're doing research like this, keep looking around; you might find different data (or points of view) around a topic—even things that should be easy to verify.

5. *Remember that Google Scholar is a great collection of high-quality articles and papers that anyone can access for free.* While it's a collection of academic and scientific papers, it's NOT just for academics but rather for everyone to use. Google Scholar gives everyone equal access to a rich source of knowledge that's otherwise difficult to find. The kind of knowledge that you can discover in Google Scholar is comprehensive and authoritative, which makes it perfect for you to use when studying lakes that explode due to subterranean

4 Things You Notice While Traveling: How and When to Switch Search Modes to Find Information

Satisfying your curiosity while on the road is usually a quick search on your mobile device. Here are some fast ways to get to the answers that you seek.

I don't know about you, but when I'm traveling I often end up with small questions that arise during the day from reading the local news, listening to the radio on those long drives, or watching slightly sketchy TV in a random hotel room.

Mostly, these questions that pop up are fairly easy to answer, but they're like mosquito bites—you're not really satisfied until you know the answers. Here are a few questions that came up for me in my travels over the past couple of months. As they happen, I just jot them down and look these things up when I get home. How many of these have you also had?

Research Question 1: *You're driving a rental car into the gas station. Is there some way to tell (without getting out of the car) which side the gas cap is on? Is it on the left or right?*

It's really annoying to have to get out of the car, walk around, and discover it.

The answer is obvious, once you know. But I had to look it up; more important, I had to realize that this was a problem, a minor one to be sure, yet it's a problem for which I could probably search out the answer. Here was my query: [car dashboard fuel side] (see figure 4.1).

Interestingly, this also led me to a Snopes.com article asking if the gas cap side was indicated by which side the pump handle on the ICON was

Figure 4.1
A quick query about fuel indicators on the dashboard uses just the essential query terms.
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on.[1] I hadn't thought of that interpretation. But no, it's the triangle that points to the correct side of the car; the pump handle doesn't actually indicate anything.

By the way, what's the correct term for that part of the car where the gas cap is located? What's it called? I did the following query:

[gas cap diagram]

I ended up finding out that the gas cap is the cover (the cap) on the "fuel filler hose" that leads to the fuel tank. Another term I didn't know! In the process, I learned that this is the term you should use when looking up information about the "gas cap" in the booklet that came along with the car. The language that you and I might use to talk about gas caps isn't necessarily the same as the language that people who *write* the manuals use.
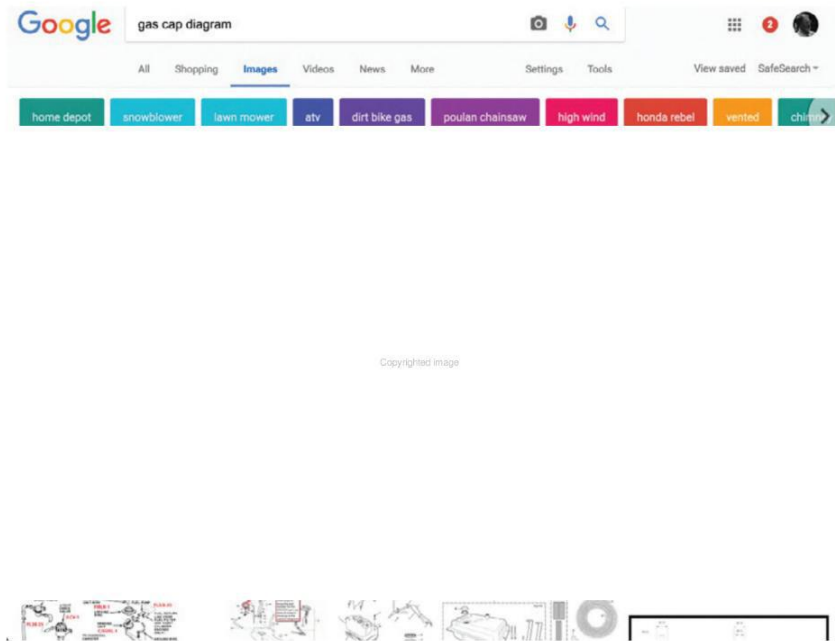
Figure 4.2
The query [gas cap diagram] gives you a set of results that are all diagrams that have a gas cap in them somewhere. Adding the extra context term "diagram" is a handy search tip to know when you want to learn how things are built, organized, or laid out.
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It's also worth remembering this search trick of adding in a term that describes what you're looking for; I call this a *context term* because it provides a bit more context for the kind of query results you want.

With this query, if you look in Google Images (which is probably where you'd expect to find the diagrams), you'll find lots of useful diagrams showing you how the fuel filler hose is located, and where the cover is located.

Research Question 2: *I saw Mount Rushmore, and while I was being amazed, I also wondered about how it was designed by the sculptor. What was the original design for Mount Rushmore? Was what we see today what he originally thought it would be? How different was the original design?*