

ROBERT SEATON

MANAGING MODERNITY

IF KNOWLEDGE CAN CREATE PROBLEMS, IT IS NOT THROUGH IGNORANCE
WE CAN SOLVE THEM.

ISAAC ASIMOV

USE ONLY THAT WHICH WORKS, AND TAKE IT FROM ANY PLACE YOU CAN
FIND IT.

BRUCE LEE

MOST HAYSTACKS DO NOT HAVE EVEN A NEEDLE.

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Introduction

At the rate of progress since 1800, every American who lived into the year 2000 would know how to control unlimited power. He would think in complexities unimaginable to an earlier mind. He would deal with problems altogether beyond the range of earlier society. To him the nineteenth century would stand on the same plane with the fourth – equally childlike – and he would only wonder how both of them, knowing so little, and so weak in force, should have done so much.

(Henry Adams, *The Education of Henry Adams*)

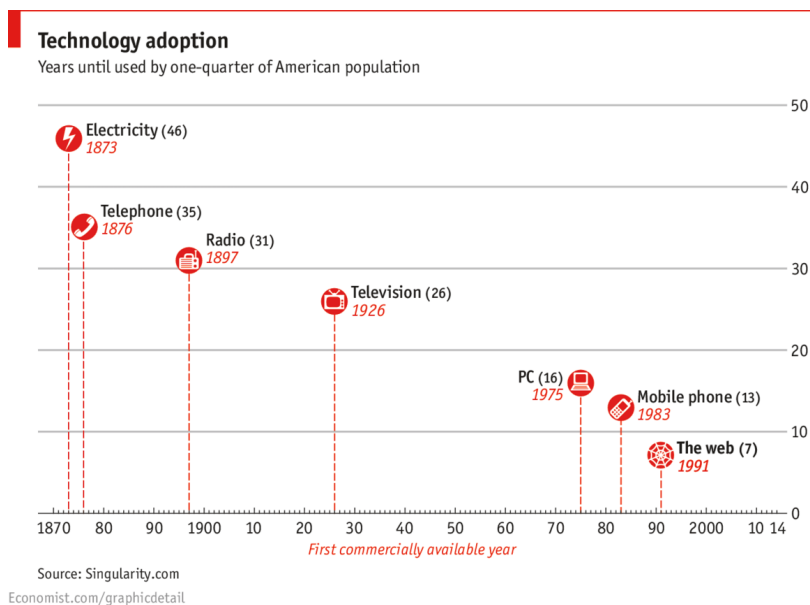
It is change, continuing change, inevitable change, that is the dominant factor in society today. No sensible decision can be made any longer without taking into account not only the world as it is, but the world as it will be...

(Isaac Asimov, *Asimov on Science Fiction*)

IN 1907, Henry Adams published his autobiography, *The Education of Henry Adams*. In it, he simultaneously laments and marvels at the technological change he has witnessed. When he writes about the impossibility of understanding it all, his despair is palpable.

Today, we can only laugh. Too much change? In 1907? Sure, mankind's taming of electricity may have been a bit of a shock (pun intended), but it was 46 years until it had reached a quarter of Americans – more than enough time for the novelty of the thing to wear off. Childlike, indeed.

Compare that to the inventions since then: It took the telephone 35 years to reach a quarter of Americans, radio took 31 years, 26 years for television, 16 for the personal computer, 13 for mobile phones, and a mere 7 for the world wide web.



If we accept, then, that the dissemination of the world wide web and electricity are roughly comparable, well, some arithmetic suggests that the world is changing about 6.5x faster today than it was when Henry Adams published his autobiography. I'm sure you've felt it – the constant barrage of the “next big thing” that you're tasked with mastering: for web programmers, the latest and greatest JavaScript framework. For teens, Vine and Snapchat. For workers generally, your employer's latest iteration of new time tracking software.

And this rate of change is accelerating. We're expected to adopt each technology faster than the last.

THIS TREND isn't limited to technology. It's more than advances like television and radio. In the 13th century, Roger Bacon argued that it was impossible to master mathematics in less than 30 to 40 years. Today, the equivalent material is taught to high school students.

Sports, too, are no exception. If we transported Olympic swimmers from 1896 to now, they would not even qualify.¹

FURTHER, CONSIDER the sheer amount of information being produced. About a million books are published each year. That's more than were published by Western civilization in the sixth, seventh, eighth, ninth, tenth, and eleventh centuries combined – a 600 year span. More books were published *just today* than France published during a 100 year span from 600 AD to 700 AD.² If that wasn't convincing enough, Google's executive chairman, Eric Schmidt, estimates that we create more information every two days than man-and-woman-

¹ K Anders Ericsson et al. The influence of experience and deliberate practice on the development of superior expert performance. *The Cambridge handbook of expertise and expert performance*, pages 683–703, 2006

² Eltjo Buringh and Jan Luiten Van Zanden. Charting the “rise of the west”: Manuscripts and printed books in Europe, a long-term perspective from the sixth through eighteenth centuries. *The Journal of Economic History*, 69(02): 409–445, 2009

kind created from the dawn of civilization until 2003.

There is, then, this expectation that students and workers today will absorb more and more information in less and less time, and we have no reason to expect this trend to abate. In fact, it looks as if it will only get worse.

What to expect

DON'T PANIC. The entire point of this book is to make the world more manageable – to teach you a few techniques and principles that will supercharge your ability to find, absorb, and retain information.

