"Thought has been the father of every advance since time began."

- Thomas J. Watson, Sr.

"Technology is neither good or bad, nor is it neutral."

-Melvin Kranzberg's First Law of Technology

Introduction: Begin at the Beginning

You don't think the way you think you think.

For that matter, many of us probably never pause to even think about how we think. And if that's the case, we wouldn't notice how thought is changing, abruptly and dramatically.

David Foster Wallace tells a tale-

An old fish runs into two younger fish; he nods, says, "Morning, boys, how's the water?", and swims off. One young fish looks at the other and says, "What the hell is water?"[i]

We can be so utterly immersed in an environment that we don't know the environment is there or consider our relationship with that environment. In these cases, nothing is so invisible as the obvious.

These are two of the things I've learned over the last decade, as I set out to understand how technology affects how we think, and how we think affects our technology. This book shares more of those insights, focusing on our relationship with our self-created environment. It sets out to understand how we think in the modern world.

Thinking is the essence of our lives, but it is rapidly changing, especially as we increasingly outsource thought to the technology around us. We no longer remember our children's phone numbers or endure the arduous effort of dialing it - we just ask our phone to call them. Those children need not turn their head when they drive; they have blind spot monitors and backup cameras. Artificial intelligence agents monitor our communications as we type, highlighting errors, and suggesting the next few words. Or, with the enhanced capabilities of platforms like ChatGPT and others, writing our papers and doing our work for us.

In many American households, you only need conceive of something you want and speak it, and Alexa will have it delivered to your door tomorrow, if not later today. Your day, how

you spend your time, and priorities are often dictated by the various notifications that reach out to you from your devices.

How do we think? How has modern technology affected our thinking? Despite thousands of years of musings and research into the human mind, none of the available models adequately describe the complex processes that modern humans *actually* use to think today, and certainly not the ways we may think in the near future, especially because of rapidly accelerating technology.

While many of us may have noticed certain aspects of this, and wondered how this changing piece or that may affect us, it is a difficult task to consider the whole of the thing, in part because one must look across many different facets of life, and specialized fields of study, some of which seem incommensurate.

This book describes how we think by synthesizing work from multiple fields and approaches. The result is a new(ish), three-part model of human cognition, composed of bits of existing scholarship that each offer partial views, which are then tweaked and stitched together to offer us a more comprehensive model. There is no significant originality in the model itself, other than the integration. There are, however, some novel and useful insights gained from the application of that newer fused model to our modern context.

That is because once we have that model, we are, like the old fish, able to step back and orient ourselves to the larger context and consider how we think in the real world. When we do that from this comprehensive perspective we can see that thinking is changing so quickly and so dramatically that it is accurate to say it is undergoing a 'disruption' - a phase change that towers over the few precedents in human history: bipedalism, tool use, language, agriculture, and symbol use/writing.[1] This disruption can be good or bad for us, but it is one of the most important issues facing humanity today. Worse, no one is talking about it, holistically, or working on it, to help us manage this transition.

One reason we do not sense this is that we are all so specialized today. It is almost literally impossible to step back from our daily lives, our narrow roles, training, toolkits, and perspectives, and sense this bigger thing.

Like the parable of the three blind men and the elephant: one describes a rope (tail), another a tree (leg), and the last a snake (trunk). We all sense one small part of the thing, but not the whole. The neuroscientists, psychologists, archaeologists, and other cognitive scientists that study thinking each see their own part, in great detail. But it is rare for a discipline to reward them for seeing the whole, even from the relatively narrow perspective of cognitive science. The technologists creating amazing new tech see their piece of the puzzle, but they don't see how it affects our thinking, and the unintended consequences.

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[1] These are greatly simplified statements, which will be MUCH more fully developed in the book.

The parents, legislators, social scientists, philosophers, clinicians, and others have their own very detailed but really quite narrow view of the field of thinking as a whole. Each of them struggles to keep up with the knowledge base in their own fields because it is evolving so fast, much less the other fields we will cover in this book.

The goal of this book is to describe how we think, and this transition in how we think, holistically, so we can as a human collective can see the whole elephant. This book is about awareness. Wallace ends his parable by noting, "*It is about simple awareness - awareness of what is so real and essential, so hidden in plain sight all around us, that we have to keep reminding ourselves, over and over: 'This is water, this is water.'*"

This is not a how-to book, full of prescriptions of what to do, though I will attempt to turn a flashlight into those futures at the end of the book.

