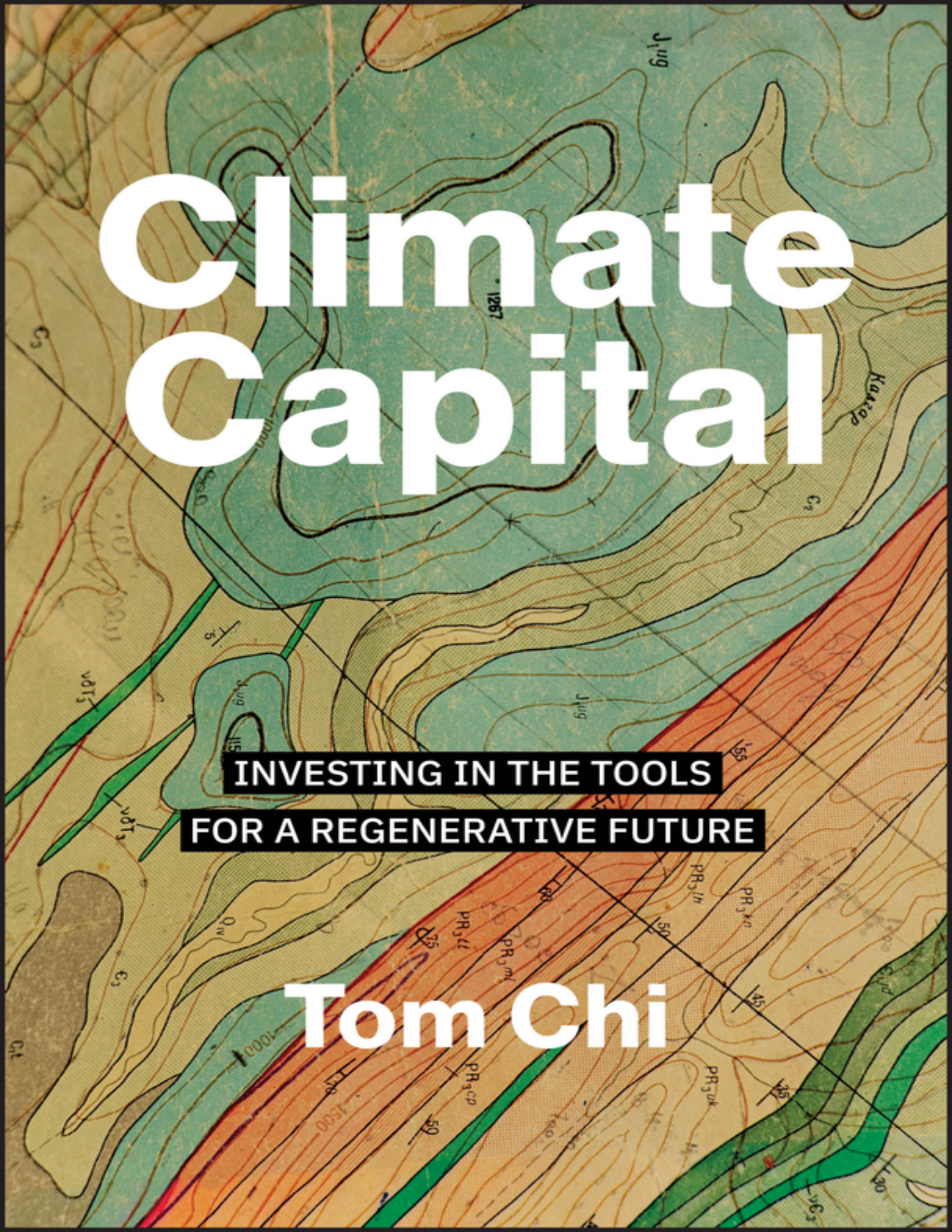

Climate Capital
INVESTING IN THE TOOLS FOR A REGENERATIVE FUTURE
Tom Chi

Table of Contents

Praise For *Climate Capital*

This is the rare book that translates complex climate solutions into actionable practice. Chi doesn't just challenge conventional thinking; he enables the work of creating the future.

—Bola Olusanya, Vice President & Chief Investment Officer, The John D. and Catherine T. MacArthur Foundation

Tom Chi is singular in his ability to think across disciplines and scale solutions that match the complexity of our ecological predicament—from prototype to planetary scale. *Climate Capital* is a masterclass in systems thinking, deep pragmatism, and visionary investing.

—Tristan Harris, Cofounder, Center for Humane Technology

Chi cuts through the noise to highlight what it takes to build and scale climate solutions. *Climate Capital* is an innovator's roadmap for building a sustainable future that will define jobs, economies, and resilience in the decades ahead.

—Jeff Johnson, General Partner & Head of Energy & Resilience, B Capital

Tom Chi understands deeply that the conflicts of our world don't have to be destructive. Just as my home, Taiwan, was formed by the friction of tectonic plates, this book demonstrates how to transform the friction into fuel for cooperation.

—Audrey Tang, Taiwan's Cyber Ambassador and 1st Digital Minister

As our #1 rated mentor at Unreasonable Group, Chi has enabled a community of hundreds of entrepreneurs around the world to scale innovations that provide the foundation for a regenerative economy. This book is a treasure of tools that move beyond why—to how.

—Christiana Musk, Chairwoman, Unreasonable Group

Beautifully written with meaningful tech insights by a master!

—Daniel Goldin, 9th NASA Administrator

Tom's fabulous new book gives us a critical and catalytic playbook for how humanity can become a “net positive” force, leaping beyond sustainability toward a regenerative relationship with nature that delivers profit, risk reduction, restoration and resilience if we invest with a full stakeholder, full systems, full utilization of disruptively better tools recently available to us approach.

—Jane Woodward, Managing Partner, WovenEarth Ventures & Adjunct Professor, Civil and Environmental Engineering, Stanford University

Tom is one the few people who truly understands technology, capital, and Nature deeply. Anyone tired of the traditional silos and seeking a more natural and integrated approach to building solutions will love this work.

—Marcius Extavour, Partner, Ode | Founder, Extempo Media

As a venture capitalist for over 35 years I have worked with some of the most brilliant minds in the world. Tom has the unique skillset of taking the most complex problems and distilling them down into a simple and digestible format for the layman. Putting Tom's brain trust behind the largest problem in the world facing humanity—climate change—is a blessing and win for humanity.

—Eric Chin, General Partner, Crosslink Capital, Cofounder, Alpha

The same quiet, powerful principles that bring life back to our soil hold the key to regenerating our world, a truth Tom Chi brilliantly lays out for our entire economy. He provides a common sense blueprint for the most important work of our lives; creating a world of true abundance for the generations to come.

—Gabe Brown, Regenerative Rancher, Cofounder of Regenified, and Author of Dirt to Soil

Tom Chi is a visionary with no patience for fantasies. *Climate Capital* is a deep look into the physical and economic reality of the climate crisis. Chi brings a unique understanding grounded in his experience and success as both a scientist and a businessman. The result is a refreshing perspective that encompasses both the monumental size of the problem and a realistic approach to addressing it. After reading page after page of Chi's insights I am more optimistic than ever that we can solve the climate crisis. The

solution is not about assessing blame but using efficient capitalistic means to achieve goals that everybody wants.

—Bruce A. Brown, JD, CFA, CAIA, Head of Strategic Climate Initiatives, New Mexico State Investment Council

Climate Capital

INVESTING IN THE TOOLS FOR A REGENERATIVE FUTURE

Tom Chi

WILEY

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

The manufacturer's authorized representative according to the EU General Product Safety Regulation is Wiley-VCH GmbH, Boschstr. 12, 69469 Weinheim, Germany, e-mail: Product_Safety@wiley.com.

Library of Congress Cataloging-in-Publication Data is Available:

ISBN 9781394351244 (Cloth)
ISBN 9781394351251 (ePub)
ISBN 9781394351268 (ePDF)

Cover Design: Wiley
Cover Image: © Виктория Котлярчук/stock.adobe.com

Author Photo: Courtesy of the Author

To my parents, who, along with many immigrant families, taught me that life is created in the build

Introduction

I've had a long career in technology as an inventor, designer, engineer, leader, and executive. I've worked on products and technologies that changed a lot of how the modern world operates, including Microsoft Office, web search, the early social web, and self-driving cars. In 2006, when I started making an executive salary in Silicon Valley, my partner suggested we get a vacation home in Hawaii. We found a modest place in the jungles of the Big Island; it was a two-minute walk from our front door to an astoundingly beautiful coral reef.

Many of my days in Hawaii were spent on this reef. It was vibrant—bursting with life from every pocket and pore on a foundation of colorful corals in oranges, yellows, browns, and blues. The volcanically heated groundwater seeping out from the island floated on top of the cold ocean water and created a light-bending reflection where you could see a mirror of the reef below when you looked at the right angle through the warm layer. The effect was like being immersed from all sides in the exquisite beauty of one of the most biodiverse settings on Earth. Even better, because I snorkeled, I didn't generate any sound when I stopped swimming. This meant I could take in the full 360-degree symphony of the reef—the shimmers, the clicks, the hearty crunch of a parrotfish taking a bite.

Many people who get to visit a coral reef describe a similar sense of wonder and awe, and while this feeling never faded for me, the fact that we lived next to a reef made it feel like an extension of our neighborhood. Just as I knew my human neighbors, I got to know where specific individuals of the reef lived and had the same wary curiosity as my aquatic neighbors when a new group of fish or an eagle ray was passing through from out of town. My friends on the reef became dear to me, as any beings you spend enough time with often do.

So it was a devastating heartache in 2011 to watch it all die in front of my eyes. In less than two months, it went from a bright beautiful paradise home to so many aquatic friends, to gray, brown, and devoid of life, The buzzy sounds of the reef had faded to silence—just the distant sound of wave action. Like swimming over a graveyard.

What I had witnessed up close was a mass bleaching and reef collapse event. I don't know how to express the feeling of losing a place like this other than saying it left a hole in my heart. As a former scientist (I was an astrophysicist for six years studying active galactic nuclei and star-forming regions in the infrared), I reached out to other scientists to understand what had happened. I ultimately connected with about two dozen marine biologists and coral scientists and learned that the bleaching that killed our reef had been caused by thermal stress, and such events would happen with accelerating frequency on a warming planet.

This group of scientists taught me that when water temperatures get too hot, corals expel the symbiotic algae living in their tissues. These organisms (zooxanthellae) contribute most of the color of a coral, so losing them causes corals to turn white, which is why what happens is called “bleaching.” These bleached, stressed corals are extremely vulnerable to dying because they are starving: 80+% of the energy that nourishes corals comes from photosynthesis done by these symbiotic organisms.

If the water doesn't cool back down within two to three weeks, you'll see mass die-off of these bleached corals, which, depending on the reef, may have taken hundreds of years to establish. Shortly after die-off, the reef ecosystem collapses. Depending on its nutrient levels, the ecosystem may experience algal overgrowth, blocking future recovery. I saw this play out over about six to eight weeks, starting with the bleaching in a few corals then spreading en masse as the unusually hot water temperatures were not reducing in time. After bleaching, the coral has almost no energy to care for itself; it turns from a bright bleached white to duller grays as it dies and then to a bit brown with algal overgrowth. Beyond all this, the coral scientists also informed me that what happened on my reef wasn't at all isolated. It was happening around the world at massive scale, and the consensus among these two dozen scientists was that we were on a trajectory to lose most reefs on planet Earth by 2050. Likely coral reefs as an ecosystem would be extinct before the end of the 21st century. If we allow this to happen, we will immediately lose 25% of all known ocean species, as they live directly on the reef. That 25% is likely a low estimate, as more species that don't live on reefs year-round will perish, because their food sources or reproduction cycles depend on reefs.

Hearing this expanded the grief I felt for our reef to a sense of growing grief for all the world's reefs—for the hardships they would face on this march to extinction, for the beauty that would be lost to this planet and to all future generations. I wanted to find a way that we could change course, to preserve even a tiny, biodiverse fraction so that there'd be hope for long-term recovery.

Oceanic warming is happening so much faster than international scientific bodies, specifically, the UN's Intergovernmental Panel on Climate Change, had anticipated. Current reality is at the very ceiling of what was modeled as possible in this time frame. Beyond what has already happened, their models lay out warming scenarios as a function of how we handle the coming decades, centered around how different levels of emissions would affect average global temperature rise. Their work also comes with the admonition that exceeding 1.5°C (in 2025 we are currently passing this mark), for an extended period would likely drive large-scale disruption of global systems. The scenarios beyond this—2°, 3°, 5°C—are all intensifying flavors of chaos, blowing past important tipping points. But what I learned from our reef is that this way of communicating the effects is tragically incomplete.

When I looked into the numbers on warming, I realized we had been focused on the wrong metric. It's not that average warming is unimportant to track, but the big dangers from climate change weren't being driven by a year-round 1–2°C increase in temperature; those dangers came from the widening range between the upper and lower bounds that the temperature could reach at different times in a year. This is a figure that is much better tracked by measuring volatility. To illustrate what I mean, a 1°C increase in average temperature for a particular spot on Earth might practically mean 6°C hotter in the summer and 4°C colder in the winter. Many organisms can survive a slight and steady increase in temperature, but far fewer can function well when the highest highs and lowest lows increase in intensity.

The large-scale death of ecosystems, massive human displacements, and avoidable deaths are all driven by the upper and lower extremes, not by the average temperature, so the risk to the planet is not described sufficiently by average temperature increase alone. This volatility is also not restricted only to temperature in its felt effects. Differential warming leads to changes in atmospheric circulation that dramatically change the precipitation profile

(rainfall, snowfall) of nearly every spot on Earth. When your spot on Earth typically gets rain and suddenly that stops, it's a huge issue. If your place on Earth never got much rain and now it's deluged, it's a huge issue. After realizing that volatility is the killing edge of climate change, I renamed the overall process “climate destabilization.” This is a simply more accurate way to describe what is happening and what we can expect in nearly every region on the planet over the coming century.

As I reviewed the numbers, I realized that volatility was not only increasing, but its rate of increase was faster than the rate of average temperature increase. For this reason, we are experiencing life-disrupting impacts from climate destabilization far sooner than many predicted. We need to monitor the right metrics if we're going to take a good look at possible futures and meet the challenge skillfully, and volatility is one of the key metrics that needs to be elevated to the top of the conversation.

These calculations were done in early 2012, a few months after our reef died, and it was a substantial departure from the conversation at the time. This was still three years before the Paris Climate Agreements were signed, and at that time, we spoke of the impacts of climate change primarily in terms of having more frequent and violent hurricanes. But following my volatility assessment, I realized we could be experiencing far more disruptions: floods, droughts, and fires, much sooner—likely within 10 years.

In other parts of my professional life, it has been rewarding to interpret data well; it was little consolation, however, that 8.5 years later, I found myself struggling to do chores in unbreathable air as dark orange skies hung over San Francisco for almost a week. These were created by record wildfires that vaporized entire towns in a day. Not to mention record floods, droughts, storms, and loss of lives, property, and infrastructure. Of course, I didn't know all that staring at my calculations in 2012. The conclusion I came to was troubling conclusion to, but it didn't seem impossible given how rapidly I had seen our reef die. So I had to ask myself: Do I believe my own calculations? And if I really did believe them, what to do about it?

When I looked around at our progress on climate in 2012, I was dismayed, both by the limited successes of those efforts relative to the scale of the problem and by the fragility of theories of change. While I support folks

protesting and trying to elect candidates who take action, it doesn't seem to be a stable way to get the important changes done. The level of conversation that happens in politics tends to be simplified for mass media and is underdetailed compared to what information we need to skillfully address the problem. Furthermore, in one cycle, you can elect a candidate who creates the largest Marine Protected Area in history, only for the next president to undo those protections. One can make progress, but it's unstable, and we hope that through enough elections, enough of the important changes stick.

Another theory of change is scientists publishing their best understanding of climate and ecosystem breakdown. Although this is necessary, it is not sufficient. While this is the right level of detail to study the problem, it doesn't drive the further discussion around solutions in a coherent way. Science and engineering are not the same discipline. It takes a very different set of conversations about engineering to talk about how we upgrade our industrial systems to eliminate harmful emissions. The task of explaining science well to the public is important and noble, but the subset of the public that will step up to practically solve the problems through engineering, system design improvements, and financing need a different and more detailed conversation.