In pursuit of this goal, the book is organized into three parts:

1. Finding, filtering, and managing information
2. Understanding
3. Retaining knowledge

The chapters are chronological – they're listed in the order in which they're intended to be enacted.

THE CHAPTER ON “Finding, filtering, and managing information” is about, as you might expect, information gathering. It's a guide to figuring out what information you need, what it's called, where you can find it, what you don't need, and how to read through it all.

I almost want to call information finding “something of an art,” but, on reflection, that's not what I mean. Information finding is a skill. It's a repeatable process and, with my instruction and practice, that process can be refined. I don't know of any skill that a dedicated adult can't master³, and I'm confident that research ability improves with time.

³ Except maybe perfect pitch.

As part of this chapter, I've included several of my most effective techniques – the tips and tricks of the trade that I've picked up over the years. This includes tips for googling, when to dive into the research, taking advantage of human resources, tricks when dealing with recommendation engines, discovering keywords, and more.

THE CHAPTER ON “Understanding” also has a revealing title. Once you've found the information you need, you're tasked with understanding it – converting mere information into knowledge.

Most of the time, understanding something is a straightforward task. However, the more technical your material leans, or the more unfamiliar with a field you are, the more explicit the understanding phase becomes. It feels like the frustration of not getting something,

or of having sort of artificial knowledge of a field, without the ability to spontaneously apply that knowledge and realize when it's relevant.

In this chapter, I reveal the five most important questions you need to be able to answer when it comes to really understanding something, and the cognitive science principles behind why these questions work.

FINALLY, THE CHAPTER ON "Retaining knowledge" covers the basic principles of human memory, why it's important, and how these basic principles can be exploited for fun and profit.

It's sometimes claimed that, when you understand something, there is no longer any need to devote any time to committing it to long-term memory – that this crucial step will just spontaneously happen on its own.

This is emphatically not the case. Understanding facilitates remembering, but it doesn't alleviate the need to manage your own memory. Your memory obeys certain laws, and these laws cannot be violated.⁴ I'm going to teach you these laws and, once aware of them, you'll better understand why you forget the things that you do forget, and how you can enhance the effectiveness of your own efforts.

ENOUGH WITH the introduction, then. Let's get started.

⁴ Unless you're Kim Peek, the real-life inspiration for Dustin Hoffman's role in the movie *Rain Man*. Extreme brain abnormalities enabled him to instantly commit anything to long-term memory. At his death, he'd memorized around 12,000 books.

Finding, Filtering, and Managing Information

In an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.

(Herbert Simon 5)

⁵ Herbert A Simon. Designing organizations for an information-rich world. *Computers, communications, and the public interest*, 72:37, 1971

IN A CLASSROOM ENVIRONMENT, at almost every level, students are given the sources that they're expected to gather information from. They're assigned a textbook or papers to read. Students are never in a position where they're forced to evaluate the quality of several textbooks before deciding which to sink time into.

It's maybe no surprise, then, that most people develop, instead of hearty brain matter, a broth-soup in their heads that comes *this close* to spilling out whenever they sneeze.

How to do research is a skill that's not often taught and never taught well. That's where this text comes in. I'm going to teach you how to realize that you have a research problem and what to do about. I'll reveal the tricks and techniques that I've picked up through years as an infovore.

There are, broadly speaking, four steps to information gathering.

1. Realizing you have a research problem
2. Gathering all relevant information
3. Filtering
4. Processing and recording

Recognizing an opportunity

TODAY, THE WORLD IS AWASH in information, a constant deluge of the stuff. A bitter, acrid sea that scours the world's digital stage and leaves a trail of blog comments in its wake.

Supposing that tomorrow you were transported to some platonic library, staffed by stern but fair angels who mute mp3 players with a wiggle of the wing, where you never needed to sleep or eat, such that you could read constantly, it would still take you about 62,000 years to read all the books that currently exist. Or about the time spanned from the first human crunching Australia's long grass beneath his feet until now.

If that is not tantalizing enough, consider the case of Shaun Winterton. One May day in 2011, he discovered a new species of green lacewing, a dragonfly-esque insect.

Where did he find it, you might wonder – braving ornery Amazonian black Caiman or hunched over with yellow fever, praying for compassionate, generous death to just take him, maybe? But no. He discovered it not under the eerie glow of a hyena's eyes at night, but under the eerie glow of the photo-sharing website [Flickr](#). A new species! Advancing human knowledge! From his couch.^{6,7}

So, yeah, there is a lot of information out there. If, for some real-life problem, you can't think of any already existing information to take advantage of, you're not thinking hard enough.

I've written, for instance, a popular article on the science of eye contact. It opens with an anecdote about 17th century Italian women: in an attempt to enhance their appearance, they would dilate the pupils by consuming the Belladonna plant. The only problem? Belladonna, sometimes called nightshade, is poisonous. Yeah, Belladonna might be the plant of love, but those heart palpitations aren't lovesickness, but symptomatic of Belladonna poisoning.

Now, I think this is a great fact, the sort of spice that sets an article apart from more common fare. How did I find it? I did a Google search for "site:scientificamerican.com eye contact". (The addition of the "site:" operator restricts my results to articles from that site.) I then read the five relevant articles that Google returned. One of them included that morsel – I don't know where they got it. Perhaps doing the same thing.

Another example? You know that bit about Shaun Winterton discovering the green lacewing on Flickr? Yeah, I found that the same way, with a Google search for "site:scientificamerican.com finding information."⁸

WHEN PEOPLE THINK of research, a few representative examples spring to mind: a man in a too white coat, the smell of dust and the inevitable resulting sneeze, a laboratory, a library, books with enough heft to stand-in for pepper spray, that sort of thing.