This is about teeing up the issue. As mathematician and computing pioneer Andrew Odlyzko told me, "*very often the key element in an innovation is to realize there is a problem to be solved, not the technical solution*."[ii]

To put this in context envision the late 1970s discussions on climate change: the discussion was about *if* climate change was happening, and *if* CO2 and other gases played a part in it. They weren't yet talking about sophisticated solutions like carbon credit trading schemes. We see similar problem orientation phases in public issue campaigns, where people need to become aware of the dilemma they are in, before they roll up their sleeves and address it. This can be seen in the evolution of public policy issues like smoking, drinking and driving, civil rights abuses, opioid use, and even concussions in football. Before the solutions can be discussed, we first must understand *and accept* the problem or opportunity we are trying to address. That is the focus of this book.

Who is the target audience? I wrote it for thoughtful people, who want to understand our modern times better, and who is invested in living and maybe building a better future.

It could be a parent who looks at their child's screen time and wonders how it will affect their future. Or the technologist, who is building emerging technologies, and wants to find opportunities to build them in ways that will both outcompete existing technologies and competitors but also leave people and maybe their own children better off. Or leaders in various fields that will be impacted by changing cognition, like national security, education, social justice, or business, trying to understand emerging trends which may affect their missions and stakeholders.

This is not an expert opinion written by one who has figured everything out. I would say that the experience that I and my immediate family have had with technology contains as many missteps as uplifting outcomes. But that is to be expected as we all experience and try to adapt to new things. The key is to learn from those events. My work here is not to tell you

how to be, but to map out how we are feeling our way through this the modern cognitive niche; one we have created for ourselves through technological innovation.

This book requires no existing specialized knowledge; it is so interdisciplinary that it assumes an expert in one area is unfamiliar with the others; therefore, all topics are presented as if the reader may not have experience in the field. Because of the range of fields pulled from in this work, it may feel like we are jumping around a bit, but in my assessment all these pieces need to be looked at to fully understand the current situation.

This is not, at first, an uplifting work. Our societies were facing 'catastrophe-fatigue' even before the pandemic and the recent epidemic of shooting wars.

Even then we had rising social tensions, climate change, economic uncertainty, and other challenges surrounding us. Certainly, now we don't need someone bringing us a new problem, much less one that is, as this book argues, the 'biggest problem facing humanity; one few are aware of and fewer are working on'. It is a bridge too far, the straw that broke the camel's back, etc., etc. It may seem that we just - as a people -don't have the headspace to tackle something this complex and profound.

The complexity of the new problem disorients us, and some people may reject the ideas in this book; frankly, because it requires too much work to understand, and appears to add to the list of already overwhelming challenges we face. This book imposes several intellectual tasks on the reader, something we are not supposed to do as content creators today. And, besides, if this was really important, wouldn't we already know about it, and wouldn't people be working on this?

People are working on this – but they are doing so within their own silos, atomistically. They are talking about shortening attention span, social polarization, unethical technology companies, surveillance capitalism, misinfo/disinfo, and so many other issues. They are working the symptoms and facets, but not the root cause.

But here's the thing: this is not just the biggest problem facing humanity – it is also the biggest opportunity we've ever been presented. We walk around with computers in our pockets that are better than the world's best supercomputer 20 years ago and we have increasing access to much of the world's collected knowledge, most of it for free. Yes, it may be depressing to read about how poorly technology is serving our thoughts and human condition, today. All of this is new, though, and rapidly changing. We can be forgiven for not getting it perfect on our first try.

That doesn't mean we shouldn't step back and look at the broader issue, and not plan a better effort on our next attempt, though.

Knowing and understanding the problems, stated frankly and objectively, gives us new insights into old problems.[2]

Accepting those intellectual challenges does have a reward, however – it shows us new pathways for solving both existing problems, but also to address others that are certain to pop up. It also improves our ability to work together effectively to tackle the other existing challenges of the world. Once the problem is understood and socialized, solutions will emerge that can turn this cognitive transition from a potentially bad thing for humanity into a potentially great thing.

