INTRODUCTION

Information and Conscientious Organization

We humans have a long history of pursuing neural enhancement—ways to improve the brains that evolution gave us. We train them to become more dependable and efficient allies in helping us to achieve our goals. Law schools, business schools, and medical schools, music conservatories and athletic programs, all strive to harness the latent power of the human brain to deliver ever higher levels of achievement, to provide an edge in a world that is increasingly competitive. Through the sheer force of human ingenuity, we have devised systems to free our brains of clutter, to help us keep track of details that we can't trust ourselves to remember. All of these and other innovations are designed either to improve the brain we have, or to off-load some of its functions to external sources.

One of the biggest advances in neural enhancement occurred only 5,000 years ago, when humans discovered a game-changing way to increase the capacity of the brain's memory and indexing system. The invention of written language has long been celebrated as a breakthrough, but relatively little has been made of what exactly were the first things humans wrote—simple recipes, sales receipts, and business inventories mostly. It was around 3000 BCE that our ancestors began to trade nomadic lifestyles for urban ones, setting up increasingly large cities and centers of commerce. The increased trade in these cities put a strain on individual merchants' memories and so early writing became an important component of

recording business transactions. Poetry, histories, war tactics, and instructions for building complex construction projects came later.

Prior to the invention of writing, our ancestors had to rely on memory, sketches, or music to encode and preserve important information. Memory is fallible, of course, but not because of storage limitations so much as *retrieval* limitations. Some neuroscientists believe that nearly every conscious experience is stored somewhere in your brain; the hard part is finding it and pulling it out again. Sometimes the information that comes out is incomplete, distorted, or misleading. Vivid stories that address a very limited and unlikely set of circumstances often pop to mind and overwhelm statistical information based on a large number of observations that would be far more accurate in helping us to make sound decisions about medical treatments, investments, or the trustworthiness of people in our social world. This fondness for stories is just one of many artifacts, side effects of the way our brains work.

It's helpful to understand that our modes of thinking and decision-making evolved over the tens of thousands of years that humans lived as hunter-gatherers. Our genes haven't fully caught up with the demands of modern civilization, but fortunately human knowledge has—we now better understand how to overcome evolutionary limitations. This is the story of how humans have coped with information and organization from the beginning of civilization. It's also the story of how the most successful members of society—from successful artists, athletes, and warriors, to business executives and highly credentialed professionals—have learned to maximize their creativity, and efficiency, by organizing their lives so that they spend less time on the mundane, and more time on the inspiring, comforting, and rewarding things in life.

Cognitive psychologists have provided mountains of evidence over the last twenty years that memory is unreliable. And to make matters worse, we show staggering overconfidence in many recollections that are false. It's not just that we remember things wrongly (which would be bad enough), but we don't even *know* we're remembering them wrongly, doggedly insisting that the inaccuracies are in fact true.

The first humans who figured out how to write things down around 5,000 years ago were in essence trying to increase the capacity of their hippocampus, part of the brain's memory system. They effectively extended the natural limits of human memory by preserving some of their memories on

clay tablets and cave walls, and later, papyrus and parchment. Later, we developed other mechanisms—such as calendars, filing cabinets, computers, and smartphones—to help us organize and store the information we've written down. When our computer or smartphone starts to run slowly, we might buy a larger memory card. That memory is both a metaphor and a physical reality. We are off-loading a great deal of the processing that our neurons would normally do to an external device that then becomes an extension of our own brains, a neural enhancer.

These external memory mechanisms are generally of two types, either following the brain's own organizational system or reinventing it, sometimes overcoming its limitations. Knowing which is which can enhance the way we use these systems, and so improve our ability to cope with information overload.

Once memories became externalized with written language, the writer's brain and attentional system were freed up to focus on something else. But immediately with those first written words came the problems of *storage, indexing*, and *accessing*: Where should the writing be stored so that it (and the information it contains) won't get lost? If the written message is itself a reminder, a kind of Stone Age "To Do" list, the writer needs to remember to look at it and where she put it.