It's so much broader than that! If you're longing for a long-term relationship and, as part of the process of prospecting for the "one",

"I have always imagined that Paradise will be a kind of library." Jorge Luis Borges

"Basically what Shannon said is that we define information as the opposite of uncertainty. If you have uncertainty, you don't have information. And once you receive information, uncertainty is being resolved." Martin Hilbert

⁶ The story continues. Winterton contacted the photographer, Guek Hock Ping, and asked him if he had a specimen. He didn't, but eventually caught one and sent it to Winterton. Winterton then named the species after, not Guek, but his own daughter.

⁷ Shaun L Winterton, Hock Ping Guek, and Stephen J Brooks. A charismatic new species of green lacewing discovered in malaysia (neuroptera, chrysopidae): the confluence of citizen scientist, online image database and cybertaxonomy. *ZooKeys*, 214, 2012

⁸ Why *Scientific American*? No particular reason beyond the wonderful tendency of science writers to pack their articles with just the sort of anecdote I'm after.

you take someone out on a date: *that's research*. When you ask a friend how he feels about his new job, more research! Deconstructing your competitor's last successful ad campaign? That's research.⁹

Research is trying on clothes until you find something that fits your shoulders, instead of draping across them like a dead raccoon. Research is paying attention to the words that your customers use in their emails so that, next time you need content for your company blog, you aren't stuck wondering, "What do I title this?" Research is putting ketchup on a burrito or peanut butter in your ramen,¹⁰ or cracking your knuckles on only one hand twice a day for 50 years to see if that hand gets arthritis.¹¹

Competitor analysis

OUT OF ALL these examples, there's one that I'd like to emphasize (literally!): **competitor analysis**.

But, first, a detour into the diet and anatomical quirks of the most badass of all the sea slugs: the nudibranch. The name comes from the Latin *nudus*, meaning naked, as it has no shell.

The remarkable thing about the nudibranch is not its nudity, although "naked sea slugs" would make a good name for a band. No, what's cool about the nudibranch is its power of absorption. Power as in superhero *power*. Spiderman might have been bitten by a radioactive bug, but that arachnid has nothing on the nudibranch.

When a nudibranch consumes a plant, its digestive system actually absorbs the plant's chloroplasts. This allows the slug to undergo photosynthesis. It can turn the sun into food. A slug! Photosynthesis!¹²

Similarly, when the slug consumes a jellyfish, it absorbs its stinger cells and incorporates those into its own body.

Competitor analysis is just like this slug. It's about finding some resource, or business, or anything you admire, and then picking it apart until you understand why it works. Once you know how it ticks, you can build a better one.

Imagine the typical antique store. You know the one: junk everywhere. It feels as if you're walking into someone's home, the home of a hoarder. Why are the stores laid out this way?

Well, I'll bet that the average antique shop owner has no idea *why*. He probably just thought, "Well, this is what Mike Wolfe's shop looks like in Nashville¹³ and, if it's good enough for him, it's good enough for me." But that's not very satisfactory, so I'll tell you the real answer.

It turns out that there's good reason for this: the clutter evokes a psychological response in customers. They feel like they're stumbling

⁹ Writing this book came about as the result of research. I noticed that so many successful blogs were running email campaigns and offering an incentive for signing up and, well, now we're here.

¹⁰ This is actually pretty good. The ramen bit, anyways.

¹¹ It doesn't. Donald Unger actually carried this out and, for his work, received the Ig Nobel Prize.

It took me way too long to realize that Ig Nobel is a play on the word ignoble.

¹² (!)

¹³ Mike Wolfe is best known as one of the leads in the television series, *American Pickers*, a show responsible for my all of my meager knowledge of antiquing.

on buried treasure (perhaps literally) and, as a result, are more likely to buy. You know the absent minded older gentleman tending the store – absent-minded because he forgot to put a price on something?

More of the illusion. He knows what everything in that store is worth.

As another example, email subscription forms are a subject near to my heart. When writing my own, I could have started from scratch and then split tested each iteration, figuring out what works best.

But why bother with that when large campaigns, like Neil Patel's blog, [Quicksprout](#), have already done this? You can bet that, as the cofounder of an analytics company, he's spent a couple hundred hours tweaking his own copy, and there's no need to duplicate that effort. You can go on his website, see what works, and then riff on that for writing your own.

This technique applies to everything. Whenever you see something impressive, figure out what makes it tick. Their success can be your success.

Wait, but who's the competition?

As a general heuristic, whenever you feel a pang of jealousy, that's an emotional cue that you ought to be deconstructing whatever that person is doing.

You have to be careful with words. The word research brings one set of images to mind, not necessarily the best ones, and the phrase "competitor analysis" is similar.

Any great piece of work, anything that you aspire to create, ask yourself: How did she do that? What was her process? How can I duplicate it and do it, too? I mean, imagine if you had some magical talisman that enabled you to recreate anything awesome, be it special relativity or the Venus de Milo.

What a world that would be... except, you do have that ability: you can deconstruct and recreate anything. I mean, yeah, it won't be a perfect replica, but you don't need an exact copy, anyways. Your intelligence allows you to do this!

If life were a video game, the creators would have to nerf this ability. It's too powerful. It would fundamentally break the game.

Names and keywords

If you have the name of a spirit, you have power over it.

(Hal Abelson)

THE MOST IMPORTANT piece of research, second only to realizing that

"It is not enough to succeed. Others must fail." – Gore Vidal

Why are original works worth so much more than identical forgeries?

you have a problem, is figuring out what things are called and what language to use.