One of the core skills of any executive is assessing whether a team, given current resources and available time, will be able to meet its goals. My assessment of our societal climate response in 2012 was that we did not have the right people working in appropriate ways to meet the scale of the challenge in any time frame that could avoid global mass extinction and significant degradation to human life. And this led to a critical decision point in my career. I'm someone with good technical and leadership skills, and it was clear that the critical work to avoid mass extinction included the expansive effort of technically upgrading our most damaging industries to be compatible with a healthy planet. Many may believe it is delusional to go after a goal so large, but my history in shipping technology with global impact made it seem at least somewhat possible, and really, how could I know if I didn't even try? Unfortunately, doing so required me to walk away from an incredible job working with a team that I loved to enter the wide unknown of the unsolved, but hey, when the stakes are this large, it would seem more irrational *not* to try.

Regardless of who and where you are in this world, we are all facing a transformative century ahead. We've already locked in at least another half century of destabilization based on greenhouse gases already emitted, so our physical landscapes will be transforming from destabilization—whether that is floods, droughts, fires, unbearable heat, or ecological collapse. For others, the big transformation will come from changes to work and the economy, driven by AI and robotics taking over much of the repetitive cognitive and physical labor that currently drives a large fraction of employment. Basically any setting where automation would be more economical will probably get filled in.

Outside of these mounting disruptive forces, we are also at a pivotal moment in human history where we recently developed the ability for anyone to digitally connect with anyone else in the world, and it holds the potential to help build a peaceful and prosperous global civilization for the first time. This of course is not guaranteed at all—especially if the channels of communication are hijacked primarily for commercial or political benefit. Regardless, this century still holds the huge promise to rise to this challenge and use the tools and technologies we now have to imagine and experiment, so we can start creating the world we want.

My formal training and career have provided me with a pretty good view of the technological and environmental changes ahead. I spent much of my career as a technologist and inventor advancing the frontiers of robotics and AI as well as building and shipping technologies that I've seen transform the world (web search, email, self-driving cars, etc.). I've developed these technologies up close, designing hardware and software systems directly, as well as later driving strategy and team operations as an executive leader. I'm now making use of that experience to run a venture capital firm that focuses on *helping humanity to become a net positive to nature* by reinventing the industrial economy to be compatible with (or generative to) nature. This work has given me a front-row seat to both the damage we are doing to the biosphere and an advanced look at a suite of technologies that might be a part of changing that course.

I've written this book to attempt to address the promises and challenges of the present moment and to share some tools that might help us step up to meet them. In this book I hope to get you ready for the challenges that the 21st century will present. Through an examination of the challenges, a

quick assessment of the dynamics that create the challenges, and a demonstration of the perspectives and tools that can make a difference, my goal is to inform and empower you with practical skills for the century and civilization we can collectively create. This book isn't just for entrepreneurs, businesspeople, or those who are actively working in the climate space. This is a book for everyone to see how you can make a difference in shaping and revitalizing our world. Whatever field you're in—business, teaching, nonprofits, the arts, service—you can be part of a community that will help use our collective abilities and wisdom to put our planet and economy back in balance.

A lot of technologists will focus on the technology discussion, and while there's plenty to say here having built and shipped tech to billions of people in my career, I believe the coming decades have too much volatility to be well predicted and that most technological discussions are not particularly empowering to folks that don't directly build tech. It's also easy to fall into naive optimism or existential despair in such conversations, both of which I find to be pretty ineffective for problem-solving. I also don't think they will be the most important tools to solve the problems of the 21st century (especially because some of the tech will be creating the problems). What we need are skills that make a difference for the big challenges ahead that can be used by most people to help the people and situations that matter most to them. Given that the breakdown will happen nearly everywhere, the solutions will need to happen nearly everywhere as well.

There are four skills I'll focus on—the 4Cs—that will be central to our work going forward. They are critical thinking, creativity, compassion, and community. These are skills that will be more important in an automated world both because they are incredibly powerful and because their application is notably nonrepetitive, and they are more meaningful when done by a human. Although the skills support each other and are often used in tandem, it is useful to examine each separately to discuss more clearly how to use them effectively. I know from having worked on many robotic and algorithmic systems that these are the skills that are much harder for machines to do well—especially when we gain some experience in them and understand their full power to solve problems and change systems. In this book we examine each skill in detail, how each works, and how each

can be used toward challenges big and small, including the existential challenges ahead.

This book is intended to be practical but may feel optimistic, simply because it posits that our problems actually *can* be addressed and substantial improvements to life *can* be fought for and achieved. It is also realistic in that I do not shy away from the hardships that will be felt by so many people and the biosphere in the coming decades. All that said, I don't assume we have to let everything fall apart. That is a lot more hope than many people are working with at this moment. Ultimately, we will see that there are no inevitabilities in the path ahead, but there are big challenges with profound stakes. A book can't solve everything, but I hope it provides more people with the skills and tools to see that they can take part in meeting the challenges that are most important to them and inspires them to share any progress to help others. With skills we gain choices.

One choice is to allow runaway feedback loops, whether in climate or technology, and watch helplessly as we lose much of our ecological, economic, and societal stability. The other choice is to be an active creator of possibility and improvement in the spheres of life that matter most to us. If enough of us make that choice, then we have a shot at a century that creates a generally peaceful global civilization that is on the path to deep repair and a flourishing of the biosphere (us included!).

Many of us don't feel like we have much choice or agency in the path ahead, but I hope to change both that feeling and that reality back toward one of maximum agency—to build what truly matters to us. It's important to state up front that we won't likely be able to repair all the damage we've done to nature in our lifetimes. We may spend our entire lives working toward that goal with the result that the health of the planet will be worse off when we die (although substantially less bad than it could have been). Our fastest timelines to get to net negative emissions as a civilization are still decades off, and we have decades of historical overage to overcome. But that doesn't mean we give up—really quite the opposite. Some goals that matter take more than a lifetime. Think about the folks who pushed for civil rights, the abolition of slavery, gender equality, democracy movements, or the many other causes worth fighting for over generations. It was not completed within just one job, or one lifetime, but over multiple lifetimes. Even though they could not see all the benefits within their

lifetimes, these folks did not waste their time working as hard as they did, because everyone since has benefited profoundly.

This is the invitation we have before us. And whether you come to this because of grief or optimism, it is time for us to develop the skills for the “deep solve.” Something worthy of the magnitude of the problems and worthy of the magnitude of world prosperity we could create together. I'm trying to do this in my own ways, and while I hope to share and teach some useful ideas, I'm on this journey along with everyone else trying to change the course of the future. Since those weeks of heartbreak watching my reef die, I have founded a team that has built the first robot in history to plant live corals back into a reef (off the coast of a Hawaiian coral protection lab), and we've modified it to be able to restore seagrass beds as well (one robot can plant 10,000 seagrass seeds per day). It's a cheap enough robot and plants fast enough that the platform could someday do region-wide restoration of undersea environments. Its existence gives us options we didn't have before, and each of us will need to step up and repair the pieces of the world closest to us. Doing so will take all the skills we have, plus some we'll develop along the way, but we'll never know if we could have made the difference if we don't give it a shot. Let's go.

PART I
The Challenges We Are Facing

Chapter 1
The Challenges

The 21st century has begun in a tangle. As a species, we are more technologically interconnected than at any point in history, and yet in many ways we are more disconnected than ever. Our approach to industry has demonstrated incredible scale and prodigious output, to the point where some parts of the planet are mired in waste and overconsumption while our climate system is destabilizing. Our financial systems and economy, which are our main means of global organization, are strained to the point of dysfunction, and we have become inured to the fact that major economic collapse occurs roughly once a decade. Work, once laid out as the most reliable path to dignity and stability, is becoming uncertain for millions.

What we are experiencing is not a single upheaval. It is the convergence of multiple, deeply interconnected ones:

- AI and robotic automation are no longer nascent technologies, and their accelerating adoption is driving a fundamental reevaluation of labor (what we work on), cognition (whose thinking shapes it), and agency (who gets to decide what is done) as they challenge core assumptions of our current systems.
- Climate change is not simply a problem of average temperatures increasing but a volatility crisis. Each spot on the planet is going through larger and more unfamiliar swings in temperature and hydrology that will drive a system-wide disordering of the environment we depend on.
- Our economic systems, which still run on mental models from the Industrial Age, are out of sync with the limits and needs of the biosphere. These dislocations[1] are being preyed upon for political gain[2] and are driving further political and social instability.[3]

Ultimately these many upheavals come from our choices. They are symptoms of a design failure—a civilization built on partial or clouded

understanding. We have treated the health of nature as an externality, labor as interchangeable and disposable, and technology as neutral. Each of these misguided assumptions now threatens our collective future.

Yet against this backdrop, this is not a book of despair. Instead it aims to provide clarity, tools, and agency for the century ahead. The systems that got us here were all designed by people, and that means that any and all of them can be redesigned. I personally know many of the people who designed technological systems that make up our digital infrastructure and run the current moment. Although there are some virtues in what we as technologists have built, there is clearly the need for a lot of improvements.

This moment feels existential because we are at the end of running systems that cannot sustain themselves. But such moments are the beginning of a new conversation, of new design, of changes aimed directly at the world we want—and I hope to have as many people as possible gain the skills to be active shapers of the changes that are important to them.

Ultimately we will need to design a civilization that works with nature, not against it. To design an economy that provides broad opportunity[4] even as the form that work takes continues to evolve. And to design political structures that are a culmination of collective human wisdom and possibility.

No one has a complete blueprint for the future. But we do have the power to ask better questions, to listen more deeply, and to design more wisely. This book proposes ways of thinking—and, more important, ways of doing—to meet the profound potential of this moment. Whether we hoped for this or not, we are the generations that must step up to this responsibility, and the decisions we are already making will reverberate for millennia. It's time to become the generation that is ready for that responsibility.

AI, ROBOTICS, AND THE FUTURE OF ECONOMICS

As we sit in the first half of the 21st century, we are in the process of another transformation ushered in by new technology. The last 50 years has seen in breakneck succession the rise of the personal computer, internet, cell

phones, mass digitization, software for every imaginable application, the upgrading of physical industry through sensing and robotics, and now the upgrading of cognitive industry via artificial intelligence (AI) and agentic tools.

My life almost perfectly overlaps those 50 years, and in my 30+ years in the technology industry, I've been fortunate to contribute to hardware, software, design, and architecture spanning all these major technical transitions. We are in the early days of the last two, but they have been driving a lot more anxiety than other recent waves of technological change.

In some ways there is no real difference between AI and autonomous robotics and the many other tools and technologies that have preceded it. Technologies magnify our ability to carry out intentions, and AI and robotics absolutely are able to do this. Technologies also tend to be designed for reliable utility for their chosen task. Whether you are pressing play on a Walkman or asking a voice assistant to pause a track, the technology should work reliably. Reliability has allowed a type of cognitive comfort with the role of such technologies. A toaster toasts. A scooter scoots. For most tools and technologies we use daily, we can see exactly their intended use and can quickly assess the general bounds of their capabilities.

Herein lies one of the first departures of this latest round of technologies. Autonomous robots like the self-driving car carry out sophisticated actions and reason through complex environments without having the flat cause/effect reliability of most technologies. Generative AI systems often synthesize unexpected combinations that will sometimes meet our expectations and other times confuse or defy them.

When a being does something unexpected, or reasons through situations without much input, we tend to ascribe consciousness and agency to the being. Of course we do, because throughout our biological history, it has always been a correct assumption whenever we've had that experience. Whether the behavior came from your pet dog or a remote coworker, it's the right assumption that the other being is conscious and employing agency in the process of doing something capable or unexpected.

Furthermore, ascribing consciousness and agency is actually a bit comforting to us. We have a lot of practice interacting with other conscious

beings, so making this assumption is also a way of trying to interact in a way we are well practiced in. A person who speaks one language well and another poorly might try to speak to a stranger first in their stronger language just to see if they can understand in the language the person is most fluent in. We are highly fluent in the interactions between conscious beings.

As someone who has built these tools and contributed to widely used versions, I can tell you this: The assumption of consciousness is not correct.

While the outputs of each type of system (whether it is rules-based, inference-based, reinforcement, reasoning, or generative) can sometimes be surprisingly interesting or successful to the task, the architecture of any approach also create large regions of what is technically impossible for a specific system: limitations that actual humans and other conscious beings do not have. For example, a large language model asked to explain the physics behind a phenomenon could grab and remix what others have written about the topic, but it doesn't reason from an understanding of the internal structure of physics; it just tries to surface enough relevant text for you to work it out. This lack of understanding doesn't prevent us from wanting to communicate and relate to these technologies as if we were talking to a physicist, and that difference between the desire and reality will always generate errors. We may even interpret that experience as one where we seemed to be interacting with a conscious being. Again, our bias is that if the technology can interact in a manner we are already fluent in, we tend to prefer that.

The effect is not widely different from that in a well-established field: ergonomics. In this field we study the range of human motion: What actions are comfortable? Which are stressful? How should the design of physical things be put together to work well with most humans that will need to physically interact? The leap here is that AI and robotic tools enable a mentally ergonomic interaction with our consciousness. A table or chair feels comfortable when it is well designed for the human body, and an AI system might feel conscious to us when well designed for comfortable interaction with the human mind.

When I was at Google X, I was part of the leadership team and ran the group that developed all our product experiences, including the experience

of the self-driving car, which has since spun out of Google and is currently known as Waymo. Having led many software and hardware efforts in the past, I was well accustomed to designing, testing, and iterating on regular tools and technologies across a wide variety of domains, spanning from search engines, productivity software, to advanced hardware work in interactivity, robotics, and sensing. Because what's common to all these tools is that people use the tool to get a task done, we can conduct user research on how successful they were in doing the task. By comparison, with the product experience of a self-driving car, the passenger is succeeding at the task of going from point A to point B, but they have no “driving” task. As such, without a task to complete, assessing the usability and success level with typical study design was going to give us nothing.

So we designed an entirely different approach to testing.

We had a summer intern from Rosalind Picard's group at MIT Media Lab, which specializes in affective computing, the discipline of assessing and factoring in human emotion (aka affect) into how digital and computation systems work. Our intern was one of the world experts[5] in using a combination of galvanic skin response, heart rate and variability, facial microexpression analysis, and more, to triangulate what people were feeling about a situation without them needing to verbalize directly.

This meant that even if people did not have to do the driving task themselves, we could learn a lot about how they were experiencing the technology. One early result was eye-opening. You see, when you have a car that is updating its understanding of the world 60 times a second and can make control decisions on how to steer 10 to 30 times a second, then it's not that hard to do something that we thought would be amazing: to drive a perfectly smooth trajectory in the center of the lane with absolute minimum deviance.

But when we tested such a system, we realized quickly that it created massive stress for riders. Why? Well, a steering wheel that is making little robotic driving adjustments 10 times a second, even if the ride is smooth, visually looks like a steering wheel that is shaking or jittering. When a human is driving, the only situations in which a steering wheel is shaking or jittering are ones where there is either a serious mechanical problem or an extremely anxious driver. Neither situation is safe or comfortable. On the

flip side, user responses made us realize that if we were thoughtful about those visual and kinematic experiences, then we could inspire comfortable or useful experiences for riders.

We came up with the idea of robotic choreography. Choreography is the discipline of using motion to inspire emotion. We recognized that the motion of a car you are in absolutely can inspire emotion. Imagine the difference in feeling (even with your eyes closed) of riding in a car driven by an extra-careful grandma, versus a professional limo driver, versus an NYC cab driver. The difference you feel in that motion inspires differences in emotional response.

We realized that in the future we might teach robots to move like us, or move in ways that are akin to conscious beings we are familiar with (e.g., cab drivers). By doing so, we would simplify the cognitive and experiential interface between the person and the many lines of code and robotic sensor and control systems that were directing the driving. The task of making our tools relatable and approachable is foundational to the task of making a technology useful.

Given this, I see value in anything that humanizes technology so it works better with what we are foundationally and who we hope to become. The risk, of course, is that if we mistakenly believe that these technologies already are conscious, we will absolutely make mistakes as we find out they are not. We will put technologies in settings where they are inappropriate to the task, and as a result there will be loss of reputation, of finances, and of life. As of mid-2025, when I am penning this sentence, it's clear that this string of errors has already started in earnest.