Suppose the writing contains information about edible plants. Maybe it was written at the morbid scene of watching a favorite uncle die from eating a poisonous berry—wanting to preserve information about what that plant looks like and how to distinguish it from a nutritious plant that is similar in appearance. The indexing problem is that there are several possibilities about where you store this report, based on your needs: It could be stored with other writings about plants, or with writings about family history, or with writings about cooking, or with writings about how to poison an enemy.

Here we come upon two of the most compelling properties of the human brain and its design: *richness* and *associative access. Richness* refers to the theory that a large number of the things you've ever thought or experienced are still in there, somewhere. *Associative access* means that your thoughts can be accessed in a number of different ways by semantic or perceptual associations—memories can be triggered by related words, by category names, by a smell, an old song or photograph, or even seemingly random neural firings that bring them up to consciousness.

Being able to access any memory regardless of where it is stored is what

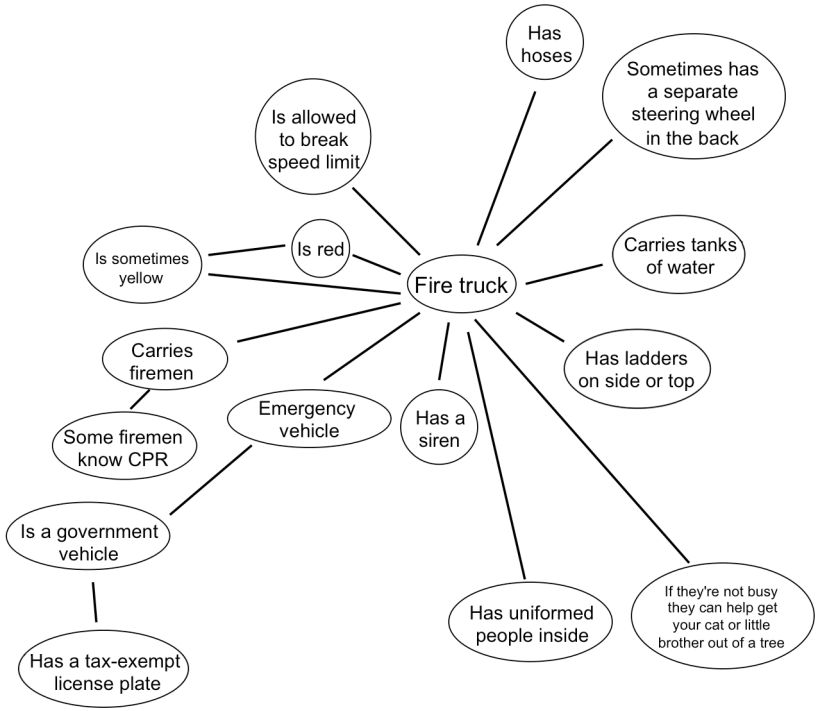
computer scientists call *random access*. DVDs and hard drives work this way; videotapes do not. You can jump to any spot in a movie on a DVD or hard drive by "pointing" at it. But to get to a particular point in a videotape, you need to go through every previous point first (*sequential access*). Our ability to randomly access our memory from multiple cues is especially powerful. Computer scientists call it *relational memory*. You may have heard of relational databases—that's effectively what human memory is. (This is revisited in Chapter 3.)

Having relational memory means that if I want to get you to think of a fire truck, I can induce the memory in many different ways. I might make the sound of a siren, or give you a verbal description ("a large red truck with ladders on the side that typically responds to a certain kind of emergency"). I might try to trigger the concept by an association game, by asking you to name as many *red* things as you can in one minute (most people come to "fire truck" in this game), or to name as many emergency vehicles as you can. All of these things and more are *attributes* of the fire truck: its redness, its emergency vehicle-ness, its siren, its size and shape, the fact that uniformed men and women are usually found riding both in and on it, that it is one of only a small subset of motor vehicles that carries a ladder around.

If you just started thinking, at the end of that last sentence, what *other* vehicles carry ladders (for example, telephone company repair trucks or the vans belonging to window installers, roofers, and chimney sweeps), then you have come upon an important point: We can categorize objects in many, and often seemingly infinite, ways. And any one of those cues has its own route to the neural node that represents *fire truck* in your brain.