This can be a daunting task: How do I find the right keywords without already knowing the keywords? Don't panic. You have a few options.

Human resources and expertise

The fastest and most effective way to figure out what something is called, or where to look, is to take advantage of human expertise. Think about it. What system can tell you what a concept is called based on a description of it? Like Soylent Green, it's people.

Here's a real example I encountered the other day: someone on the internet was complaining that they couldn't find any articles that both dealt with energy costs *and* included the cost to the environment.

Now, depending on your facility with economics, you'll realize that what this guy is looking for is a paper that includes "externalities," a piece of economic jargon that refers to the "cost or benefit that affects a party who did not choose to incur that cost or benefit."

The fastest way for this guy to find what he was looking for would be to talk to someone with a larger economic vocabulary, maybe by emailing a professor or asking a friend with an interest in the subject.

This second option is actually representative of a broader method: leveraging the collective intelligence and expertise of your social network – Facebook friends, Twitter followers, a blog, etc. Leverage this. Throw out a question to them. The cost to you is zero, and sometimes it pays off.

Given an opportunity to look knowledgeable, people will leap on it, like a crazed herd of Black Friday shoppers trampling the fallen in pursuit of a giant Tickle Me Elmo that oh-my-god their child just *must* have.¹⁴

¹⁴ After all, what do you think the point of the externality example was?

Q&A Sites

If you don't know someone with the right expertise, you can harness the brainpower of a relevant chunk of the internet by asking your question on a Q&A site, like one of [the Stack Exchanges](#) or on [Quora](#).

Describe your problem and you'll often receive a prompt and useful response from, you know, a flesh and blood human who can point you in the right direction. They get fake internet points. You get an answer to your problem. You both win. Or, well, you win, anyways.

Sometimes the act of writing down a problem is enough to solve it.

Librarians

If you can't find someone with domain expertise to help, the next step is to get in touch with a librarian.

They're paid to help people find what they're looking for, and they're pretty good at it. They'll be familiar with the available information databases, how to interpret catalog numbers, and all of that.

"When you absolutely positively have to know, ask a librarian." – American Library Association

"When the going gets tough, the tough get a librarian." – Joan Bauer

"[Librarians] are subversive. You think they're just sitting there at the desk, all quiet and everything. They're like plotting the revolution, man. I wouldn't mess with them." – Michael Moore

Recommendation engines

If you have the name of a relevant resource, like a book, you can pull it up in Amazon and browse through the related items. You'll often find closely related material to dig into, and by paying attention to the language used to describe the texts, you can discover the right keywords. The categories a book is filed under are also a useful clue.

For a paper, you can pull it up in [Google Scholar](#), and click "related articles," which will give you, you guessed it, related material.

FURTHER, IF YOU bother tracking down a book in the library, check out whatever is nearby it. Chances are, you'll stumble on more useful material.

Indeed, if you have the name of a book, you can track down the subjects it's filed under in the [Library of Congress catalog](#) and, once you know the name of a subject, you can use that to track down more books.

THIS IS a subset of a broader strategy. As long as you have one book or paper, you can use that to find even more material. It's a bit like there's the top of a root sticking out of the ground and, once you get a hold of it, soon you're yanking up a few miles of the stuff, plus the accompanying tree.

The most straightforward and effective way to go about this is to track down all the sources mentioned in the text that you've discovered. If you have one relevant paper, it'll typically review related research either in the introduction or at the very end of the paper. You can then track those down, and then do this recursively, until you've amassed everything on your subject.

This same method applies to books and, with Google Scholar, you can also go in the other direction: hunt down everything that cites a certain paper or book.

Bibliographies

Now, once you have your keyword, the first thing you want to do is look for an annotated bibliography.

An annotated bibliography of a subject is just what it sounds like: a list of works along with a description of each work. Often, these bibliographies will also indicate the most important papers in a field.

Except they're written in a special sort of ink made from the tears of angels or, at least, that's what it seems like, because they'll simplify the hell out of your search. Once you have the name of your subject, Google searching for one should be your first priority. This can be accomplished with a search like, "judgment and decision making annotated bibliography."

If you don't have the name of your subject, but you do have the name of a relevant book or paper, say *Thinking and Deciding*, you can find useful resources with a search for the name of the resource, along with the words bibliography or reading list, for example ""Thinking and Deciding" reading list" or ""Thinking and Deciding" bibliography".

Textbooks

I wanted to mention review articles, but first I should cover the granddaddy of them all: textbooks. Textbooks are like extended review articles.

Introductory textbooks are designed for people new to a field, to get them up to speed as quickly as possible. They're made for teaching. It's like someone sat down in a room for four years, with a little picture of you to remind them that you're the one they're writing for, and churned out a book. Other resources, like papers, are often aimed at audiences already familiar with the material.

But I should add an important caveat: if a textbook isn't good, it's terrible. And they suffer from feature bloat (to boost sales to undergrads), so it'll end up as a 1200 page behemoth that tries to be everything, not bequeathed but *inflicted* onto the world, when all you really wanted was a concise introduction.

If you're faced with this problem, search for lecture notes published online, with a Google query like, "subject X lecture notes". Since these are constrained by classroom time in a way that textbooks aren't, they can be more useful as an overview of a field.

The trick to finding a good textbook? More research: check out Amazon reviews, reviews on Goodreads, along with what textbook college courses on the subject use. Try a search for "best textbook introduction to x."