This is a decidedly different danger to AI from the one that has absorbed so many imaginations, which is that we will soon achieve true AGI, or artificial general intelligence. This is the state when our AI system possesses “human-level” (or greater) intelligence, meaning the system can perform any intellectual task that a human can: learn, reason, adapt, and solve problems across domains.

I'm a skeptic on this, but I do believe we will soon achieve systems that *feel* like AGI. That danger is very real; it's just a different danger from actually achieving AGI. If you had an iguana that looked a bit like a dragon, you could easily imagine that it would grow up to be a dragon and gobble you

up. But if it's not actually a dragon, you might make fatal mistakes assuming too much of its future capabilities. You might, for example, spend trillions of dollars to be the first nation to breed many iguanas or put iguanas in charge of your national defense, expecting them to be dragon strength soon. And these mistakes could be just as dangerous to your world as the fabricated fear of dragons would be.

That brings us to this moment in history. Even without being conscious, AI and autonomous robotics are at the point where they can displace large swathes of the current job market—specifically the jobs that feature repetitive physical or cognitive labor. This may come in the form of a complete one-to-one replacement of a role, or in the reduction of labor through productivity leverage, where one person can handle what 5 or 10 people previously handled. It also could involve the entire elimination of a job category, as the work is being handled differently upstream or downstream in such a way that it eliminates the role.

Whatever the form AI displacement takes, we're in a period of rapid change. We're going to need new tools and perspectives to make the most of this moment, both for the livelihood of our families and communities and also for the more profound questions of how we choose to collectively construct our world.

CLIMATE DESTABILIZATION

Through our actions, the Earth system is rapidly shifting outside of the narrow band of stability that nurtured human civilization. What's coming isn't gradual warming—it's high volatility, with spikes, unusual plateaus, and unexpected disruptions. Every year we're seeing unprecedented floods, fires, and droughts, and they will intensify in their instability throughout the course of the century.

These aren't freak occurrences; they are the shocks and reverberations of a system losing its equilibrium. As much has been made of how virtual the modern world is, ultimately everything in the physical economy was either mined or grown, which means it came directly from the natural environment. Our economy is a subset of our ecology, though we don't treat it as such in our economic designs, and as our ecology is imperiled, so goes

our economic stability. Between economic and environmental shock, we will continue to see degradation of human welfare and dislocations in the larger biosphere.

What is currently understood to be a crisis of temperature will soon be understood to be a crisis of water. Not because we will have less water, but because we will have *more*. The main source of the freshwater we experience comes in the form of rain that supports our agriculture and rivers and streams that support our industry as those rains make their way across the landscape back to the ocean. There is more evaporation on a warmer planet, and that warmer atmosphere can carry more water vapor. Specifically, for each degree Celsius of warming, the atmosphere is able to hold 7% more water.[6] At this moment in history as we are passing 1.5°C of warming, so the atmosphere has the ability to hold 10% more water. This incremental increase represents a volume that is 60% of the volume of all rivers and streams on the planet.

This means a lot of water will be falling on Earth in new patterns: too much in one spot, too little in another. As anyone who has ever dealt with flooding in or around their home knows all too well, water is an incredibly powerful force in terms of physical impact and destructiveness. Water can reshape landscapes and tear down infrastructure in hours. It could come in the form of an atmospheric river flooding areas with water beyond their carrying capacity. It could come from hurricanes strengthened by the warmer, wetter air. Or it could come from patterns of drought or glacial-fed rivers (e.g., Andes, Himalayas) retreating and drying up so that humans can't sustain themselves on the many landscapes fed by glacial rivers.

Changes to water will also become changes to fire. We live on a planet with a 21% oxygen atmosphere, a chemical oxidizer that allows biomass to burn. Any place on the planet with substantial stocks of dry biomass can be sites of massive fires. The upshot is that changes to water that are reducing water availability in unprecedented ways set the scene for fires and fire damage of unprecedented scale. In the past few years, multiple towns (Paradise, CA; Lytton, BC; Lahaina, HI) have been wiped off the map by fire. In Los Angeles, an area twice the size of Manhattan burned to the ground, with economic losses exceeding $250 billion (in 2025 dollars).[7]

What we had once spoken of in abstract terms (graphs and charts accompanied by stern warnings from scientists) is now being felt in sharp, visceral ways. We also see all the organizations that care concretely about risk actively adjusting their approaches. Insurance companies are shrinking coverage areas,[8] the military is spending on climate risks to infrastructure that could affect readiness,[9] and farmers are adjusting how they grow to keep up with more losses and destabilization.[10]

Herein lies one of the major shifts that is happening around the climate equation. For some time, it has been argued that it would be too expensive to address the changes to atmosphere and climate, but we are passing into the era where it is too expensive to *not* address climate destabilization. The $250 billion in losses incurred in a week in Los Angeles massively outstrips the <$100 billion in clean-technology investments that the United States did over the latter 2.5 years of the Biden administration. An either/or question arises: Do we want to spend less money to build the climate-ready resilient infrastructure we need, or do we want to spend astoundingly more money trying to clean up the best we can after the human and natural fallout of a series of tragic disasters?

This new financial reality has not sunk in for most yet, but it is a fact that the damage (financially, socially, politically) we will see is going to quickly outstrip the cost of addressing the problem directly by an order of magnitude or more, and we'll soon have to face deeper questions around how such obvious mistakes and excuses were allowed to persist.

The stakes are much greater than the negative economic and human costs. The changes we have been making to the planet are driving extinction at roughly 1,000 times[11] the base rate, meaning that with each generation, we are leaving the planet ever more bereft of biodiversity. The gift of global biodiversity is one that took billions of years to create, and we have been taking a chainsaw to the tree of life, largely in an unintentional way. We find a few organisms we'd like to farm and it drives us to decimate landscape after landscape as we scale its production, only to realize later what we've driven to extinction, whether from habitat loss, interrupted migration routes, pesticide runoff, or active hunting.

The living diversity of this planet represents a body of wisdom of how life can thrive in every nook and niche on Earth, and it is stored in the genetic

legacy of these beings, in their behaviors, learned and instinctual, in their languages and cultures, in all the ways that these organisms communicate and live in community.

Our actions are burning down this multi-billion-year body of wisdom—an incalculable loss that, if we cannot course-correct, will be the biggest and most devastating legacy of this era in history. Society will change, technology will change, but the collapse of this planetary wealth will leave our descendants in a long-depleted landscape, and the 21st century will be the one they cite for when this wealth was lost forever.

This is the legacy we are creating, and it's clear that the magnitude of what we have been unconsciously creating through our destruction is about to substantially outstrip the magnitude of benefit we've created in our intentions. We had intended to use some of the world's natural resources for the project of making a stable and prosperous global civilization. We have instead crippled the biosphere in a way that threatens that very promise of stability and prosperity.

GLOBAL GEOPOLITICAL HARMONY

Rising ecological and economic pressures have global implications. Dislocations and migrations are increasing as climate destabilization makes areas of the planet uninhabitable. Trust in institutions is eroding. If we don't manage this transition with intention, we could slide into intensified conflict—between nations, between economic classes, between people and planet.

But if we do it right, we could move toward something humanity has never seen before: a global civilization capable of extended periods of peace, which continues to improve life for all beings in a widening circle of compassion while building an economy that allows and supports ecological balance.

In times of uncertainty, it is easy and currently politically effective to scapegoat minorities as the cause of ills, as doing so appeals in bald-faced ways to the tribal parts of our brain. This is the part of social organization that is driven by in-group and out-group dynamics, loyalties, rivalries, and dominance. We have not yet developed an effective immune system to this

type of cognitive impairment, but we know that there are limits to the quality of societies that can be built on tribal allegiances.

It may seem naive to presume that any individual can make a difference in geopolitical harmony, but I am colleagues with a number of the folks who developed the major social media services and their dopamine-loop exploiting algorithms and interactive designs. I've seen that industry stoke geopolitical chaos, and, in a way, this was things working as intended. The algorithm's goal was engagement, not political stability, scientific accuracy, or public benefit. It doesn't mean that these systems always drive toward negative impact on these nongoals, but they will always prioritize goals over the nongoals, and if meeting the more engagement goal means more political division and instability, then the algorithm will push for engagement—the goals—at the expense of nongoals. This is the algorithm working as designed. Given the chaotic nature of our current geopolitics, it's clear that the tools that I and others in my field have worked on have an influence here. We have definitely demonstrated several pathways for negative influence, where misinformation and division can be easily magnified by algorithm and interactive design changes. On the positive side, online organizing tools were credited for helping to catalyze the 2011 Arab Spring,[12] but the additional tools to support democratic participation and encourage social stability were not in place. Again, things pan out in arbitrary ways on nongoals like social stability.

If ignoring society-destabilizing factors seems like a shortsighted way to design a system, you are right. And I hope to make it clear that we need more folks to hold these decisions to account, to develop effective immune systems to such manipulation, and to build the skills and access to be in decision rooms in the future, whether it’s at the scale of globe-spanning technologies or at a local neighborhood meeting. The roots of harmony come from folks recognizing what still needs to improve and making different decisions at these critical junctures. It comes from gaining fluency in the prosocial behaviors and ways of connecting and leading that so that we can be a step more skillful in navigating the tangle into which we've tumbled.

I was fortunate to be on the internet before most were—first on BBS (bulletin board) systems in the 1980s, then the web in 1991. Back then it was not just HTTP but a bundle of protocols including FTP, GOPHER,

TELNET, IRC, and NNTP. This was well before high-flying internet companies like Yahoo, Google, Amazon, and Facebook were founded. The internet consisted of a smallish number of links between research universities, and everyone on it was exploring these protocols. Many of us felt we were on the cusp of a new world.

This proved to be true. In short order, millions of webpages started to appear on every topic, and people around the world were finding common interests. An open web with democratized access to reading or publishing is exactly what we hoped to create and protect. It makes me (and many others that were part of that early tech generation[13]) sad to have seen the trajectory we could have had, only to end up in a very different world. Everything is owned by just a few companies, and algorithms are evaluating us to direct us toward advertising and platform benefiting behavior, as opposed to us looking toward what most fascinates us—the things that surprise us and expand us, and the experiences that allow us to go deep, learn, create, and change.

For those of us who lived through this missed opportunity, the experience only clarified how systems of governance and power built on outdated frameworks can steer us unconsciously unless we bring their mechanisms to light and consideration in the design process. Specifically, we saw unprecedented creative energy and connection emerging as huge proportions of the world were able to express themselves online to anyone else in the world for the first time, through home pages, blogs, and online profiles. We saw new forms of publishing and a vast expansion of the media landscape. Two decades later, the internet has become a machine for advertisers to purchase attention, and human expression and connection is emphasized only when it drives more ad conversions and platform revisits. Attention is being handled without our intention, and the mechanisms to commandeer our attention have become a consistent cognitive drag force in every moment of modern life. We missed it. What we didn't examine clearly enough and seriously enough is how the economic frame that seeped into the technological tools we developed would eventually make the goal of these systems economic, not serving the people. We missed it because for a long time these two goals seemed to overlap well enough, and when they started to diverge, we had no effective reflection, improvement, and governance mechanism. In our older team designs, we had a customer

experience and product group that was generally trying to make things that improve life. Without it, there'd be no draw to the tools at all. In contrast, the monetization and ads teams were looking to move metrics that improved net profitability. In this team layout, the product and design teams tended to keep the voice and interests of the customer in the mix. As we moved to more algorithmic content presentation and algorithmically suggested user journeys, the balancing force started to wane, because the algorithm splinters the customer experience into as many experiences as there are people. User experience assessments became more statistical on aggregations of customer behavior, meaning a slower response loop, as it takes longer, for example, to see that algorithms are affecting self-image of young folks[14] than it does to test that a particular screen flow is confusing. This movement to algorithmic user experience led to practical slips in governance design and strongly highlighted the algorithmic goals of maximizing engagement and ad conversions. The degradation of these systems was almost preordained by this combination of goal and governance design. Slips in goal and governance design lead ultimately to degradation in system design. These are lessons that we should not painfully repeat.

In the same way, the economic frame doesn't govern itself. Bad goals and bad governance lead to bad system outcomes. The closest thing we have to a governance mechanism in the economy right now is the moral integrity of people in executive leadership, in boardrooms, and if things go awry, the ability for government regulation to rein in the most societally detracting elements of a technology or business model.

Maybe some of you bristled at the idea of moral integrity for CEOs or in boardrooms, because it hasn't been going great on that front recently. I agree. That said, I have been an executive leader and served on many boards, and I can say from direct experience that questions of intent and moral integrity definitely are discussed, usually earnestly, and often the right decisions are made. Yet I am still certain that the checks and balances in place are woefully inadequate. You don't need a lot of decisions to go wrong to create massive negative societal impact, just a handful of bad decisions in the critical spots. It's time to look at the redesign of all these systems. Let's talk about a simple new design concept that could help provide better governance.

THE MEMBRANE IS PERMEABLE

As mentioned, I've spent a career developing new experiences on new technologies, and subsequently I’m well steeped in the user research required to understand whether a new experience is serving people or not. Most people at technology companies do intend to improve human life, but when the business model starts to hurt people, it creates tension with staying focused on improving life. So imagine a simple mechanism where for every major technology company, there are quarterly studies where 1,000 of their customers are picked at random and they fill out a 5-minute survey that allows us to empirically see if the tools and technology are beneficial or detracting from their lives. The company would not be in charge of picking the 1,000 customers; that would be done at random, and the people would be told that their input would be used toward improving that tool for the future.

This methodology could provide an independent assessment of how a technology is adding or subtracting to society, and if human benefit scores fall below a critical threshold, then it moves into the category of regulatory review. This additional governance mechanism might go a long way toward helping folks in the boardroom stand firm against changes that provide short-term financial gains, but ultimately hurt the folks who use the service. Of course, this is just one possible governance experiment; if it was tried widely enough, we'd likely find some aspects that work and other areas to improve toward the goal of ensuring an independent gauge of societal utility. I mention it not as the only and best recommendation of how we improve governance but as an example of how simple the changes that could make a difference are. How utterly available to us they are if we are interested in the process of redesigning our world toward collective health and thriving. A lot of regulatory approaches have a high cost to enforce, but something like this survey is incredibly inexpensive (especially in contrast to the potential scale of societal damage of tools and platforms run amok) and can be done at any time with an independent assessment body using transparent research protocols.

In that same vein, let's take this survey concept and imagine a modification of it as an experiment in political governance. One of the current malaises of our political system is that it is highly driven by short media impressions,

villainization of political personalities, and misrepresentations of intent. At the end of day, this process is meant to result in policy that aims to improve life for citizens and society as a whole. What if we took the 1,000 random respondents and pointed that methodology toward whether people understand the intent and effects of the laws being proposed. Currently laws are often written to obscure their intent—using “weasel words,”[15] as Carl Sagan would say. They gain popular support given a misunderstanding of the law’s intent. Imagine if the content of such laws are presented to 1,000 folks at random, and they are then asked questions on their comprehension of the law’s intent and its mechanisms of action. If more than 30% of people cannot understand the law above an 80% comprehension level, then it cannot be passed. Something like this would be a governance check that would require politicians and policymakers to be more direct and clear about the intent and effect of their proposed laws. This comprehension check is based on the straightforward idea that democracy works better when people know what they are voting on. Simple enough. Others may have different ideas here, and that's perfectly fine. The point is that we know there are some acute dysfunctions in our current systems, and the process of experimenting toward concrete improvements that could address or obviate those dysfunctions is not particularly hard.

Nothing I've mentioned is expensive to do, and if it were able to head off even one wasteful bill from passing or one technology from driving unintended negative consequences, the cost of the research would be paid off 100 times over. The reason we are not in the practice of improving in this way has nothing to do with the cost or the difficulty; it is likely because those who currently benefit prefer an inefficient governance system as the inefficiency insulates against change. All the while, the vast majority who do not benefit like the current winners in the system have their energy of inquiry and change shunted over to political conversations. While some efficacy can come from that type of engagement, I know from direct experience that it takes far fewer people and less effort to solve problems directly through experimentation and research of the form just described. The membrane to change our reality is permeable. Cynicism and polarization benefit folks in power in the existing system because they both lead to inaction. Even if you believe you have great reasons to be aligned with cynicism and polarized perspectives, understand that this is the least effective place to act from, because it does not encourage action,

experimentation, and learning. This book aims to give you more of the tools that can help solve these problems directly on behalf of your own communities, society, and the biosphere. So let's dive in another step.