The concept of *fire truck* is represented in the picture (opposite) by a circle in the center—a node corresponding to a cluster of neurons in the brain. That neuronal cluster is connected to other neuronal clusters that represent the different features or properties of *fire truck*. In the drawing, other concepts that are most closely associated with a fire truck, and are retrieved from memory more quickly, are shown closer to the fire truck node. (In the brain, they may not actually be physically closer, but the neural connections are stronger, allowing for easier retrieval.) Thus, the node containing the fact that a fire truck is red is closer than the one that says it sometimes has a separate steering wheel in the back.

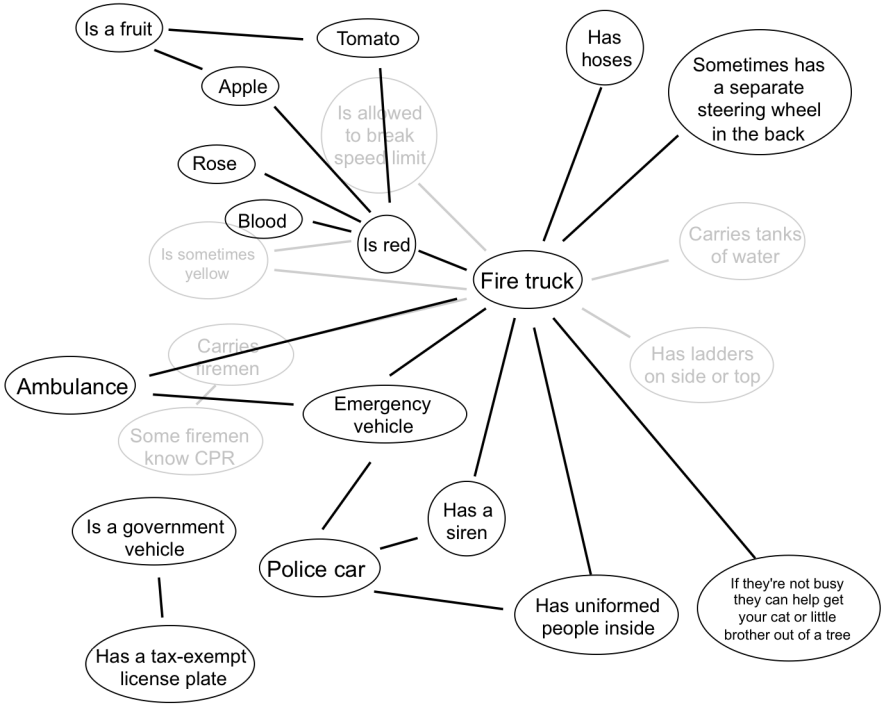
In addition to neural networks in the brain that represent attributes of things, those attributes are also connected associatively to other things. A



fire truck is red, but we can think of many other things that are: cherries, tomatoes, apples, blood, roses, parts of the American flag, and Sun-Maid raisin boxes, for example. Did you ever wonder why, if someone asks you to name a bunch of red things, you can do it so quickly? It's because by concentrating on the thought *red,* represented here by a neural node, you're sending electrochemical activation through the network and down the branches to everything else in your brain that connects to it. Below, I've overlaid additional information that resides in a typical neural network that begins with *fire truck*—nodes for other things that are red, for other things that have a siren, and so forth.

Thinking about one memory tends to activate other memories. This can be both an advantage and a disadvantage. If you are trying to retrieve a particular memory, the flood of activations can cause competition among different nodes, leaving you with a traffic jam of neural nodes trying to get through to consciousness, and you end up with nothing.

The ancient Greeks sought to improve memory through brain training methods such as memory palaces and the method of loci. At the same time,



they and the Egyptians became experts at externalizing information, inventing the modern library, a grand repository for externalized knowledge. We don't know why these simultaneous explosions of intellectual activity occurred when they did (perhaps daily human experience had hit a certain level of complexity). But the human need to organize our lives, our environment, even our thoughts, remains strong. This need isn't simply learned, it is a biological imperative—animals organize their environments instinctively. Most mammals are biologically programmed to put their digestive waste away from where they eat and sleep. Dogs have been known to collect their toys and put them in baskets; ants carry off dead members of the colony to burial grounds; certain birds and rodents create symmetrically organized barriers around their nests in order to more easily detect intruders.