Review articles

As I mentioned earlier, textbooks are like extended review articles. The non-extended form, well, those are just review articles.

To find them, search Google Scholar for "'subject x" review article." In general, Google Scholar is a good place to begin looking for published research on just about anything. Just plug in a keyword and go.

Oh, and another point: **research papers are almost always easier to understand than you expect.** Except *maybe* highly technical fields like pure mathematics (and I'm not even sure about that). Non-experts can often get a solid understanding of the gist of a paper, even if they can't follow all the details, which are usually not that important anyways.

Seriously! Most papers are like bikers that also volunteer at a soup kitchen on the weekend. Grim looking on the outside, but with a soft gooey center, er, I mean, an easy to understand interior. Or something – I don't know. You get the point.

OEIS

If you're interested in mathematics (and, c'mon, you should be), the "[On-Line Encyclopedia of Integer Sequences](#)" (OEIS) has been quietly revolutionizing the way to look up information about some mathematical phenomenon. If you can get an integer sequence out of whatever it is that you're studying, you can look it up and figure out what's been written about it.

Imagine, for a moment, that your name is Brian, and you're toying with the Tower of Hanoi puzzle. (It's a puzzle about moving blocks between poles. If you're unfamiliar, that's not important.)

But, okay, say you're moving blocks around, and you start to count the number of necessary moves between each. Soon you have a sequence of integers: 1,3,7,15, which you humbly dub "Brian numbers." But now what do you do? How do you know if someone else has already discovered them?

Well, you can plug that sequence into the OEIS, and it will inform you that these are the numbers satisfying the equation $2^n - 1$, and it will point you to a lot of the relevant literature on the Tower of Hanoi puzzle.

Indeed, one of the most exciting mathematical discoveries in recent history – the deep connections between the Monster group, number theory, and mathematical physics – stemmed from John McKay's realization that the number of dimensions necessary to construct the Monster group, 196884, is awful close to a number that springs out

of the Fourier expansion of the j -function. A relationship that could have, at least in principle, been discovered with a tool like the OEIS.

Note that, in general, human resources are especially valuable when it comes to mathematics, as our current search technologies don't handle mathematical discovery very well. For example, you can't exactly just Google an equation like this:¹⁵

¹⁵ If you do want to Google it, this is one of the Navier-Stokes equations.

$$\frac{\partial(\rho e)}{\partial t} + \vec{\nabla} \cdot (\rho e + p)\vec{u} = \vec{\nabla} \cdot (\bar{\tau} \cdot \vec{u}) + \rho \vec{f} \cdot \vec{u} + \vec{\nabla} \cdot \vec{q} + r \quad (1)$$

So, for integer sequences, try the OEIS. For other math, try asking a friend, or one of the Q&A sites, like [the Math StackExchange](#).

Summary: How to find information

As Matthew McConaughey would put it, "Alright, alright, alright." We've reviewed here how to find information, but it's been a sort of lightning tour. If all this seems overwhelming, just follow these steps:

1. Figure out your topic's keywords
 - Take advantage of human resources
 - Ask a friend or colleague
 - Email someone in the field¹⁶
 - Ask on a Q&A site
 - Ask a librarian. Seriously, that's what they're there for!
 - If you already know of relevant resources, you can use those to discover more. (See below.)
2. Once you have your keyword, amass everything vaguely related to it:
 - Search for a textbook on the topic.
 - Search for a review article on the textbook.
 - Search for an annotated bibliography.
 - Check the references on Wikipedia for your subject.
 - Once you have a book on the subject, try:
 - If in a library, check for books shelved near that book.
 - Search for the book on Amazon and search for related works under "Customers Who Bought This Item Also Bought."
 - Find what subject the book is classed in under [the Library of Congress system](#) and skim through the list of books on that topic.

¹⁶ Worst case scenario: you get back a passive-aggressive email signed with a professor's full title.

- Search for the book on Google Scholar, click “Related articles”, and scan through those. Also check out who cites that book.
- Check for a bibliography at the end of the book and hunt down those papers.
- Search Google for “reading list “bookname””, “annotated bibliography “bookname””, or “recommended reading “book-name””
- Once finished, repeat this process for everything new you found.
- The process is similar for papers:
 - Search for the paper on Google Scholar, hunt down “Related articles”
 - Check out everything the paper cites and everything cited by it.
 - Search Google for “reading list “paper title”” or “annotated bibliography “paper title””, or “recommended reading “book-name””
 - Repeat this for every item you just discovered.

Filtering Information

Okay, by this step, you ought to have a huge, hulking pile of research, either physically, like on a desk, or metaphorically, like on your hard drive. And I mean a hulking pile. The sort that, if you tried to check it out from the library, the librarian would make a sort of harrumph sound, that would momentarily make you doubt this whole enterprise, but then your resolve would steel and you’d push your library card into her hand with an admonishment of, “Yes, all of it.”

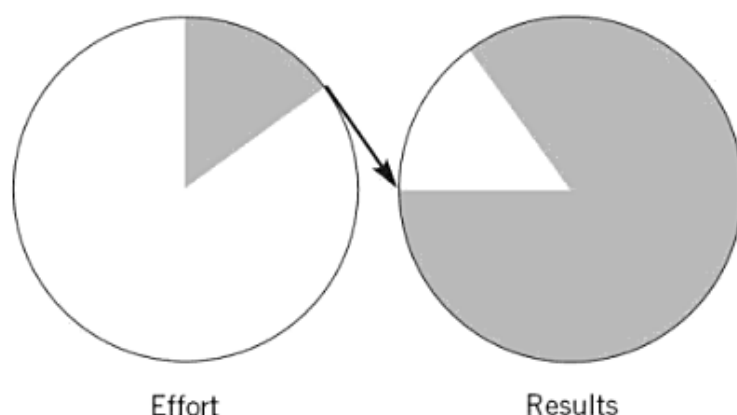
Except you aren’t going to read through all of that. That’s a waste of your time. Remember Sturgeon’s law! 90% of everything is crap.¹⁷

Remember diminishing marginal returns! The first book that you read about something will be more valuable than the second, and probably as valuable as the next three combined. This is one of the most empowering realizations ever!