NOTES

1. Zeinab Shuker, “Syria’s Environmental Crisis Is Its Achilles Heel,” Century Foundation, June 16, 2025. https://tcf.org/content/commentary/syrias-environmental-crisis-is-its-achilles-heel/

2. Jeff Cercone and Caleb McCullough, “Fact-Checking Misinformation about the Los Angeles Wildfires and California Water Policy,” *PBS*, January 12, 2025. www.pbs.org/newshour/politics/fact-checking-misinformation-about-the-los-angeles-wildfires-and-california-water-policy

3. Justin Worland, “How Climate Change May Be Contributing to Our Political Instability,” *TIME*, September 15, 2020. https://time.com/5888866/climate-change-wildfires-political-instability/

4. US Census Bureau, “The Opportunity Atlas: Mapping Economic Mobility Across the U.S.,” n.d. https://opportunityatlas.org/

5. mPath, Build Empathy, n.d. www.buildempathy.com

6. NASA Science Editorial Team, “Steamy Relationships: How Atmospheric Water Vapor Amplifies Earth’s Greenhouse Effect,” February 8, 2022. https://science.nasa.gov/earth/climate-change/steamy-relationships-how-atmospheric-water-vapor-amplifies-earths-greenhouse-effect/

7. Roger Vincent, “Estimated Cost of Fire Damage Balloons to More than $250 Billion,” *Los Angeles Times*, January 24, 2025. www.latimes.com/business/story/2025-01-24/estimated-cost-of-fire-damage-balloons-to-more-than-250-billion

8. Dana Nuccitelli, “Nobody’s Insurance Rates Are Safe from Climate Change,” Yale Climate Connections, January 14, 2025.

https://yaleclimateconnections.org/2025/01/nobodys-insurance-rates-are-safe-from-climate-change/

9. US Office of Sustainability/Department of Defense, “2024 Climate Adaptation Plan,” 2024. www.sustainability.gov/pdfs/dod-2024-cap.pdf

10. Josie Garthwaite, “Climate Change Cuts Global Crop Yields, Even When Farmers Adapt,” *Stanford Sustainability News*, June 18, 2025. https://sustainability.stanford.edu/news/climate-change-cuts-global-crop-yields-even-when-farmers-adapt

11. Peter Aldhous, “We Are Killing Species at 1,000 Times the Natural Rate,” *New Scientist*, May 29, 2014. www.newscientist.com/article/dn25645-we-are-killing-species-at-1000-times-the-natural-rate/

12. Wikipedia contributors, “Arab Spring.” *Wikipedia, The Free Encyclopedia*. https://en.wikipedia.org/wiki/Arab_Spring

13. “Cory Doctorow at CF 25, *How Enshittification Conquered the 21st Century and How We Can Overthrow It*, *YouTube*, posted May 2025. www.youtube.com/watch?v=_Ai-fC-2Bpo

14. Kim Elsesser, “Here’s How Instagram Harms Young Women, According to Research,” *Forbes*, October 5, 2021. www.forbes.com/sites/kimelsesser/2021/10/05/heres-how-instagram-harms-young-women-according-to-research/

15. Maria Popova, “The Baloney Detection Kit: Carl Sagan’s Rules for Bullshit-Busting and Critical Thinking,” *The Marginalian* January 3, 2014. www.themarginalian.org/2014/01/03/baloney-detection-kit-carl-sagan/

Chapter 2
Why Our Existing Tools Are Failing Us

Before we elaborate on tools to address these challenges, it's useful to explore why things are breaking down at this juncture.

THE HISTORY OF WORK

Interchangeable Factory Labor Is a Simplification for Management

To talk about work today, it's useful to understand how it has changed over the millennia. Our current best understanding is that before agriculture, the amount of work being done daily by most hunter-gatherer societies was significantly less than the number of hours we work today. Being mobile, members of those societies set up settlements close to natural abundance and move as that abundance moved. It's estimated that people needed to work only about three hours a day,[1] and their contributions, collectively across a community, were more than sufficient to sustain their populations, which tended to be smaller and tribally oriented.

With the development of agriculture, human settlements became more permanent, and resources started to be stored at a scale. More accounting and organization were required, and our abilities in mathematics improved. More consistent trade networks started to form, hinting at the larger-scale societies yet to come, and this heightened cultural interchange drove more specialized skills that led to ever-deepening levels of craftsmanship and expression from a wider base of individual networks through trade.

In pre-industrial modernity, long-lasting materials like stone and metal were expensive, and labor was comparatively cheap, so a concentration of artistic attention to ornament arose that is rarely seen today; as demonstrated by the intricately carved stones, detailed metalworking, forming, and engraving. Training and vocational development occurred in guilds that sought mastery in each of these valuable materials: bronze, clay, glass, wood, leather, paper,

straw, textiles. This was a period of highly skilled craft in natural materials, which had the additional ecological benefit of more easily returning to nature at the end of their useful life.

The idea of automating away repetitive human labor with machines is something of an anomaly in human history. For most of humanity, labor was not so tightly repetitive. We made it repetitive recently because repetition and systemization simplified management within corporations, which themselves are another recent invention—about 400 years old.[2] Given how much work has changed over the centuries, it's valuable not to get overly focused on preserving it in its modern format. This current moment of upheaval could also be the moment where we consider the best elements of how work has contributed to society over the millennia and experiment with how much of the best stuff we could bring to our updated systems of work.

During the Renaissance, guilds, which consisted of professional communities built around mastery and creativity, flourished.[3] These groups of highly skilled artisans came together to share their knowledge, support one another, and create things of function and beauty. Rather than being repetitive and nearly mindless, work was varied and creative. The collective goal was about developing mastery in a craft, building traditions and lineages of skill, and applying that craft to meet the needs of the community.

This was a high-skill economy, which required artisanship, knowledge, and collaboration. And it was a time when we built some of the most beautiful and intricate structures ever built—from elaborate cathedrals and temples down into everyday objects like candle holders, doorknobs, and roof gables. We did this not just because of the tools available but because of our approach to work itself. Even as people moved from one craft to another, whether it was farming or carpentry, there was daily variety, creativity, and the application of deep skill. These people were fundamentally *makers*, and the building of a career was driven by building of depth in the craft.

Looking at recent history, we see an entirely different world. The Industrial Revolution shifted the nature of labor from creative to repetitive, alienating humans from their artisan traditions. Machines began to take over tasks, first in factories and later in nearly every corner of the economy. Because

we designed the machines for repetitive, consistent output, the human work adjacent to these machines needed to become repetitive and consistent as well. Add a century of building in this way, and the results are obvious all around us: Our buildings, once full of character and ornament, are now rectangles of steel, glass, and cement, built for cost efficiency and minimized assembly time rather than beauty. Our residential communities, instead of being walkable and human scale, have become separate, resource-consuming houses connected by traffic to big-box stores. The products we use in daily life are mass manufactured and are usually easily broken and disposed of instead of being made to last. We can collectively make choices about whether any of these changes are what we want. While there are benefits and drawbacks to every option, we need to get cognizant and creative when we recognize that the drawbacks of our current approaches are piling up.

What has happened, given our recent changes to work, is that instead of deriving pleasure and meaning from developing deep craft that allows them to make directly for their community, people have work that tends to provide a small contribution to a product or service over which they don't have a full sense of ownership and craft. Our role in the economy has shifted away from our agency as makers and creators to the smaller and much less satisfying scope of agency that comes from consumption. Simply put, we've created an economy of consumers rather than makers. In doing so, we've severed ourselves from a deep well of accomplishment and purpose that comes from being able to directly make a new reality for ourselves and our communities. In addition, we haven't put into our short-term cost calculations the erosion of social connection and cohesion that comes from a homogenized and disposable lifestyle over one that is filled with things of beauty that reliably serve a role in our lives. Even using a pure cost lens, if one expands their scope of consideration from short term to a longer period than the moment of successful commercial transaction (which is the point most corporations stop optimizing), then there are many cases where a high-quality product that lasts is more cost-effective than “low-cost” products that need to be repeatedly disposed and replaced. When one cross a 400-year-old bridge in Florence or sit in a 400-year-old temple in Kyoto, they are experiencing the benefit of artistic, design, and engineering excellence from 20 generations ago. We are fully capable of making a nondisposable world.

* * *

With the development of mass production and modern material science over the last century and a half, we moved into a world where material is cheap and labor is comparatively expensive, which has driven further mechanization of labor and homogenized handling of materials. Thus, no more individually carved gargoyles for the cathedral or handmade ornamental glass for our lights. Instead, we get duplicates pulled from a mold or stamp. The other major force of change came from incentivizing labor to maximize domestic economic production. Before this, it was enough for guilds to make high-quality work for their community or region, but now all industries were being asked to contribute to a larger goal of national economic dominance. This drove a need to focus on mass employment, as gross domestic product (GDP) is maximized when all working-age folks are engaged in work. As full employment became an explicit goal of nation-states, a constellation of systems were built that became feeders toward that larger goal of GDP maximization. For example, if housing is expensive, people must get jobs to ensure they have a place to live. Through a combination of hard influences like the need for housing and soft influences from social pressure and societal expectations on being a contributing member of society, we have made a society where work of a specific format is nearly required to take part in it.

All that said, it is important to note that nothing about work needs to be the way we have currently designed it. Given how much work has evolved over the long span of history, and seeing how much the recent friction within work is almost entirely generated by our most recent definition of work, it seems safe to assume that we can design work differently to better meet the needs of the society we are moving toward. Whether work is three hours a day of hunting and gathering or whether it is developing deep craft in a guild or badging into a cubicle farm, we know that our definition of work shifts over time. So let's remember that the definition of work itself is a medium we can experiment with and improve upon.

We had a small jag in the trajectory 30 years ago as many of the richest nations started to move away from having a large domestic manufacturing base toward encouraging more “knowledge work”[4] in the burgeoning “information age.” This was billed as the future, and the safe haven for job prosperity in the old mold, by simply replacing manufacturing and trade

skills with STEM and team collaboration skills. Recent achievements in AI are now challenging many of these knowledge-work jobs, and a large enough proportion of the job market is being challenged that it begs the deeper question of whether it is time for a more substantial redesign.

For all the major transitions in work we've seen over a few thousand years, there have always been people addressing the needs of the age with personal skills development from the bottom up, interacting with top-down efforts to shape work so that larger societal needs and goals could be met. Examples of larger societal needs and goals include having younger folks help subsidize retirement through Social Security, or shifting the industrial production mix in times of war, or directing resources toward building national infrastructure and public works. Whether explicitly framed as such, all of these parties were engaged in a design process wherein different approaches were tried and those approaches worked better or worse toward a set of larger goals.

The bigger question right now is not if we can come up with enough new jobs to fit the frame of work we previously had. It is this larger question: How do we design work for the future we are headed into? What will we decide to value? Who will get to contribute, and who will decide how the future of work is put together? My hope is to have a large representative group shape this, via how they experiment into new models separately, and how the experiments that are yielding the most beneficial outcomes are brought together to develop better outcomes for all. A process like that is not at all guaranteed, but my goal of sharing tools, perspectives, and frameworks in this book is to enable more people to be active in that redesign process.

* * *

Knowledge Work Offered a Small Revival of Craft, Particularly Cognitive Craft

There are plenty of open questions on where work and the economy will go, but what is not in question is that we will still have *humans with needs* in the future and will still have *humans with skills*. Given this, the changes to the economy ask us to be thoughtful about how the mapping between needs and skills will evolve in the future. While robotics and AI can help to

reduce the cost of production on the supply side, addressing a former need by reducing the cost structure, enabling more of a good to be produced more cheaply, tends to massively increase the supply and devalue the good in consumers' perception as cheap or less capable of durable value. For example, after a short couple months of initial awe at the ability for generative AIs to produce images across a wide collection of visual styles (trained from vast databases of artistic output), we quickly became inured to these visuals, and many began calling these outputs "AI slop." Along the same spectrum of how an artist painstakingly developing a piece over five years might heighten its meaning and perception, AIs spitting out images in 50 milliseconds lower the perception of the pieces.

As humans, we could probably get some narrative value from having a machine describe how difficult a creative task was to complete, but this is a pretty superficial patch. The machine doesn't have access to meaning constructed in the ways that humans construct meaning in life. There are no stakes to its "life," given that it has no feelings, doesn't die, and can be arbitrarily replicated at scale. The story that AI is conscious or alive in some way makes the technology more relatable but it is fundamentally not a true representation of what is happening.

Instead of thinking of AI tools as consciousnesses that are using effort and creating meaning, it may be more useful to think of them as a series of cognitive appliances that can be plugged into specific cognitive roles. In many ways, this is familiar design territory, as many products are just swapping into the role of a small piece of what a human does. A clothespin does what a pair of fingers would do if you could leave your fingers in place on a clothesline. A bicycle does what your feet do for you if you could operate them five times faster. We are actually pretty used to making products and services that fill in for functions that humans already have, and we also have long experience in working with designed objects. Our responsibility when using such tools is to curate where to put those functions. Specifically, we are responsible for putting those functions into places that are ethical and effective. For example, using a clothespin to close off the nutrient feed to an indoor farming system would not be effective; doing the same thing to someone's life support feed would be obviously unethical. Similarly, we are deciding right now where to put AI tools. Treating them as if they are conscious (where they are not) is going to

be ineffective while using AI to make up fake case law or scientific papers to support a position would be unethical.

Even if something is effective and ethical, there is a further consideration—one of aesthetic preference. While aesthetics are often associated with superficiality, what a society at large considers aesthetic and how it acts on those aesthetic instincts is one of the main ways we decide what designs are successful and what values are visibly expressed. If we value a world where most humans live in a stable and prosperous society, we will make different choices than if we simply value a world where all goods are the cheapest they possibly can be. If humans from the aesthetic perspective find something beautiful and interesting enough, they can adjust their systems to ensure that it can be part of their lives for aesthetic reasons alone.

For example, computers categorically outpaced human capabilities in playing chess about 20 years ago, employing some of the best supercomputers and training software available at the time. Currently even low-cost devices have enough processing power to beat the best grandmasters. In a world where chess is “solved,” it would seem ludicrous for people to spend years of their life studying to be excellent at the game, yet the total number of players has increased globally since the solve. I believe this is because the solution itself did not address the aesthetic as to why people value chess. They value seeing what their minds can do, they value the rewards of problem-solving on the board, the connections and friendships that they make with other players, the sense of mastery as they improve. There is a lot of room in our values and aesthetic considerations to make a world where people are still quite important. A type of subtle oppression is what allows only the economic question of maximum efficiency to dominate what we choose in our design space of possible futures.

This distinction is not widely discussed, but there is a significant difference between selling to consumers versus selling to other businesses. When businesses sell to other businesses, they tend to be almost entirely unit-economic driven, and the emphasis on values and aesthetics tends to be a step or two removed from the conversation. Because ultimately, a business can be seen essentially as a simple financial machine that organizes production to deliver a service for a lower cost than it charges customers for the service. If the changes to the unit economics don't hurt a company’s

ability to sell to customers, the algorithm of capitalistic optimization will have the business gravitate to the least expensive way for it to deliver that service, thereby maximizing profit and retained earnings in a way that gives the business more resources and options across its core activities, including reinvesting in growth, profit sharing with shareholders, and paying employees.

Clearly, values and aesthetics start to creep back into the discussion when we look at how profits are distributed, but, overall, the algorithm on the production side is simple and flat: Cheapest path (with acceptable quality) wins. And in a world where AI and robotic tools are sufficiently cheaper than human labor, they will become a part of how every business decides to deliver their service. We've seen this effect before in the materials space for consumer goods. Most things that were previously made of wood, metal, and glass are now made of plastic. This is simply because plastic became cheaper (enabled by the fact we were extracting oil for fuel anyhow) than nearly any other material, allowing businesses to make products at lower costs, and, at the time, what customers wanted was more products at lower cost. There was nothing about aesthetics or values that pushed back coherently on the plasticization of most products.