Prescriptions and solutions will be legion, diverse, and come from many corners of our society - *if* they can be catalyzed, galvanized, and harnessed. But we shouldn't enter this fundamental change (to be clear this disruption is shaping the essence of what it means to be human) without a plan, and just bumble through, reactively. We should do so intentionally, with a plan, and have a purpose towards which we work.

In this vein this book is an extremely optimistic siren call, trying to draw us all towards a more flourishing human future that uplifts all of us and our world, in ways that matter to each of us, respectively, and ultimately to all of us collectively, and ideally to the planet.

It is with this context and optimism that I write and present this work. Hopefully it finds a few souls to whom these ideas will resonate, potentially engage, and ideally - inspire.

The book is broken into four parts.

Part 1 is the punchline – the very fabric of how we think is being disrupted. It lays out the most important things I found during my research into how technology affects cognition today. It's like starting a review of the Lewis and Clark journals by answering the questions: did they find the Northwest Passage? What was the *most* important thing they learned or found? Skipping over the details - how or where the trip went, and all the little discoveries found along the way - to get to the good stuff. Part 1 of the book also discusses how and why I think thought is currently undergoing disruption, and why I think this is the most important issue facing humanity.

Part 2 of the book introduces my new(ish) model of human cognition, and a discussion of why a new model is needed. You won't think about thought the same again, after this.

Part 3 introduces some key insights gained from that model, and dives deeply into most of them. This section goes beyond the headline of 'thought is being disrupted' to provide some other important insights and details that help you understand thought in the modern world when you use the model from part 1.

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[2] To understand how perspectives can be radically altered, I highly recommend this very short (<2 pages) but influential article by Aldo Leopold, which can be found here - https://www.ecotoneinc.com/wp-content/uploads/2021/01/aldo-leopold-tlam.pdf

Part 4 looks at how well these dynamics are working for us, signals where some of the solutions will come from, and generally puts a bow on this so that people can hopefully begin to incorporate these ideas effectively into their own life and work.

The parts are not able to stand on their own – I learned this over several virtual book clubs I've hosted over the last two years. It's hard to understand the counter-intuitive and dramatic conclusion that thought is being disrupted, without understanding the model of how we think. Part 1 cannot stand without part 2. The model by itself is worthless, because the value of a model is its utility – how it helps you to understand the world. Therefore, you can't have part 2 without part 3. Et cetera.

Starting with the conclusions may not make sense for some readers – they are so big, provocative, nuanced, and counter-intuitive that it might be hard to understand without the foundational material in part 2. For those readers, you might read part 2 first, and maybe even part 3, before looking at part 1. This is your journey, not mine. To truly understand this conclusion, though, you really need to see the legwork and approach that I took to arrive at it, and that is the rest of the book. In fact, originally part 1 was the last section of the book, so you would understand it in context, after digesting the foundational material. However, it became clear that it was important not to 'bury the lede' at the end of the book. Many folks won't be motivated enough to get through the supporting material if there isn't a compelling reason. Thus, the decision on the current order.

My purpose is not to entertain you and distract you from your life for a few hours. This book will not generate a lot of Instagram followers for me.

My goal instead is to help you understand the problem I've encountered on *my* journey and give you useful notes to work from so that you can understand the nature of the problem from *your* perspective. But reading useful notes takes some work. Reading the book may seem even more challenging because it draws connections between very different fields; experts in some areas will need to get up to speed in other areas. People unfamiliar with many of these areas have even more work to do. Therefore, when I introduce a topic, I try to provide enough context so that people that are new to it will be able to understand it. There is no easier way to introduce and engage with this highly interdisciplinary tapestry.

Like any good story, this one is full of danger and existential threats. I have no doubt that when you finish this, you will be more afraid of technology than you are right now. But, if you squint, tilt your head, and look at the material in a different way, you will see that I'm writing a love letter to technology, our modern way of life, and potential human futures. It's just that work needs to be done to get them to play together as well as they could, and to yield desired outcomes.

Let's get started.

(Reviewer note – this section is rough, and will be vetted in a separate phase' additional citations are needed in many places)

Introduction

[i] https://fs.blog/2012/04/david-foster-wallace-this-is-water/

[ii] private communication.