Vilfredo Pareto realized that 20% of the pea pods in his garden produced 80% of the peas. (A startling example of the pervasive inequality in the Pea Kingdom). Since then, this has been immortalized as the Pareto principle, sometimes called the principle of “the vital few and trivial many.” Most value is concentrated in a few exemplars. My website’s most popular 3 articles account for 82% of the total traffic.

“I repeat Sturgeon’s Revelation, which was wrung out of me after twenty years of wearying defense of science fiction against attacks of people who used the worst examples of the field for ammunition, and whose conclusion was that ninety percent of SF is crud.”

¹⁷ I’m not as optimistic as Sturgeon – more than 90% of everything is crap.



So, yeah. We're going to filter out the good stuff. You can take any given field, throw out everything except the 5 best papers and textbooks, and they probably wouldn't be much worse off – and, hey, you'd avoid stuffing your head with a lot of garbage that will end up being wrong in the future. So bonus.

Skimming and Trashing

So, how do you know what to throw out and what to keep? By skimming it, of course. At this point, you're going to want to spend about 5 minutes with each book and paper gathered, and discard those that don't seem promising.

Maybe there's a science to this. I don't know. It's not that hard. You look at a book, you read the table of contents, maybe you check its Amazon reviews or citation count. Then you make a decision: do I want to pursue this further?

Sort of like you would do with a potential date. Yeah, it's like textbook dating. If the textbook says, "My ex is in prison for assault with a deadly weapon, but she's getting out soon," well, maybe you shouldn't pursue that further. But you're an adult, so I'll let you decide.

If you can't see yourself digging more deeply into the book or paper in question, there's no use keeping it. And if you're thinking something is maybe on the fence, like it's readable, but going to be a slog, or that she has more than one copy of *Mein Kampf* on her bookshelf,¹⁸ you're probably best off pitching it.

I mean, not all the time, like maybe its one of those papers that set the research agenda for the next twenty years or sparked a new field. In those cases, you should make an exception and read it anyways. (Or, to extend the dating example, if his or her parents are wealthy

You forget half of what you learn in medical school, and half of what they teach you turns out to be dead wrong. You just have to hope they're the same half.

¹⁸ I draw the line at three copies. One copy: okay. I can justify one copy of anything. Two copies? That's a little weird, borderline. But three copies? What does this person do? Do they have an eBay store for Hitler memorabilia or something? I'm out.

enough to be described as “oil barons.”)

Plus, reading a bad paper is not that much of a time sink, anyways, at least not usually. Bad books can take up about 10x as many hours, so I’d be even pickier with those. Sort of like the difference between a few dates and buying a naked cat together.

REMEMBER, EACH RESOURCE that you cut out at this stage of the pipeline is one less thing that you’re going to have to read through in the future. It’s like gaining an extra two hours of your life.

So be ruthless. Be brutal. Salt the earth like Pope Boniface VIII salted Palestrina in 1299.¹⁹ Crush the papers with the vigor of Charles Martel at the Battle of Tours. Filter like natural selection! If you spend an extra five minutes checking whether or not to pursue something further, that’s time spent well.

Being thorough at this stage is worth it. Look up citation counts, read reviews, check tables of content, flip through stuff – is the math too advanced? I repeat, for this and all things in life: *You can probably just skip it.*

Heuristics

Now, let me give you some heuristics for deciding what to throw out.

Easy books are often so worth it. A gentle introduction as the first few things you read: keep these, these are a lifesaver.

Hard stuff tends to be overrated and, at the beginning, too hard to process without additional expertise. It’s harder to digest, understand, and remember, a triple penalty. You don’t need it.

Oh, and remember: if at any stage you really need a book or paper again, it’s a download or a library checkout away. There’s a very modest cost attached to accidentally pruning something, so not a big deal.

Another easy way to filter stuff: if it has a ton of citations, keep it. If it doesn’t have a ton of citations, but looks very relevant, keep it. Super-specific, super-relevant papers often don’t get attention from larger audiences, but they can be great. Just one of those might solve your problem.

If a paper is neither super relevant nor has it been cited more than 5 times, get rid of it. On the other hand, if a paper is not super relevant, but has received more than 100 citations, you should probably read it, just so you can understand what it is that other people are talking about.

DO RESEARCH ON your research. Check things you can quantify: is it super long? Maybe you don’t need it, or you can just read a certain

“One of my most productive days was throwing away 1,000 lines of code.” Ken Thompson

¹⁹ I wanted to say like Rome salted Carthage, but that particular story turns out to be a 19th century fabrication.

chapter. Does it have poor Amazon reviews? Toss it.

Check citations, Google for book reviews. Here's a tip (don't make this mistake): parapsychology is not a science. It's about ghosts and extrasensory powers and stuff. Don't read any of that. Popular books can sometimes be good, sometimes horrible. Not that useful of a heuristic. Check author credentials²⁰ – although there are a lot of experts who are terrible at exposition, so this is a noisy signal.