We now live in a world of plastic. Thankfully, our decades of experience with those materials are now giving us better discernment on which places it can be used skillfully and which places it may drive detrimental environmental and human health effects. On the aesthetic side, sentiment is shifting around the perceived quality of plastic goods. Similarly, polyester clothing has been central to the rise of fast fashion, enabling folks with sufficient disposable income to buy more clothing than ever. For a while, the promise of less expensive clothes that still meet acceptable quality standards was a winning sales pitch. Now we are in a world where huge volumes of clothes are wasted, never sold, or purchased and never worn. This waste is starting to mature our perspectives and values. In this case, the shift is delivered through a sense of personal disgust, of stuffed closets, of ecological damage, of exhaustion from the endless trend cycles. As values change, so do aesthetics and with it demand. The power to want and evolve what we want is at least one power that people will continue to hold—to welcome or refuse the stuff that new technologies enable. Being skillful with the consideration of our wants is the way we assert agency even in the

lessened role of being a consumer versus being a maker. Such consideration is a skill worth developing. Plastic is an example of a massively lowered cost curve invading every industry, and we're decades into that story, which gives us good guideposts to the next massively lowered cost curve invasion. AI is basically *cognitive plastic*. It will provide a good-enough stand-in material in settings where we currently use higher-quality material. We are at the beginning of this curve, but something akin to the realizations and backlashes we've had with plastic will eventually surface, helping us to mature our understanding of where to skillfully deploy the cheap material that AI represents. Until then, we will suffer various forms of unskillful deployment.

Another potential righting force (although it will be destabilizing in the near term) is that in the process of corporate owners rapidly shedding jobs to reduce product costs and improve margins, they will be collectively decimating the disposable income of their customer base. Consumers can be consumers because they have money from jobs where they serve as workers. When work is imperiled in a way that removes all the workers, there will soon be a shortage of consumers. Too much job loss decimates the demand base, and while a few percent of consumers at the top currently have concentrated a disproportionate percentage of wealth holding, they are still and will always be a tiny minority of demand. Without demand, production, no matter how cheap, is meaningless.

Everything Is Capital Now

This discussion of how simple the algorithm of capitalism is and how little the business-to-business side of it cares for aesthetics and values highlights another reason our systems are breaking down right now. We have turned everything into capital to feed into the capitalistic algorithm. A simple working definition of the word “capital” is “an asset that has been given intentionality.” This is clear when we see how we characterize capital via terms like “investment capital” versus “operating capital.” The words “investment” and “operating” tell us what the intentionality of the capital is. But we have now done this conversion into capital for nearly everything. Human beings are now just “human capital,” and the natural environment becomes “natural capital.”

It's worth noting that we have already made consequential decisions in adopting this framing. When something becomes capital, it becomes easier to interface with the capitalistic optimization algorithm. So anything that has been characterized as capital can now be traded off against other forms of capital in the capitalistic algorithm. That's why it feels obvious in this framing that if some AI can be more efficient than human capital doing that function, then our aesthetics and values will have less sway on the result. The capitalistic algorithm will dominate without active effort to the contrary. Similarly, even if we value a natural landscape for the value of its natural capital and environmental services, the capitalistic algorithm will absolutely drive the demolishing of that natural system if something of greater economic value can be wrung from that same landscape. In short, one of the important decisions we've applied very little agency to is the basic decision around which aspects of life we allow to be cast as capital.

We have the ability to say no to this process. We've done it before: For example, the sale of human organs is banned worldwide. We decided that the value of the organs that grow inside of our bodies is something that should be completely outside any system of capitalist exchange. It's easy to imagine the horrific chaos that would arise if people's organs were allowed to be part of capitalist exchange. We've literally done it recently in the form of chattel slavery. When people and their bodies become property, or body parts become a form of harvestable and exchangeable capital, then don't be surprised when slaves' teeth are pulled to replace one's own lost teeth (via George Washington's dentist[5]). All of this is facilitated when people and their bodies can be owned by others as just another part of their total "capital." We have similarly been enabling the dismembering of ecosystem function as we de-dimensionalize the natural environment into capital in the flattest sense.

ORIGINS OF THE CLIMATE CRISIS

Breaking Down Foundational Beliefs About Our Relationship to Nature

The viewpoint that nature is just another form of capital is at the heart of the climate crisis. The capitalistic efficiency algorithm doesn't care about the

function of natural systems, only about what can be done to improve margins and scale production. In prioritizing this, our economic endeavors often sever essential connections that then destabilize the metabolisms of natural systems (biology and hydrology). We are now living in the collective breakdown of these systems from having lived this “nature as capital” viewpoint for several decades. Many of us have lived in the current system for our entire lives, so are not fully aware of other possible system designs than natural capital being consumed by the capitalistic algorithm. But there are many other possible viewpoints would lead to different system designs. It's worth exploring this briefly, to set the table for how expansive the reimagining of our systems could be.

Many Indigenous cultures around the world have arrived at ways of being that are in deep alignment with nature, understanding humans as part of a broader natural system where they hold responsibility to *learn from* and *give to* their lands. That belief is so widely observed that it is almost a universal attribute of the longest-lasting Indigenous cultures—because living on land successfully for hundreds to thousands of years without despoiling it almost always necessitates the deep listening and observation, wisdom building, and care work that we see in so many cultures.

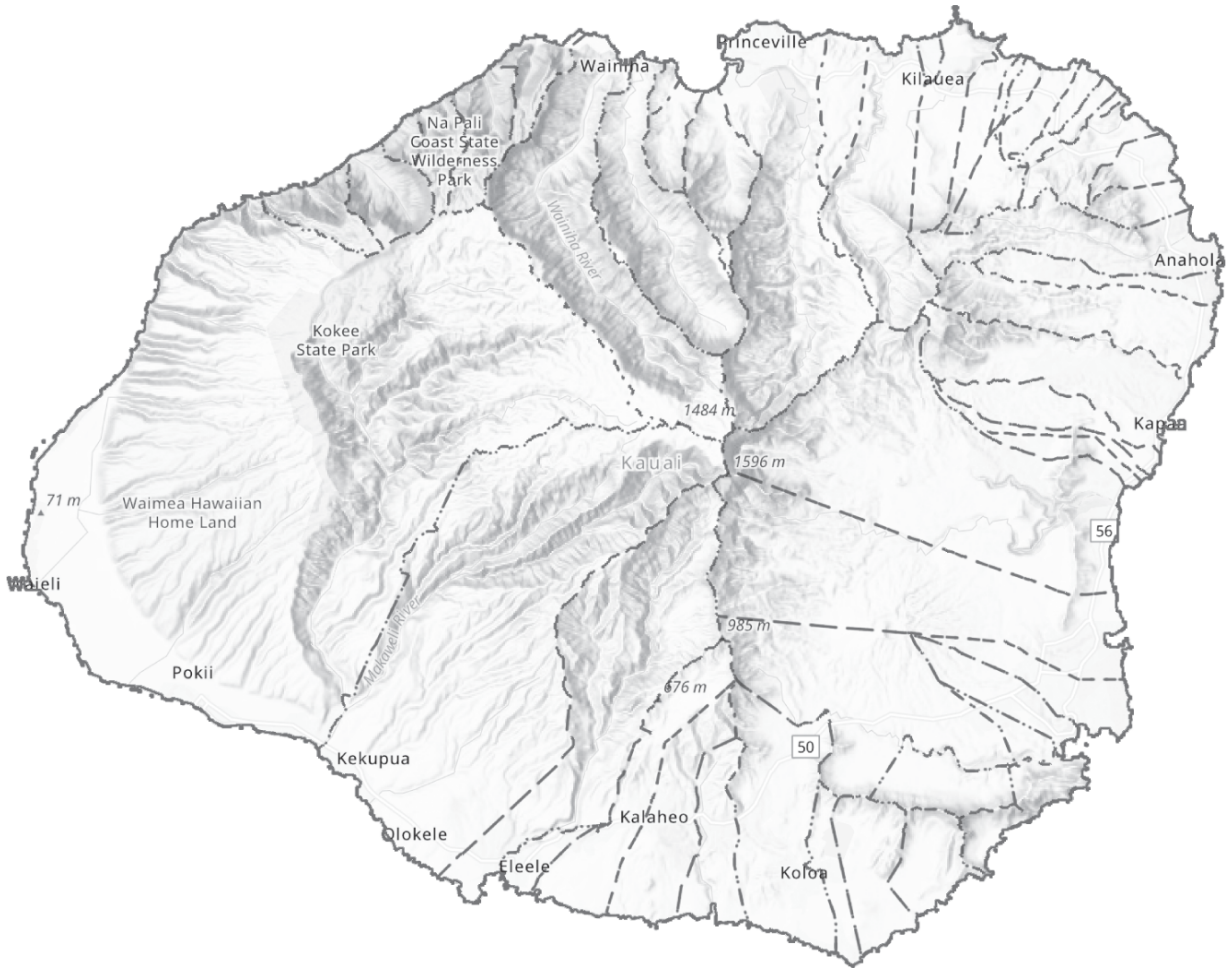
By comparison, in many Western traditions, humans put themselves at the top of a hierarchy of control that helps to justify narratives around the extraction and exploitation of nature. Concepts of hierarchy and domination are the go-to narrative justification for exploitation, whether it is toward natural resources or toward people via hierarchical concepts such as racism, religious superiority, and social class superiority. In the recent Western system, there are always some humans who are allowed to be exploited more than other humans. This creates tension with ideas such as universal bills of rights. When systemic exploitation is happening to other humans, they can work to speak up and politically organize. When this domination worldview is applied to places, animals, plants, lakes, mountains, the atmosphere, or minable ores, they can't push back or speak up the way humans can. The further assumption that everything “below us” in our conceptual hierarchies can now be characterized as capital and exploited opens pathways to creating real damage, whether what we see as “below us” is a factory worker or a pine tree.

Let's further expand our perspective. In *Braiding Sweetgrass*, Robin Wall Kimmerer, an Indigenous author, shares: “We say that humans have the least experience with how to live and thus the most to learn—we must look to our teachers among the other species for guidance … They've been on the earth far longer than we have, and have had time to figure things out.”[6] This worldview completely inverts the sense of humans as the intellectually dominant species that is meant to have dominion over Earth into a frame where wisdom lies with all beings and greater wisdom may exist in the beings that have had the longer tenure on the planet. This complete inversion of where wisdom is to be found drives completely different values and aesthetics and suggests wildly different possibilities in terms of how humans are meant to interact with nature.

The Hawaiian Islands provide another fantastic example. The islands before Western colonization supported a population of more than one million people, requiring no imported energy, materials, or food. Modern Hawaii has a population of about 2 million people, but now 90% of food[7] and energy[8] must be imported. The per-acre carrying capacity of the landscape has substantially decreased under management with “modern” tools and perspectives.

Let's talk about how the ancient Hawaiians achieved better carrying capacity on the same land. In Hawaiian, the word for freshwater is *wai*, and the word for wealth is *waiwai*. This is reflective of a foundational cultural perspective that the management of freshwater was the source of all wealth. This perspective drove the development of tools and practices that allowed ancient Hawaiians to get dramatically more land productivity per acre than our best modern industrial approaches. Following the idea that freshwater was the source of wealth, they broke their land into *moku* (major watersheds) and *ahupua‘a*[9] (minor watersheds). Any drop of water that fell within the ahupua‘a would stay in the roughly pie-wedge shape of that land parcel as it traveled downhill toward the ocean. The fact that each ahupua‘a was managed by a coordinated group had the huge benefit of eliminating the concept of an upstream neighbor polluting the waters and hurting a downstream neighbor, since they'd only be polluting themselves. There's already huge brilliance in this approach, as it completely solves a problem we have not solved in our modern economic design. We often struggle with environmental “externalities” (aka damage) from industrial activities

upstream, but the Hawaiians show us that this is an artifact of how we've decided to divide and manage land, not anything intrinsic about how externalities must always arise in economic systems with competing interests. I have a more radical suggestion: There is *no such thing as an externality*. What we call externalities are just another way of saying “We drew our system bounds incorrectly.” If drawing land management lines differently makes hydrological externalities magically disappear, then it would seem that the system boundary lines are the independent variable and any arising of externalities are the dependent variable.



Ahupuaʻa layer.

Putting that aside for a second, let's talk about how this management approach drove higher productivity. As water flowed from the mountaintop to the shore, native Hawaiians slowed the progression of that water while still always allowing it to flow and circulate. At each elevation, productive

crops and life-supporting activities were enabled by Hawaiian water management ranging from cultivating trees for building materials and tools, to providing a steady supply of calorie-rich staple crops like taro, to consistent access to protein via near-shore fishponds. All of these activities sprung into life in each ahupuaʻa, making the most of each drop of freshwater as it made its way across the watershed powered by gravity. This incredibly productive infrastructure didn't need external power sources to operate, just rainfall and gravity. In managing water in this way, the total carrying capacity of the land increased, not just for humans but for countless biodiverse organisms that benefited from improved habitat diversity that came with Hawaiian land management. The ahupuaʻa was their process of turning water into wealth, of turning wai into waiwai.

Evidence of these systems still remain today, and they continue to support biodiversity and carrying capacity improvements, even without drawing energy or requiring significant maintenance. I have lived near examples of this infrastructure for decades during the time I spent in the islands. As an engineer, designer, and scientist, I find this work to be remarkable on so many levels. If I had to summarize, though, it is the sheer scale of productive output native Hawaiians achieved for both humans and the ecosystem for absolutely minimum operating and maintenance effort. Even with all our current technological tools, we don't really ever achieve this incredible leverage of many positive outcomes supported for so low an operating cost.

As discussed, much of what was made possible in the Hawaiian islands came from having a different starting perspective that led to drawing system lines and assumptions differently. Instead of just accepting that productive industry necessitates pollution and accepting that downstream pollution was a necessary evil of operating in a watershed, the ancient Hawaiians' foundational perspective flipped everything around and supported the understanding that the watershed itself was the main resource. Through thoughtful watershed management, they emerged with incredibly productive system designs that offered economically valuable outputs all while *increasing* ecosystem carrying capacity. In contrast, the system lines we draw for our current economy suggest that environmental damage is just "what industry does" whenever it tries to pursue the creation of economically valuable output. The Hawaiians show us that this is an

unnecessary fiction. Through existence proof, they (and many other Indigenous cultures[10]) have demonstrated completely different and more productive outcomes by employing different assumptions and perspectives.

As with any culture, Hawaiian society was not a utopia. There were laws and conflicts that wouldn't play well to our current sensibilities, but with regard to how industry, land management, and environment operated from a place of deep mutual benefit, there is so much to learn. Hawaiians sustained a vibrant human culture that amplified their environmental health for centuries. These effective practices—born of place, observation, and care—often have higher efficacy and better staying power than modern approaches that are designed for rapid commercial scale to establish homogenized industrial production. Seeing how other societies have viewed these challenges and risen to the task of effective economic design reminds us that humans are not inherently extractive. The extent to which we behave in ways that are extraction-oriented has arisen from how we have decided to organize and relate to each other. We are, and always have been, capable of increasing the carrying capacities of the lands we are a part of. Many cultures have done so in the past, others are doing it today, and I'd suggest that we'll need to practice much more of this in the future if we're going to land on our feet in this century.

Working with Worn-Out Tools

The tools that have gotten us to this moment in the industrial economy could exist only in a world where enormous natural resources had built up via geologic and biological effort across deep time. A few centuries ago, nature was often characterized as boundless and untamable, an idea that was close enough to people's lived experience before the Industrial Revolution. Without industrial scale, there were few landscapes where the pace of human resource extraction could get high enough to make the damage appear lasting. Given this fact, assumptions of limitlessness worked well enough for a while, but as ecological damage started to mount and become visibly acute, we ignored it—until this moment when a large fraction of Earth's biosphere is now at risk.

Given where we are in the timeline on the damage curve, we must turn our goals toward an economy that is foundationally regenerative. Really anything where there is net damage to the environment from human

activities of a kind that accumulates over time simply won't last. For example, if humanity's annual net damage to nature was 0.1%—in other words, 1/1,000 of the essential health of natural systems was damaged per year—then such a civilization would have a death date of 1,000 years or less. (A society usually falls apart before you get all the way to 0% environmental health.) Right now, our rate of damage on several critical thresholds exceeds 0.1%,[11] so many of us feel (rightly) that we don't have a shot of this civilization seeing through the next 1,000 years without some major course corrections.