A key to understanding the organized mind is to recognize that on its own, it doesn't organize things the way you might want it to. It comes preconfigured, and although it has enormous flexibility, it is built on a system that evolved over hundreds of thousands of years to deal with different

kinds and different amounts of information than we have today. To be more specific: The brain isn't organized the way you might set up your home office or bathroom medicine cabinet. You can't just put things anywhere you want to. The evolved architecture of the brain is haphazard and disjointed, and incorporates multiple systems, each of which has a mind of its own (so to speak). Evolution doesn't *design* things and it doesn't build systems—it *settles on* systems that, historically, conveyed a survival benefit (and if a better way comes along, it will adopt that). There is no overarching, grand planner engineering the systems so that they work harmoniously together. The brain is more like a big, old house with piecemeal renovations done on every floor, and less like new construction.

Consider this, then, as an analogy: You have an old house and everything is a bit outdated, but you're satisfied. You add a room air conditioner during one particularly hot summer. A few years later, when you have more money, you decide to add a central air-conditioning system. But you don't remove that room unit in the bedroom—why would you? It might come in handy and it's already there, bolted to the wall. Then a few years later, you have a catastrophic plumbing problem—pipes burst in the walls. The plumbers need to break open the walls and run new pipes, but your central air-conditioning system is now in the way, where some of their pipes would ideally go. So they run the pipes through the attic, the long way around. This works fine until one particularly cold winter when your uninsulated attic causes your pipes to freeze. These pipes wouldn't have frozen if you had run them through the walls, which you couldn't do because of the central air-conditioning. If you had planned all this from the start, you would have done things differently, but you didn't—you added things one thing at a time, as and when you needed them.

Evolution has built our brain in much the same way. Of course, evolution has no will, no plan. Evolution didn't *decide* to give you memory for where you put things. Your *place memory* system came about gradually, through the processes of descent with modification and natural selection, and it evolved separately from your memory for facts and figures. The two systems might come to work together through further evolutionary processes, but they are not necessarily going to do so, and in some cases, they may be in conflict with each other.

It might be helpful to learn *how* our brain organizes information so that we can use what we have, rather than fight against it. It is built as a

hodgepodge of different systems, each one solving a particular adaptive problem. Occasionally they work together, occasionally they're in conflict, and occasionally they aren't even talking to one another. Two of the key ways that we can control and improve the process are to pay special attention to the way we enter information into our memory—*encoding*—and the way we pull it out—*retrieval*. This will be unpacked in Chapters 2 and 3.

The need for taking charge of our attentional and memory systems has never been greater. Our brains are busier than ever before. We're assaulted with facts, pseudo facts, jibber-jabber, and rumor, all posing as information. Trying to figure out what you need to know and what you can ignore is exhausting, and at the same time, we are all doing more. Consequently, trying to find the time to schedule all our various activities has become a tremendous challenge. Thirty years ago, travel agents made our airline and rail reservations, salesclerks helped us find what we were looking for in stores, and professional typists or secretaries helped busy people with their correspondence. Now we do most of those things ourselves. The information age has off-loaded a great deal of the work previously done by people we could call information specialists onto all of the rest of us. We are doing the jobs of ten different people while still trying to keep up with our lives, our children and parents, our friends, our careers, our hobbies, and our favorite TV shows. It's no wonder that sometimes one memory gets confounded with another, leading us to show up in the right place but on the wrong day, or to forget something as simple as where we last put our glasses or the remote.