"If anything of the classical supernatural existed, it would be a branch of engineering by now." – Steve Gilham

²⁰ Except for mine. Don't check mine.

KEEP META-ANALYSES. Anything with a large sample size is going to be more useful than anything with a smaller one. Here's a way to think about it: imagine that, for every person included in the study, you have to spend a minute considering the evidence.

So, for a paper on 400 people, that's six and a half hours. For one on 40,000, that's about a month.

In real life you can read them at the same rate, but the amount of evidence in the second one is two orders of magnitude larger, and should be weighted as such.

Only you can prevent yourself from falling victim to scope insensitivity.

A final pass

Okay, let's say that you've done that. You've trimmed, cleaned, scrubbed, and pruned. Do a second pass now that you're familiar with what you've got. Check for resources that are more or less duplicates of each other, (two introductory textbooks?) and pick the best-seeming one.

The goal in this pass is to be more holistic about the whole thing. Try to see where papers fit in with other papers, how the books connect into it. See the big picture. Try sorting by date. Once you've done this and filtered out everything you can, you can move onto the next step.

Creating a reading list

Now, you've got a bunch of papers and a couple of textbooks. You need to organize it all into a reading list. Read this, then that, then this, and so on.

I once read 150 papers on happiness over the course of a summer. How? By reading a couple of them each day, according to schedule. Less work than you might think.

BUT HOW? How are you going to decide what to read when? First, remember that when it's difficult to decide between two things, it's

often because they're so similar.

Fredkin's paradox: The more equally attractive two alternatives seem, the harder it can be to choose between them – no matter that, to the same degree, the choice can only matter less.

With that heuristic in hand, what you want to do is create a system that fosters “success spirals”. You want to facilitate in yourself a belief that you can do it (which you totally can). The limiting factor in research journeys is not brainpower, but motivation and consistency.

Consistency is a separate book and I still haven't figured it out, but you want to break it down into tasks that you're going to do every day. I made it through my last big research session by reading 60 book pages and at least 1 paper each day. You could do something similar.

And if that doesn't sound like how you operate, don't listen to me. Seriously. My way is one possibility among many.

As far as motivation goes, you don't want to come up against papers that are too hard to read or too hard to understand, so save those for when you have a better grasp of the field. In the beginning, focus on the easiest and most relevant pieces of research.

And I mean *easy*. If I wanted to go through a huge tour of statistics, I'd probably start with something like *The Cartoon Guide to Statistics*. Reading too hard or too dense books is a grueling affair, and you need not do it.

If at any point in the whole process, you're like, “Man, this book sucks way more than I thought” just skip it. Alternatively, find a video you can consume. Those are generally easier to understand, or maybe an audio book – whatever works. When I'm really delving into a topic, I like to listen to podcasts about the topic when exercising or doing yard work or whatever. *Do whatever works for you*.

Right, so, place the easy, broad introductions near the front of the list. After or alongside those, place the review papers.

This is sufficient for now. Once you've exhausted those, you should have a good idea of what to place next in the list, so come back then and replan your next assault on the literature. (And, hey, if you did a good pruning job, maybe you won't need to do anymore research.)

Reading and Managing Information

Someone once told me that their graduate advisor explained to them that their duty as a student was like being a walrus, and that they needed to swim through the literature and hope that the important bits would get stuck to their walrus-mustache.

I'd like to pause for a moment and, one, reflect on just what an

awesome metaphor that is and, two, how profoundly wrong it is. Like really wrong. Like Judas killing Jesus level wrong. (But, okay, probably not *that* wrong.)

The mind and memory are not mysterious machines. You don't have to pray that they're going to work. You can find out (and you will find out when you get through the next chapters.)

So, yeah. You're going to swim through that literature, but you're not going to hope. You're going to keep copious notes.

Why people say "works like a charm" shouldn't that mean that something, you know, *doesn't work*?

Reading

I'm going to paper over (heh) a lot of the difficulties and important parts here, so that they can be more thoroughly covered in the other chapters.

But, basically, when reading all of this, there a few things you definitely, seriously, absolutely need to do.

Reading a lot of stuff is mostly about setting some kind of daily page or time quota, and just doing that. Each day. At 60 pages a day, you can absolutely plow through books, but it can be a slog when it comes to dense prose.

You can instead do time budgets, but this is not as effective or motivating. If you're into coffee, pair reading with coffee. If you're into meth, pair reading with meth.²¹

²¹ The number of public intellectuals associated with more-than-casual amphetamine use is higher than you expect.

Highlighting

Okay, I hope most of the material you collected is digital, because you're going to want to be able to virtually highlight stuff and export it as text. That way, you can search through it all later when you need to find something. And, trust me, you're going to need to find something.

For this, I use the PDF reader *Skim*. It's simple, it works, it exports highlights as text. That's all you need. When reading, just highlight the important bits: anything you'd like to remember in the future.

Anything you don't record, you're going to forget.

You should also keep a list of anything that you need to look into later. These are often papers that you'd like to look up. Research is not a linear process. The "collecting information" stage continues during the "doing research" phase.

Chapter Summaries

When reading, your only duty is to pay attention and to highlight. You don't need to do anything more than that. When you're done

with a chapter, you should write some sort of synthesis of that information. A brief chapter summary, maybe with some bullets of the main bits.

These don't need to be as thorough as the highlights but naturally, the more thorough you can make them, the better.