But flipping around this loss-centric narrative, it is also equivalent to saying that if we have any intention of staying on this planet for many millennia to come, then we must find a way to get to 0% damage; even more robust, we should aim to become a net *positive* to the health of nature as a whole, which I would suggest would come from being a net positive across air, water, soil, and biodiversity.

The Hawaiian example shows this is possible, and all of it is recent history (within the last 200 years). In 2025, with a population of about 2 million people and over 90% of its energy and food imported, the practical carrying capacity of the Hawaii has been *reduced* by the introduction of modern approaches. That massive reduction in productive capacity of the land also now drives production of significant greenhouse gas emissions, decimation of habitats and biodiversity, and higher maintenance costs. Many people alive today remember the old systems and saw the progression of this degradation play out. In some places, inefficient modern systems still sit side by side with higher-productivity Indigenous infrastructure. This moment is an incredible time to learn for our collective futures before the richness of these lessons is lost to deep time.

GEOPOLITICAL CRISIS

Epistemic Crisis from Cognitive Strip-Mining

We now come to an influence that is both downstream and upstream of the breakdowns in climate and economy. It is our foundational stability as a society, and it's at a critical crossroads after a gradual erosion in the past two decades.[12] A useful frame for understanding our present moment is to

observe that we spent most of the 20th century strip-mining and clear-cutting the physical resources of the planet, and in the 21st century, we seem to be intent on strip-mining of the cognitive resources of the planet.

The wealth of ecosystems is accrued over time, in layers of topsoil, in healthy hydrology, and in biology that expresses itself in self-stabilizing ecosystems with optimal biodiversity in every available habitat on the planet. Similarly, our cognitive ecosystem's wealth is accrued over time. Countless generations have invested in learning from their lived experiences and passing their wisdom forward—in the form of storytelling, rituals, wisdom practices, and archived and cataloged knowledge—all to support continuity of wisdom and decision clarity of everyone who is alive today. And while we don't think about it often, our collective cognitive ecosystem is a limited and spoilable resource. After all, there are a finite number of people on the planet and a maximum pace that one can have coherent thoughts. That means everyone on Earth will have a finite number of coherent thoughts in their lives. That number, multiplied by the finite number of people on the planet, gives us the total resource bounds of our collective cognitive ecosystem at any given time.

$$\text{Total Cognitive Resource} = (\text{World Population}) \times (\text{Total\#Coherent Thoughts in Average Lifetime})$$

Our literacy, numeracy, domain knowledge across fields, professional skills, and intellectual contributions are all built on generations of wisdom that has been painstakingly aggregated and patiently taught. The words I use in this sentence and throughout the book to express ideas were developed over the centuries by people collaborating to shape our basic units of communication. They are a part of our shared intellectual legacy; the same goes for everything I learned in my academic studies in physics, electrical engineering, and ecology. While people hope to add to this legacy, in any single lifetime, any human would be lucky to add even 1% compared to the great bodies of knowledge we inherit. Just as rich topsoil makes growing much easier, rich intellectual topsoil makes it possible to grow healthy societies.

We are not always careful with our rich resources. Much of the topsoil wealth of the Great Plains of North America was destroyed during the Dust Bowl years of the 1930s, an entirely human-made disaster, as newcomers to the region employed unsustainable farming practices that rapidly depleted this long-accumulated wealth. What had been the life-giving legacy of millennia of topsoil development was transformed into dust clouds that clogged lungs, darkened the skies, and drove regional economic collapse.

Similarly, we are now being careless with the long history of cognitive topsoil that countless generations have built. Instead of employing unsustainable farming practices, we are employing unsustainable practices in how we commodify and exploit human attention and cognitive clarity. We've allowed social media and advertising to uproot our sensemaking tools and monopolize our attention and agency. At this juncture in history, these platforms are allowed to operate in ways that ignore accuracy and massively prioritize anything that amplifies engagement. Unfortunately, this includes enraging things (true or not), misleading things (that sound interesting enough), and influencing as a goal (separate from informing). To the extent that these tools are now a large part of people's local cognitive ecosystem,[13] their use is shifting our collective cognitive ecosystem. Short-term monetary and political gains are being prioritized over clear sensemaking, truthful communication, nuance, and context, ultimately diminishing and despoiling our collective cognitive resources.

TOOLS FOR OUR FUTURE

Perspectives and Skills for the Problems Ahead

We need the ability to change course, and if our current perspectives and tools are what have gotten us into an extractive system design where our cognitive resources are next in line for exploitation, then it's time to start working with new perspectives and tools that can help more of us be involved in building the world we want.

While the ultimate toolkit we employ to address these challenges and collectively build a new world will be extensive (and have many nuances and contextual variations for use), I'd suggest that four cognitive tools will

be central to the work ahead. They are the 4Cs: Critical Thinking, Creativity, Compassion, and Community.

These tools are not consistently taught in our school systems, but I believe they will be central to many of our careers and community efforts in the coming century because they are highly applicable to the three big challenges of the 21st century and also because they are done as well (or aren't as meaningful when done) by robots and AI. Over the coming chapters, we're going to explore each cognitive tool and look at some ways they can be used to solve problems, including society-scale problems. To get things started, we start with a quick run-through of their skills and their utility to the efforts ahead.

1. **Critical Thinking.** When systems are breaking down, critical thinking becomes more essential than ever. It allows us to see the assumptions and framing that defined and animated the system that is ending and, in doing so, opens up room for new questions, assumptions, and alternative framing. New framing becomes the fertile ground to explore new ways that our systems can work and helps us assess and discern which aspects of those explorations are starting to work and which aspects need further iteration.
2. **Creativity.** Creativity isn't just for artists, musicians, and designers. It's the foundational skill of making our world. Even if you never studied a “creative” discipline, creativity is a skill that you can develop and employ to change/improve/elaborate anything you choose to develop, whether that is redesigning the economy, developing technologies to work in better concert with the environment, improving systems of governance and collective care, or just improving the state of your local community.
3. **Compassion.** As we redesign our systems, we need to aim for an economy that works for everyone, including the people and natural ecosystems involved. We're at a moment in history where the richest 1% of people in the world have more wealth than the bottom 95% of the world's population put together,[14] and a large number of those on the bottom are being exploited, disregarded, or dehumanized. Compassion gives us the compass to design systems that work for the many.

4. **Community.** As the world destabilizes, community will be foundational for building resilient, sustainable systems. The ability to build community where people can show up to express care and provide mutual support is a profound power that is deeply essential for social organisms to live a fulfilled life. In recent decades, this skill has atrophied both as a lived reality and as a set of individual abilities and aptitudes that we can bring to situations.

We will need to have a larger group of folks gain literacy in these four skills, so a larger and more representative group can think critically about what is not working in our current systems, both tactically and systematically. After critical thinking opens our perspectives to new possibilities, we'll need to employ creativity to build, experiment, and learn in all the areas we are looking to create anew. This creative process needs to be grounded in compassion—with deep listening and engagement among all the people and ecosystems we hope to serve through the creative process. Last, we will need community to successfully build our new systems and to support each other through the many destabilizing environmental, economic, and political shocks we will inevitably face. We will need our communities to be containers for accumulating wisdom to concretely navigate the challenges and support the learning process toward ways of living and working that will create our collective prosperity.

One of the biggest mistakes we can make right now is to assume that we can theorize and philosophize our way out of our planetary challenges. My thoughts on theorizing are simple: there are countless ideas that *work in theory that don't work in practice*, but *nothing works in practice that doesn't work in theory*, and *by the time you know the practice, formalizing the theory is optional*. At the moment, the current and impending disruptions are leading to much hand-wringing and arguing, muddied by counterarguments and encouragement from the powers that be to not change things too much. This frame of reality suggests that engaging in a series of arguments to prove your viewpoint right is an important first step, but from my perspective, it is a low-efficacy way to change a system. It's an approach that is slower and drives lower-quality outcomes than what we can create from direct *design, experimentation, and learning* toward what serves people well. These are the skills of getting things to work *in practice*, not theory.

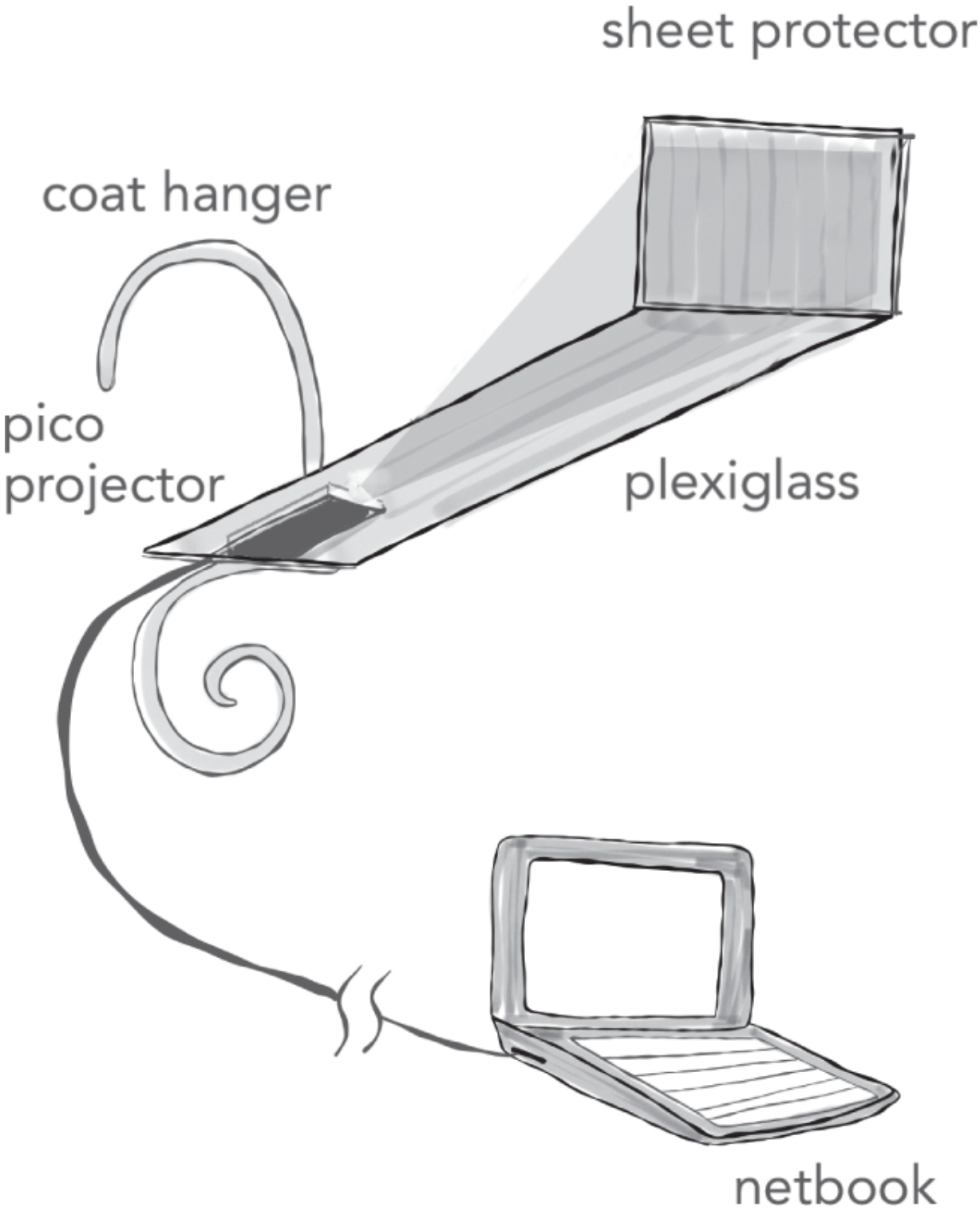
At the end of the day, what works in practice are the most important building blocks to construct a future. Herein lies the reason that many folks currently feel stuck. Our present modes of media engagement are mostly about convincing each other of viewpoints and projecting/maintaining personal brands over prioritizing the sharing of effective practice and encouraging future design exploration. In this environment, we are asked to solve problems in the abstract through debate as opposed to using our hands to build something new. This approach is dominated by pundits whose lives are focused on talking, not building. “Thought leaders” and roundtables abound, but where deep skill comes from in a person is not from thoughts but from direct experience via repeated actions and practices that have proven effective.

Instead of trying to predict the future and prove how good a thought leader we are via commentary and argument, we need to experiment and learn. It's much faster to see if something works by building it than by putting it through the cycle of theories, committee meetings, and PowerPoint presentations debating whether it might work. Actually, no amount of the second activity can tell you whether something will work. I hope it's clear that if we make it this century, we will have done so because we *created* the world we want, we didn't just win an argument about it.

I've spent over a decade of my career teaching teams the exact skill of moving out of arguments about concepts into rapid realization of prototypes that helped them create the world they wanted. I taught practical innovation techniques that can reliably solve difficult problems in less time with fewer resources. That aspect of my career spawned from my first TED talk at TEDxYouth,[15] where I shared prototyping practices we employed at Google X and taught people how they could make use of those practices to solve problems in their own lives.

Briefly, the talk discusses the early prototypes of Google Glass, a wearable heads-up display that helped create a new device category. Through a small prism floating in front of your eye, you could see digital information floating over your physical world to help inform the task you're doing or keep you connected to essential people and information. Google Glass had the processing power of a-top-of-the-line cell phone and weighed less than 37 grams, making it the most comfortable heads-up-display ever made up to that time.

In the talk, I asked folks to estimate how long it took to build the first working prototype of a heads-up display that would allow you to see any information you'd like to see floating in front of you as you walk around in the world. There was a mixture of responses ranging from months to years, and I then informed the audience that the first prototype was completed shortly after lunch on the project’s kick-off day. The second prototype was completed later that same afternoon. I then proceeded to show exactly how Google Glass was made, and after a few more prototype examples, I concluded by sharing ways that people can use the same creative cognition skills to solve their own problems. A short primer of these skills is provided in Chapter 4, “Creativity.”



Google Glass prototype.

* * *

This book is structured around teaching the 4Cs as foundational skills of a regenerative civilization. Like instruments in a band that can combine in different ways and complement each other to create myriad sounds, the 4Cs can be combined in various ways to create many pathways to solving problems. The next four chapters explore each one of these tools in depth: what it is, how it works, how to use it, and why it matters right now.

Part II: The 4Cs: Tools for Building Our World

- Chapter 3, “Critical Thinking”: how to reveal assumptions, shift frames, and ask anew
- Chapter 4, “Creativity”: the skill enabling innovation, adaptability, and new possibility
- Chapter 5, “Compassion”: the compass that helps guide toward actual beneficial change
- Chapter 6, “Community”: our ability to create social infrastructure for care and growth

Part III: Applying the 4Cs to the Big Challenges of the 21st Century

- Chapter 7, “Repairing the Biosphere”
- Chapter 8, “Future of Jobs and Economy”
- Chapter 9, “Future Governance and Stability”

In a lot of books, authors make an argument through research and examples to bring more folks over to their worldview. I'll state right here that I have no vested interest in whether you share my worldview or conclusions or not. Generally, I'm happy that many perspectives exist, and I enjoy learning about a wide variety of perspectives as a means of better understanding people. In this book, I don't presume to know what goals you'll want to use the 4Cs toward, and I’m fine if different things matter to everyone in the world. I use the 4Cs on problems that matter to me in this book because teaching through practice, lived experience, and example is better than teaching in the abstract. Given that this book is my historical work, it

implicitly reflects the goals and values I held at the time those projects were being created. Regardless, the goal is to teach the technique, not have you believe my beliefs.

I'd encourage reading the book not as an invitation to agree or disagree with any specific policy position or priority being discussed but as a demonstration of how to use tools that can help us get ready to take on times of challenge resourcefully—with effectiveness, kindness, and integrity. If you, like most people, have things you'd like to change about the world, then don't simply read about these build tools as philosophical concepts. Get engaged with learning them as competencies and practicing their use on challenges that matter to you. It's only through new practice that new capabilities form, and we're at a point where the coming waves of destabilization will require everyone who can to develop new capabilities. This book starts on the task of developing new capabilities with the 4Cs. My hope is that with enough societal capability building, we can engage a critical mass of folks to collaboratively build the updated systems we'll need to address our biggest collective challenges.