Every day, millions of us lose our keys, driver's licenses, wallets, or scraps of paper with important phone numbers. And we don't just lose physical objects, but we also forget things we were supposed to remember, important things like the password to our e-mail or a website, the PIN for our cash cards—the cognitive equivalent of losing our keys. These are not trivial things; it's not as if people are losing things that are relatively easy to replace, like bars of soap or some grapes from the fruit bowl. We don't tend to have general memory failures; we have specific, temporary memory failures for one or two things. During those frantic few minutes when you're searching for your lost keys, you (probably) still remember your name and address, where your television set is, and what you had for breakfast—it's just this one memory that has been aggravatingly lost. There is evidence that some things are typically lost far more often than others: We tend to

lose our car keys but not our car, we lose our wallet or cell phone more often than the stapler on our desk or soup spoons in the kitchen, we lose track of coats and sweaters and shoes more often than pants. Understanding how the brain's attentional and memory systems interact can go a long way toward minimizing memory lapses.

These simple facts about the kinds of things we tend to lose and those that we don't can tell us a lot about how our brains work, and a lot about why things go wrong. This book is about both of those ideas, and I hope it will be a useful guide to preventing such losses. There are things that anyone can do to minimize the chances of losing things, and to quickly recover when things do get lost. We are better able to follow instructions and plans the more thoroughly we understand them (as any cognitive psychologist would say), so this book discusses a number of different aspects of our organizing mind. We'll review the history of organizational systems that humans have tried over many centuries, so that we can see which systems succeeded and which failed, and why. I will explain why we lose things in the first place and what clever, organized people do so they don't. Part of the story involves how we learned things as children, and the good news is that certain aspects of childhood thinking can be revisited to help us as adults. Perhaps the heart of the story is about organizing our time better, not just so we can be more efficient but so we can find more time for fun, for play, for meaningful relationships, and for creativity.

I'm also going to talk about business organizations, which are called organizations for a reason. Companies are like expanded brains, with individual workers functioning something like neurons. Companies tend to be collections of individuals united to a common set of goals, with each worker performing a specialized function. Businesses typically do better than individuals at day-to-day tasks because of distributed processing. In a large business, there is a department for paying bills on time (accounts payable), and another for keeping track of keys (physical plant or security). Although the individual workers are fallible, systems and redundancies are usually in place, or should be, to ensure that no one person's momentary distraction or lack of organization brings everything to a grinding halt. Of course, business organizations are not always prefectly organized, and occasionally, through the same cognitive blocks that cause us to lose our car keys, businesses lose things, too—profits, clients, competitive positions in the marketplace. In my sideline as a management consultant, I've seen tremendous inefficiencies and lack of

oversight causing different kinds of problems. I've learned a lot from having this fly-on-the-wall view of companies in prosperity and companies in crisis.

An organized mind leads effortlessly to good decision-making. As an undergraduate, I had two brilliant professors, Amos Tversky and Lee Ross, both of whom were pioneers in the science of social judgments and decision-making. They sparked a fascination for how we assess others in our social world and how we interact with them, the various biases and *mis*information we bring to those relationships, along with how to overcome them. Amos, with his colleague Daniel Kahneman (who won the Nobel Prize for their work together a few years after Amos passed away), uncovered a host of systematic errors in the way the human brain evaluates evidence and processes information. I've been teaching these to university undergraduates for twenty years, and my students have helped me to come up with ways to explain these errors so that all of us can easily improve our decision-making. The stakes are particularly high in medical decision-making, where the wrong decision has immediate and very serious consequences. It is now well documented that most MDs don't encounter these simple rules as a part of their training, don't understand statistical reasoning. The result can be muddled advice. Such advice could lead you to take medications or undergo surgeries that have a very small statistical chance of making you any better, and a relatively large statistical chance of making you worse. (Chapter 6 is devoted to this topic.)