Reviews

When you've finished the book, you should read through your highlights and incorporate those plus these chapter summaries into something a bit larger: what the book is about, along with your thoughts on the book.

Why are you going to go through all this pain? Because once you're finished with reading all the research and six months (or six years) down the road, you're not even going to remember whether or not you've read the book.

So, really, this is the only message you get to send to your future self, along with your highlights, about the book. So I suggest you be pretty thorough: write down what the book was about, what you learned, and what you thought of it.

It's sometimes useful to imagine that you're writing this backwards in time, to somebody smart, but who hasn't read the book. You know, like you, right now, before you've begun.

I think I got this tip from Feynman.

So write down this long-form thing, maybe push it to a blog if you want, whatever. Just do it.

Then, open up a file, in Word or emacs or wherever you write most of your text, and write a brief paragraph about the book, along with its name. What you're doing here, in essence, is creating your own annotated bibliography.

In the future, you're going to be asking, "Wait, what was that book?" and it's going to be useful if you have one of these. I know. I should have made one, but I didn't. These are absurdly valuable to yourself and to everyone who hasn't slogged through the research, so do it. It's not that much work after reading a book, either. Like 500 words. Max.

That's the work flow for books.

Yeah, but what about papers?

With papers, you'll do the same thing, just on a smaller scale: write the paragraph in your bibliography and do the highlights. That's enough. For meatier or mind-blowing papers, do the final long-form write up.

But no chapter summaries with papers. Those are sort of impossi-

ble and also unnecessary. Oh, and you might want to make explicit notes about sample and effect sizes.

Evernote

Finally, take all this stuff and upload it to [Evernote](#) or [Google Docs](#). This way, it's backed up, and you can easily search through it, which you're going to want to do.

Because it's sort of useful to be able to say to someone (for example, in an email) "oh, there's a study on that," but it's better to say, "Ah, there's this study here, and they did this, but I thought this, this, and this. Here are some excerpts." You know, a link, so that they can verify that you're not making it up on the spot. Or mistaken. Lots of people are mistaken. About everything.

Chapter review

Congratulations, you've made it to the end of this chapter, and should have a much better idea now about how to go about a serious research campaign.

But, as I'll reveal in the next chapter, you're almost certainly going to forget 90% of everything you just read here within the next month (and maybe even the next 24 hours). 3 months or so down the line, you may find yourself in a situation where you need a vetted research work flow and, with luck, you'll recall reading this.

If you find your future self in such a scenario, just skip to this section. Here's a summary of all the important parts of this chapter:

- The world is awash in information, so much that you can discover a new species just by browsing Flickr. For any problem, there's some research that you should be taking advantage of.
- Research is much broader than libraries and laboratories. Googling a blind date's name is research, as is reverse engineering your competitor's successes.
- The single most important part of research is finding out the name of what it is that you want to know. If you have the name of a spirit, you have power over it.
- For things you can't Google, like when you don't know the right words, you must rely on human resources: your social network, experts, librarians, and Q&A sites, like [Stack Exchange](#) or [Stack Overflow](#).
- When it comes to learning about a field, use textbooks. That's what they're custom tailored for. If a textbook is too bloated, search for lecture notes.

- Annotated bibliographies and recommended reading lists are rhodium-level precious metals when it comes to amassing a bunch of relevant research.²²
- Throwing out information is important. For each source you decide not to investigate, you're saving hours or days of time. Thus, it makes sense to really consider whether or not something is the worth reading – is it the best source of this information? Is reading it necessary?
- Hard texts are overrated. They're emotionally and cognitively draining, hard to understand, and hard to remember. Avoid them.
- Structure reading of information from easy to hard. As you read, the once hard texts will become easy, you'll have built up knowledge of the field, and will get more out of the text.
- When doing research, keep copious notes. Export highlights as text, write chapter summaries, and write final book summaries. Assume that these documents are all that future-you will retain in a year.
- Remember: plain text is searchable. You can upload your notes to a platform like [Evernote](#) or [Google Docs](#) and have it all at your fingertips.

²² Rhodium, at \$2400 an ounce, is twice as valuable as gold.

Further reading

When it comes to finding information and research methods, I've only scratched the surface – well, okay, we went a bit deeper than the surface. If you Google “how to do research” you'll find a lot of blog posts that cover the surface and nothing more.

But this is only the beginning. Research librarians spend a significant chunk of their lives finding information, and they've picked up a lot of specialized knowledge about the inner workings of libraries, the sort of stuff that you and me aren't privy to (and, frankly, don't want to be.)

The single best guide to library research that I've read is the *The Oxford Guide to Library Research* by Thomas Mann. It covers, in detail, finding the right keywords and subjects, serendipity, along with some information on topics I haven't mentioned, like searching through microfilm. If you're looking for information that's not on the web, this is the book.

After that, *Looking for Information: A Survey of Research on Information Seeking* is the next step, although I must admit that I've only read bits and pieces.

IF YOU'RE INTERESTED in business related research, such as the

answers to questions like, “How much money should I spend on research?” check out Douglas Hubbard’s *How to Measure Anything*. The book covers how to measure things that don’t seem like they can be measured, a message I can definitely get behind. If doing Monte Carlo simulations in Excel to calculate risk excites you, check it out.

“If you don’t know what to measure, measure anyways. You’ll learn what to measure.”

REALLY, THOUGH, the best way to improve your ability to find information is to go looking for it. If an explanation isn’t satisfying, go deeper. When it comes to figuring things out, don’t settle.

In the words of the great mathematician David Hilbert, “[O]ur slogan shall be: We must know — we will know!”

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