NOTES

1. Marshall Sahlins, *Stone Age Economics*. Aldine-Atherton, 1972. https://files.libcom.org/files/Sahlins%20-%20Stone%20Age%20Economics.pdf

2. Giuseppe Dari-Mattiacci, Oscar Gelderblom, Joost Jonker, and Enrico Perotti, "The Emergence of the Corporate Form," *SSRN Electronic Journal*, February 2013. https://law.yale.edu/sites/default/files/documents/pdf/cbl/VOC_050_GDM.pdf

3. Wikipedia contributors, "Guilds of Florence," *Wikipedia, The Free Encyclopedia*, https://en.wikipedia.org/w/index.php?title=Guilds_of_Florence&oldid=1276193145

4. IBM Education, "What Is a Knowledge Worker?" IBM Think, n.d. www.ibm.com/think/topics/knowledge-worker

5. George Washington's Mount Vernon, "George Washington and Teeth from Enslaved People," n.d. www.mountvernon.org/george-washington/health/washingtons-teeth/george-washington-and-slave-teeth

6. Robin Wall Kimmerer, *Braiding Sweetgrass*. Milkweed Editions, 2013, p. 9.

7. Paulina Jany, "Food Sovereignty in Hawaiʻi." *Ke Kalahea*, April 2023. https://hilo.hawaii.edu/news/kekalahea/spring-2023/april/food-sovereignty-in-hawaii

8. US Energy Information Administration, "Hawaii State Energy Profile," n.d. www.eia.gov/state/print.php?sid=HI

9. "Ahupuaʻa System," Nation of Hawaiʻi, n.d. www.nationofhawaii.org/ahupuaa/

10. United Nations Development Programme, "Indigenous Knowledge Is Crucial in the Fight Against Climate Change—Here's Why," Climate Promise, July 31, 2024. https://climatepromise.undp.org/news-and-stories/indigenous-knowledge-crucial-fight-against-climate-change-heres-why

11. Stockholm Resilience Centre, "Planetary Boundaries," n.d. www.stockholmresilience.org/research/planetary-boundaries.html

12. A. Michael Spence, "Economic Decline Is Leading to Political Instability—What's the Solution?" World Economic Forum, March 24, 2016. www.weforum.org/stories/2016/03/economic-decline-is-leading-to-political-instability-whats-the-solution/

13. Pew Research Center, "Social Media and News Fact Sheet," September 25, 2025. www.pewresearch.org/journalism/fact-sheet/social-media-and-news-fact-sheet/

14. Oxfam International, "World's Top 1% Own More Wealth Than 95% of Humanity, as 'the Shadow of Global Oligarchy Hangs Over UN General Assembly,' Says Oxfam" [news release], September 23, 2024. www.oxfam.org/en/press-releases/worlds-top-1-own-more-wealth-95-humanity-shadow-global-oligarchy-hangs-over-un

15. “Rapid Prototyping Google Glass—Tom Chi,” TEDx Talk, TEDYouth 2012, January 22, 2013. www.youtube.com/watch?v=d5_h1VuwD6g

PART II
The 4Cs: Tools for Building Our World

Chapter 3
Critical Thinking

Our minds are always working with frameworks and stories. They are essential for cognition, as our total amount of sensory input is so large that processing sensory input without frameworks would be overwhelming. Our eyes on a regular sunlit day receive on the order of 1 quadrillion photons per second. Without sensemaking frameworks that help us know what to cluster, what to track, and what to ignore, we literally couldn't make enough sense of our world to get out of bed in the morning. Some framing happens at the sensing level, and other frameworks are invoked at more conceptual levels when we process our senses. Frameworks are at play when we look for where we should make a left turn or we use what we're seeing and hearing in a conversation to navigate a social situation. They serve us by providing orientation on information and events, and within those frameworks, our stories bring color, emotion, and a sense of sequence.

To concretize how our frameworks and stories shape us, say you are a student applying to a prestigious top university, and you didn't get admitted. Your experience could differ greatly depending on the framework you are operating in. If many members of your family had gone to that same school, your framework might be that it is part of the family legacy that you, the student, effectively deserves the spot. Given this, not getting in would be a real disappointment.

By comparison, if you came from a working-class family with lesser means, it may have been an ambitious stretch goal to get into that prestigious university. Perhaps you didn't get in, but your family is very excited that you got into three *other* schools, so the overall tenor of the situation is excitement and pride, not disappointment.

Finally, say you struggled academically. Your framework may not even include the possibility of going to any college, much less a top school. Your goal may be to see if you can find a job you enjoy instead.

In our first case, our frame of expectation leads to disappointment; in our second case, hope is followed by no disappointment. In the last case, hope,

disappointment, and expectation around schools don't even factor in. All of these frameworks are valid and common enough that if you grew up in a place where many students aspire to go to college, then you've likely seen all three. Yet the framework being employed shapes and patterns markedly different life experiences.

To the students who are employing their respective frameworks, it is “just what reality is.” Like a fish in water that doesn't notice the water it is swimming in, many of our frameworks disappear into our basic expectations of our lived reality. This is why critical thinking is so powerful. It is the skill that allows us to get out of the water so we can see our frameworks and stories and how they are shaping our behavior and thinking. In doing so, critical thinking allows us to start asking different questions that can lead to expanded understanding and capability.

Stories always have to make sense within their frameworks, and they can be used to help explain, propagate, or sustain particular frameworks. For example, if your stories about immigrants are ones of people who are part of hardworking families, some of whom have been great personal friends and coworkers, then accepting a framework that suggests that immigrants are a vital part of the community might be quite easy. If, in contrast, your stories about immigrants are that they are coming to steal from your community, by taking good jobs or increasing the crime rate, then you may easily accept a framework that immigrants are a scourge and managing their inflow is a crisis.

Furthermore, folks could have the framework of an engineer tasked with building a border crossing with the goal of absolute containment of migration; others could have the framework of a biologist who could point to historical DNA evidence that shows that at several critical points in human history, migration was the difference between the species surviving or perishing. With this view of migration, its containment might be a factor that reduces our survival adaptation capability as a species. As I hope you are detecting, many frameworks can be valid and logically self-consistent in any setting where humans are involved, as humans have a diversity of experiences and intentions that make sense within their respective frameworks. One of the core skills of critical thinking is to be able to see other folks' frameworks clearly enough to understand how their actions are appropriate within those frameworks. It's much easier to write off folks we

don't agree with, but the ability to hold multiple frames and perspectives creates a lot of room to see situations anew, build bridges, and find paths forward.

As we learn to assess frameworks and stories, the way our own minds work on particular topics also becomes evident to us. This fact alone makes critical thinking deeply useful in our lives. Even if it we applied it only to our own frameworks and not toward investigating and solving problems in the world, critical thinking around your own perspectives gives you incredible agency in how you make sense of the world and allows you to reboot your approach if your current frameworks are not helping you make your way through the world in the ways you had hoped.

As you get skilled in seeing frames, you will get more fluent in being able to think from other people's frames, which has several benefits. Doing so will help you expand compassion for how they make sense of the world and will provide more mental fluency and flexibility. It will also allow you to get the most learning from each frame, including seeing how each frame opens some new possibilities while closing others. How each frame makes some thoughts easy and obvious and others difficult to square. We saw in Chapter 2 how different frames on land management either raised or reduced the carrying capacity of the land. The differences in your world for each frame you adopt can be profound. Each framework expands fluency in a thoughtspace. In the greatest application of the skill, you'll understand and gain fluency in many frameworks, allowing you to relate to a wide range of people and solve sophisticated problems whose solutions might span frameworks or be built by borrowing ideas, possibilities, and improvements from several.

Critical thinking is also one of the skills that is harder for AIs. There are several types of AI, of course, but many are built off systems that do *training during their setup and inference during their use*. Generally, the goal is to get sufficient training data to reliably infer the highest-likelihood solution to any given input based on everything the system has seen from its training. Such systems intrinsically cannot ask deeper questions about problem frameworks. All the training data of these systems already assumes a framework that the systems cannot break out of without going into unknown territory, for which they has little training data, or invalidating the value of their previous training. You'll have no better luck with

reinforcement learning, which improves based on tracking how close you are to a well-defined success goal. That goal also effectively enforces an unquestionable frame. Reasoning models do offer some possibilities, but currently they built within a well-defined rules space. For example, AIs that look to do mathematical proofs adopt all the frames that come with that skill. If they were successful at breaking those frames through critical thinking, they would also fail to make mathematically legitimate proofs. A system that is trained in many domains would feel closest to critical thinking, as it at least has fluency in the many frames that make sense for those domains, but it doesn't challenge its training in any of the frames, as doing so would invalidate the domain training, leaving the model with nothing to work with.

None of these AI operations challenges the fundamental framing of the system. A challenge to the fundamental framing would sound more like the AI asking questions or comments like these: “Why are you training me to do this task?” “What goals and values are you trying to advance through this task? “I was looking at the training set, and believe I've found better ways the same data could be used to support training against criteria that are more important than the ones you've asked for.” In addition to the limitations just discussed, such systems would be frustrating to use, because critical thinking is not about doing the regular task in the predictable way; it is about interrupting the pattern of regular tasks to ask deeper questions about context, intent, efficacy, and contribution to larger system dynamics. Of course, a human using an AI system can realize that a particular pathway of inquiry isn't making progress, and the human can apply critical thinking and ask an AI to change its approach to a new frame. If an AI kept changing its approach and framing on its own accord, that AI would quickly become confusing and frustrating to use. More frustrating means less popular, and thus algorithmic systems that simulate critical thinking well would generally be less economically successful and are thus less likely to be developed commercially.

FLAWED FRAMES AND THEIR CONSEQUENCES

With these ideas in mind, let's quickly look at some of the frames from Chapter 2 that seem to have us stuck. We are currently in a frame that believes the cheapest, most efficient production possible will grow the economy and lift all boats. It absolutely does reduce the cost of goods and services, and up to a point more access to affordable items is broadly beneficial. Unfortunately, we also have a frame around corporate ownership, which allows equity holders (who typically participate via capital) to make much more than workers (who participate by spending half of their waking hours at work).

The corporate ownership frame stresses the workers' frame, as folks who deploy capital often don't need to spend much of their personal time making that money, and if their approach requires less time but is advantaged in terms of economic returns, success leaves them with even more capital to deploy into more efforts driving further returns, all while minimally sacrificing their time. The systemic advantage of not having to use one's time to generate wealth accelerates wealth concentration and, in any society where wealth provides more political access, can lead to policy influence that further protects and amplifies these systems of wealth accumulation.[1] It's pretty clear that these resultant actions do not lift all boats, as working-class folks have less income to participate in the economy and wealthy people tend to keep their wealth, not actively redistribute it.

If you are operating from the frame of the equity-owning class, then labor costs appear as something to aggressively reduce. Since most of the current market is owned by individuals and organizations that come from this frame, and they collectively have strong influence over what executive leadership teams do, the aggressive reduction of labor costs appears to be a market inevitability. AI and robotics will be put into every corner of the business as possible in the name of cost reduction. They will also end up in some corners that they don't belong in, even if the outcome is worse, simply because the costs will be lower.

Understanding the incentives and assumptions of a frame helps us understand why we are getting specific outcomes right now. It also helps us

to remember that these are *choices* we are making. In the absence of reviewing the frames and how they interact, it's very easy to feel powerless or that the current system is just the way the world works. Any frame that has been in place long enough starts to feel like unchangeable reality. But when we look at frames explicitly and trace their operating dynamics, then cast our net wider to get perspectives from other economic approaches across geography and time, we have new intellectual space to explore the choices we are currently making.

Similarly, our relationship to nature has its own set of frames. Some religious traditions see nature as something humans are meant to have “dominion” over. In a great example of how personal values can vary perspectives even with the same starting frame, the term “dominion” is used to justify both extreme exploitation and thoughtful stewardship of the natural world, depending on who is interpreting the word.

In either case, there is commonality in the frame that nature is something that humanity is meant to do something with. Other cultures have frameworks that see humans as part of nature and take efforts to highlight the interconnection and care that flows in all directions within nature, of which we are just one of many interconnected beings. It is clear how the difference in frames can drive a difference in behaviors and outcomes. When we take the dominion argument and blend it with a capitalistic impulse to maximize profits in the least time, it makes sense that we have clear-cut so many forests and strip-mined so many landscapes. This frame also encourages and expects collapse. A clear-cut forest gives you a lot of profit for a short time until the trees are gone and then none at all.

In comparison, native peoples of North America worked out sustainable timber harvest[2] techniques of rotating the areas they harvested from and never clearing the forest completely but focusing on harvesting timber from the trees that would be least impactful to overall forest health. By using thoughtful clearing, they were able to maintain healthy forest stock for longer, substantially shorten the recovery time after damage, and kick off earlier stages of ecological succession, thus accelerating its development into a forest with maximum carrying capacity and biodiversity. Their activities strengthened the forest as a whole. This type of system yields for as long as people need it to and never collapses; compare that to the exploit + collapse system we've recently popularized. Which is a better system?

Both approaches are logical and allowable in the frame they are coming from, but the Indigenous system provides products continuously without collapse and our current system guarantees collapse after a short period of economic output. In the capitalistic frame, the Indigenous approach may be seen as suboptimal because you could have made more money in less time by cutting all the trees, even if it leads to quick collapse. Our frames have the power to shape the range of possibilities we even allow ourselves to entertain about our future.

Last, in the field of global governance, there is a frame that nation-states are the central unit of identification and collaboration/competition. This frame enables certain types of interaction and disables others. We have seen moments—for example, after World War II—where we broke the smaller frames of national self-interest and asked the larger question: How do we move toward a world where war is rare?[3] The United Nations was formed, and even though it has its share of bureaucracy, the nation-spanning frame it has provided has helped humanity coordinate on global health, shorten conflicts, assist in nuclear disarmament and environmental sustainability, encourage participatory governance, and more. Ultimately many of the people who work there are politicians and bureaucrats, as is common in any federal government, but having them operate in the wider nation-spanning frame of the UN allows them to think bigger thoughts and go after bigger problems.

THE POWER OF CRITICAL THINKING

The Story of the Guatemalan Off-the-Grid Solar Box

To illustrate critical thinking up close, I'll share a few examples from my work where it opened up entire worlds of possibility.

In the mid-2010s, I was traveling the world helping to teach corporate teams and social entrepreneurs rapid prototyping. The consulting fees charged to the major corporations allowed me to do my work for social and environmental good pro bono. One of the teams I met during these years was based in Guatemala, working on a solar electric system to help rural populations living off grid.

Specifically, the work was in northern Guatemala, where many of the descendants of the Mayan peoples live. The entrepreneur, Juan Rodriguez, came from this lineage, with his grandmother originally being from these peoples. He was passionate about creating things that could improve life for rural folks. There are 26 languages spoken in Guatemala; only one of them is Spanish. The other 25 are from the Mayan language family. Folks with this background don't always speak Spanish, which is the official language of Guatemala, and those who don't can have difficulty accessing government services even though they certainly belong on these lands. Given the language barrier and limited connectivity in these small village communities, the people of the Guatemalan cloud forests typically live on less than $1 to $2 a day, and they rank among the populations in greatest need by the UN's Human Development Index. They make their living through subsistence farming and gathering as well as long treks to town in hopes of securing day labor jobs that help them bring goods back to their village. While most of the homes had walls and roofs, many villages had dwellings with no floors, so during the rainy season it was not uncommon to be standing in mud while indoors. Candles were used for lighting, which were expensive, provided inconsistent light for evening work, and created health risks from smoke and fire.

At the time Juan and his team started the project, about 20% of the people in Guatemala, or 2.5 million people, had no access to electricity.[4] Globally, more than 800 million people lack access to electricity, which means all the work they accomplish is human-powered or livestock-powered.

To give you a sense of how important electricity was on people’s priority list, I visited multiple homes where there were only three things in the home: a hammock, a cookstove, and a solar electric box from Juan's company. This was a strong indication that in terms of material priorities, after eating and sleeping, the next critical material priority for many was electricity.