We are all faced with an unprecedented amount of information to remember, and small objects to keep track of. In this age of iPods and thumb drives, when your smartphone can record video, browse 200 million websites, and tell you how many calories are in that cranberry scone, most of us still try to keep track of things using the systems that were put in place in a precomputerized era. There is definitely room for improvement. The dominant metaphor for the computer is based on a 1950s *Mad Men*–era strategy for organization: a desktop with folders on it, and files inside of those. Even the word *computer* is outdated now that most people don't use their computer to compute anything at all—rather, it has become just like that big disorganized drawer everyone has in their kitchen, what in my family we called the junk drawer. I went to a friend's house the other day, and here is what I found in *his* junk drawer (all I had to do was ask, "Do you have a drawer that you just throw things in when you don't know where else to put them?"):

batteries

rubber bands

shish kebab skewers

string

twist ties

photos

thirty-seven cents in change

an empty DVD case

a DVD without a case (unfortunately, not the same one)

orange plastic covers to put over his smoke detector if he ever decides to paint the kitchen, because the paint fumes can set off the detector

matches

three wood screws of various sizes, one with stripped threads

a plastic fork

a special wrench that came with the garbage disposal; he isn't sure what it is for

two ticket stubs from a Dave Matthews Band concert last summer

two keys that have been around for at least ten years, and no one in the house knows what they are for (but they are afraid to throw them away)

two pens, neither of which writes

a half dozen other things that he has no idea what they are for but is afraid to throw out

Our computers are *just like that* but thousands of times more disorganized. We have files we don't know about, others that appeared mysteriously by accident when we read an e-mail, and multiple versions of the same document; it's often difficult to tell which is the most current. Our "computing machine" has become a large, inglorious, and fantastically

disorganized kitchen drawer full of electronic files, some of indeterminate origin or function. My assistant let me have a look at her computer, and a partial inventory revealed the following contents, typical, I've found, of what many people have on their computers:

photographs

videos

music

screen savers of cats wearing party hats, or smiling pigs with human mouths Photoshopped in

tax documents

travel arrangements

correspondence

checking account registers

games

appointment books

articles to read

various forms related to employment: request for time off, quarterly report, sick day accounting, request for retirement fund payroll deduction

an archived copy of this book (in case I lose mine)

dozens of lists—lists of area restaurants, university-approved hotels, office locations and phone numbers for members of the department, an emergency telephone tree, safety procedures in the event of various calamities, protocol for disposing of obsolete equipment, and so on

software updates

old versions of software that no longer work

dozens of files of foreign-language keyboard layouts and fonts in case she ever needs to type Romanian, Czech, Japanese, or ancient or modern Hebrew characters

little electronic "Post-its" reminding her where important files are located, or how to do certain things (like create a new Post-it, delete a Post-it, or change the color of a Post-it)

It's a wonder we don't lose more.

Of course, some of us are more organized than others. From the many thousands of ways that individuals differ from one another, a mathematical model can be constructed that accounts for a great deal of variation, organizing human differences into five categories:

extroversion

agreeableness

neuroticism

openness to new experience

conscientiousness

Of these five, the conscientiousness trait of being organized is most highly associated with conscientiousness. Conscientiousness comprises industriousness, self-control, stick-to-itiveness, and a desire for order. And it, in turn, is the best predictor of many important human outcomes, including mortality, longevity, educational attainment, and a host of criteria related to career success. Conscientiousness is associated with better recovery outcomes following surgery and transplants. Conscientiousness in early childhood is associated with positive outcomes decades later. Taken together, the evidence suggests that as societies become more Westernized and complex, conscientiousness becomes more and more important.

The cognitive neuroscience of memory and attention—our improved understanding of the brain, its evolution and limitations—can help us to better cope with a world in which more and more of us feel we're running fast just to stand still. The average American is sleep-deprived, overstressed, and not making enough time for things she wants to do. I think we can do better. Some of us are doing better and I've had the opportunity to talk to them. Personal assistants to Fortune 500 CEOs and to other high achievers keep their bosses working at full capacity while still finding them time for fun and relaxation. They and their bosses don't get bogged down by information

overload because they benefit from the technology of organization, some of it new, some of it quite old. Some of their systems will sound familiar, some may not, still others are incredibly nuanced and subtle; nevertheless, they all can make a profound difference.

There is no one system that will work for everyone—we are each unique—but in the following chapters are general principles that anyone can apply *in their own way* to recapture a sense of order, and to regain the hours of lost time spent trying to overcome the disorganized mind.