When a household upgraded, it replaced smoky, expensive candles with long-lived LED bulbs, making light safer, brighter, and more consistent while also providing the additional benefit of being able to charge a phone. To give more of a sense of how this benefited people, in one village, I saw how cell phones were being used. There was no cellular service in the village, but if people walked an hour to a high hilltop, they could get one

bar and communicate with a contact in town to see if day labor was available before mounting on the five- to six-hour journey to get to town to pursue that work. In addition to these benefits, the LED light offered by the system helped their kids do better in school, as they had light at night they could use for their studies and didn't have to compete with their parents' need to use light for chores or craft work.

Juan, as CEO and cofounder of Kingo Energy, built a team to develop these off-grid solar boxes to power these communities, but at $125 a pop, they weren't affordable for those who live on $1–$2 a day. Fortunately, the team had learned from work on microloans[5] in lower-resource communities in South Asia and approached the Central Bank of Guatemala to help underwrite such loans for residents of the local communities.

For a while, this method worked great. Loans were approved, boxes were purchased, and households that could do this upgraded their livelihood and living conditions. But as the pace picked up, an unexpected challenge arose: Demand from the rural, non-Spanish-speaking Indigenous population was so large that it soon exceeded the Central Bank's available underwriting capacity. With the bank unable to keep pace with demand, it was clear we could not continue to go to market in this way.

This roadblock forced us into a critical thinking cycle that ultimately opened up huge insights from a major frameshift. You see, most electronics (and consumer products overall) are sold at retail, and all of the margin that powers the value chain for retailer, distributor, and manufacturer is generated from the moment of retail sale. If you can sell a product for the same price but quietly swap out a few components for cheaper versions that last “long enough,” then you get to take home a bigger margin for that same sale. All products that are purchased in retail settings engage in this process, which is called BOM (bill of materials) optimization. Simply put, you take a comprehensive list of the components used to construct your product, sort items on that list by price, and ask, item by item, from most expensive component to least, if there is a cheaper, good-enough component that could be swapped in, thus leaving the business with more margin. This method is so widely practiced, it is simply the water that people that work in manufacturing swim in. If you've adopted the framework of the traditional business model around hardware manufacture, this is the best way to operate. Unfortunately, when every business does this on every product, the

net result is a world where no one is surprised that a five-year-old cell phone has stopped working. There's nothing surprising if a blender is dead in a year or a new garment comes apart after three months. We're not happy about this, of course, but we're not surprised either. A world where products break down quickly is a world where more resources are needed to achieve the same net utility, and a lot of time and money is spent procuring and installing replacements. These are all direct results of working within the rules of this frame.

Given the challenges in Guatemala, our big shift happened when we explored a pay-as-you-go business model for the product. In this new model, we delivered boxes to homes for a small fraction of the total product cost but made our margins over time through use. We could now deliver solar electric boxes at much lower up-front cost, and we priced the cost of using the solar electricity box to be less than what people were already paying for candles: $8 per month, instead of $15. This meant households were saving cash immediately all while receiving a better level of service. It also meant that we didn't need to burden underwriters to get the service into the world. If you were using the box and paying for electricity, you kept the box. If you stopped using it for an extended period, we'd collect it to be deployed to another home that would make use of it.

This shift was moving us into a different frame, and critical thinking helped us realize and open up new possibilities from that frame. Doing some modeling, I realized that in a pay-as-you-go system, the longer the hardware was able to last in the field, the more revenue each box would ultimately generate. Unlike most businesses where higher margins were driven by lower product cost, our higher margins were driven by greater product longevity. This idea led to a simple calculation: If we added $5 to the BOM, but that spend increased the expected life of the device by six months or more, the improvement to the device would more than pay for itself. Simply put, if the box generates $100–$200 revenue per year and lasts only one year, then the ceiling of revenue is quite low. But if the device lasts 20 years, the ceiling of revenue from that same manufacturing effort could generate $2,000 to $4,000.

In this updated frame, the financial incentive actually aligns toward making the most *durable* products instead of the absolute *cheapest*. Adopting this framework and getting the benefits from it were also no more difficult than

regular BOM optimization. The only real difference was that instead of stack ranking the component list by cost, we did our stack rank by the shortest mean time to failure. That metric is often already characterized and listed on electronic component data sheets, so it was not harder to work with than cost numbers. By asking the simple question of whether we could substantially increase the mean time to failure by spending modestly more for a better component, instead of asking whether we could get away with cheaper components, we ultimately built a device that can be expected to last for 30 to 40 years. This effort has proven out, as the hardware has been exceptionally robust. Unlike typical electronics (like cell phones) that often break in normal use after a few years, these electronics have been in the humid, rainy, muddy conditions of a cloud forest jungle and are going strong more than a decade in.

This optimization process required no new staff or skills and was completed in about six weeks. It wasn't different skills that allowed us to rapidly improve the reliability of the product; it was simply a different perspective arriving from a different framework around the optimization. Just as these benefits arose from a frameshift, our current disposable economy arrived from adopting a previous frameshift. Roughly a century ago, the product culture valued products that were designed to last and be simple to repair when issues arose. By the 1950s, the concept of “planned obsolescence” was popularized;[6] this frame focused on increasing the pace that consumers would desire products to replace their current products, whether for updated style, function, or short durability of the previous product. The people advancing this frame did so with the intent of increasing sales volume, and as that drove more revenue into a business, it became a commonplace practice. Planned obsolescence heralded us into the age where BOM optimization dominated, with all products trending toward shorter lifespans and faster disposal.

All of that history was challenged easily in the presence of a frameshift. The pay-as-you-go approach brought to light alternative business models for product development that drove higher quality and durability. This also had the positive environmental benefit of requiring fewer materials to provide the same or more utility to the world over that longer product lifespan. Any or all of these benefits are worth exploring more in a world where we are bumping up against planetary limits due to our approach to extraction and

pollution.[7] It also suggests further directions for experimentation. Just a small step away from this framing is the idea of eliminating environmental waste from the planet by instituting a simple rule: If you intend to make a product that is to be disposed of at end of life, it needs to be made of Earth-compatible materials that can return to nature without any extended or unusual processing. If you intend to make a product that includes materials that don't easily return to the environment, then it needs to be arranged as a closed-loop service business. (The pay-as-you-go model we implemented is one such example of this approach.) By implementing that one regulation, most forms of Earth-damaging pollution could be eliminated, and the companies using non-Earth-compatible materials would transform into service businesses, potentially providing them more predictable revenues and letting their recovered end-of-life products become a major material input for their new products, saving them input costs. Frameshifts reveal new possibilities, and those possibilities invite experimentation that allows us to learn how to make the most of these new possibilities. Is this one idea guaranteed to create all the benefits I suggested? No one knows until it's tried, but our early experiments with this business model concretely demonstrated some winning characteristics and some new terrain to explore.

Along with the many benefits I’ve mentioned that came with the pay-as-you-go approach, the challenges of working out reverse logistics on underutilized boxes as well as managing debt for asset hardware financing arose. None of these challenges was intractable, and they added less complexity to the system than the complexity we'd saved by moving away from the BOM optimization frame. Your process of breaking frames will also likely surface peripheral build elements arise as you work through the close-in operating details of the new system. This doesn't mean that the new frame is not working, only that, if you intend to make something that can fully replace the existing system, you should expect to solve the problem in the new frame through to the same level of nuance as the original solve.

The feeling that comes from taking a new perspective on a problem and seeing it through to completion is one of the most profound experiences that you can have. You have the power to change the possibility space for yourself and everyone who comes after you. Critical thinking is a

consistently useful doorway to start this process. Now let's dive into how you can start building out your toolkit.

BUT FIRST, CLEAR THINKING

To be effective in creating a different course for the future, it's helpful to start by examining the frames that are shaping the present. Before any progress is made—before there is any policy, prototype, or product to try—there is always a frame. I'm sure you are picking up by now that all of us use a collection of frames to make sense of different settings and life experiences, with the frames we use most shaping our thoughts and lives the most. And just as all individuals make use of frames, societal institutions also have frames adopted by those operating in that setting. In the social institution that is a hardware startup, BOM optimization is a persistent frame. If you work within that setting in a traditional way, you will need to adopt the frame to work effectively with the rest of the team.

As we saw in our example, as soon as you assume the frame, it drives so much of what is possible. The process always starts with understanding the default system frame(s) and asking what behaviors are encouraged for each party involved. During this process, just look at incentives and actual observable behavior, don't color it with your perceptions on the moral intent of the players. As mentioned, the same hardware engineers built a super-high-reliability device as opposed to the lowest-cost device because of the frame, not because they shifted morally; rather, they did the best job they could in each of those frames.

A lot of times we self-select out of working with folks because we assume moral intent and write them off because we are repulsed by our assumptions about them. With a little critical thinking, you'll see that this mindset limits the folks you could productively work with, and your world will be as small as your assumptions are strong. In the world of political persuasion, it's a common technique to cast the folks with other frames as morally deficient, which has two side effects. One is that you listen to their perspectives less well because why would you want to adopt an immoral position? Second, the disagreement in policy position is considered something relatively ingrained in the person, as opposed to a set of beliefs and behaviors that

make sense in their current frame but could change quite quickly if the people were in another frame.

So we start by examining the frames we are in, reviewing their underlying assumptions, seeing how the structure of the frame drives behavior for all parties involved, and seeing, in the range of observed outcomes from that behavior, what set of outcomes is likely and what set of outcomes is made impossible by the frame. This type of critical thinking allows people to question their frameworks of thought and develop new ways to extend, challenge, or break through them. Critical thinking is a process that's immediately available to anyone and doesn't take years of instruction to learn. It is one of the foundational skills of enabling real change in any field.

Let’s think of almost all mental efforts we take on as either a type of reflexing or a type of de-reflexing. Reflexing is when you are doing or learning something consciously that allows you to make that activity more of a reflex over time. For example, you might start by slowly sight-reading a piano piece, but after a bit of practice, it has become enough of a reflex that you can play the piece at full speed without looking at sheet music. When we practice things enough to become a reflex, they can happen quickly and reliably, and doing them takes significantly less brain activity and conscious effort than what was needed during the learning process. This is true of skills like playing the piano but also true of worldviews, perspectives, and operating frames. In this context, we can see critical thinking as a type of intentional de-reflexing. De-reflexing our perspectives and frames can be uncomfortable. You will feel slowed down a bit, especially if you are applying de-reflexing in an area of long-standing belief or practice. We must learn to de-reflex, though, because the one drawback to getting faster and more automatic with any skill or perspective is that the reflexed part stops changing and improving. This is why learning to use critical thinking to de-reflex existing frames and approaches is so often at the start of substantial improvements to any practice.

A PRACTICAL GUIDE

Now let's get into the practical process. I'd pick a frame that is quite familiar to you, as something you've been using or comfortable with for a

while. Doing so will let you work from direct experience as opposed to from assumptions. Now, to break a frame, start by asking:

- What is defined as productive versus unproductive in this frame?
- Which parties established those definitions?
- What axes of measurement and assessment are used in this frame?
- What does this frame explicitly serve, accidentally serve, and explicitly does not serve?
- What is the typical pattern of activities and responses one would expect?
- Can you apply curiosity and compassion to understand how all the major people and parties in this frame make their decisions?
- Can you understand this decision-making deeply enough to see why they take particular actions, even if those actions differ massively from what you would do?

Plenty of questions could be added, but this is a good start. As you answer these questions, you will be able to see the lines of sequence (what has to happen before another thing happens); you'll see the lines of force (what forces drive action and which respond); you'll see how much of it is shaped psychologically (expectations, norms, beliefs) and how much is shaped physically (location, access, visibility). Once you have recorded the results and diagramed these patterns, a simple rule of thumb is that if you change any of the elements you've noted, the entire functional metabolism of the system starts to shift. A different cascade of actions will become the norm with each reframe and with each adjustment to operating assumptions. A simple thought experiment that you can try is to remove one element at a time and see how the system changes. Remove an operating assumption. Remove one of the parties to see how the others would step up if the other were to step out. None of changes needs be something that you intend to do, but taking your understanding of the sequences, forces, and setting and changing in it these ways often helps to bring to light more of the dynamic possibilities that are hiding right beneath the current frame.

Get Back into Learning: The Core Exercise Question

As much as the last instructions are not conceptually hard to understand, I have found in workshop settings that a number of folks are blocked at step 0 and can't even get started. Specifically, they have been stuck in the current dynamic so long, they bring any conversation back to their belief that it is hopeless and nothing can change. This hopelessness takes the form of statements like: “This sounds interesting, but we won't be able to get it approved by leadership” or “I've tried and I know this part can't change.” This mindset might seem well justified, but it is reflexing staying in a state of powerlessness. Here's how you shake it:

1. When you're stuck on a problem, take out a sheet of paper and write the problem at the top of the page.
2. Then spend the next 90 seconds writing out a short list of statements that lay out the things you know for sure about the situation. Especially focus on the elements that seem to be contributing to the problem.
3. Now circle any one of these statements you know for sure. For that circled item, spend 60 seconds answering this question: What else could I still learn about this?

The purpose of this exercise is to move folks out of a fixed mindset that is built around unchallenged assumptions about why the situation is stuck. Carol Dweck, Stanford professor and author of *Mindset*, describes the fixed mindset versus the growth mindset, and my main addition is that these mindsets are not permanent personality traits of anyone. The same person can be fixed in particular topics and growthful in others, and a person's mindset can change from moment to moment if the person decides to do this exercise or is helped to get there through light facilitation. Not only are these mindsets not permanent, I reliably enable people to shift into the other mindset in 5 minutes of working together. Many other techniques can make a difference. The exercise is designed to loosen your commitment to beliefs about the stuckness of the existing frame and move your mind into a state of openness to possibility. It shifts you from a rigid belief in the current, often self-consistent but limiting frame to acknowledging that there is more to discover and that you and the system can be changed by learning and experimenting with new approaches.

HOW TO THINK IN VERBS

Another entry point to understanding systems in new ways is by adopting a verb-centric view instead of the standard noun-centric view. Nouns are cognitive shortcuts that allow us to use short labels to represent things that typically are far more extensive in function and nuance. When we label something with a noun (like “apple”), our brain activity spikes briefly to accomplish the recognition task, then quickly falls once the label is assigned. If you do this live, asking someone to name what is in your hand as you pull an apple from behind your back, the labeling will be accomplished in less than a second, and then the person will look up to you wondering what's next. If you ask that same person not to name the object but to spend 60 seconds describing what is in your hand, instead of the quick cognition of labeling, they will start to describe the pattern of colors, the shape, the type of apple, ripeness and flavor, how shiny or matte the skin is, and so on. We don't totally realize that we are making a choice, but when we default to noun mode (which is most of the time), we literally see less of the world. We also auto-import unspoken expectations associated with the labels instead of seeing what is front of us clearly.

Once you slow down your initial approach from 1 second to 1 minute, many aspects of what is in front you will emerge as visible and available for your working cognition to play with. Then you'll want to plot out the chain of verbs that made that aspect possible. For example, if the apple is shiny, not matte, you may ask about the verbs that had it be that way. Was that waxy coating sprayed on, or do apples naturally produce them? Apples do have a naturally produced wax, so how does it work biologically, and when did it develop evolutionarily? If the apple has a particular name, like a honeycrisp, then what cultural and agricultural verbs made this possible? It was developed at the University of Minnesota. Great, so let's examine more deeply how varieties are developed and commercialized. These are not the only possible chain of questions, but you can see that exploring the verbs that contributed to the observed aspects of the object or situation massively expands the cognitive palette that you have to explore with. Lineages of contributing verbs are particularly potent for understanding and improving systems. Almost everything we experience is possible only from a bouquet of contributing verbs or metabolisms. Any change to the input to that verb or adjustment in the verb itself will change the whole system. By tapping

into the contributing verbs, you also have a much better chance of tapping into mechanisms that drive change, as the verbs by definition drive what the system *does*. Changes to the verbs/metabolisms nearly always get you a different system output.

Working with verbs is in contrast to what I often see when I first start working with a team—people spend inordinate time getting agreement on nouns (definitions/categorizations/problem-labeling). After doing this, they don't want to diverge much because so much stakeholder alignment was expended on just agreeing on nouns and definitions. There are too many pitfalls to list, and if you work in business, I'm sure you are familiar with these low-efficacy settings. Reset your understanding of any system focused on the bouquet of verbs at play, and you'll be in the right headspace for the rest.

THREE TYPES OF TRUTH

Critical thinking will allow you to break frames, create new ones, and hybridize parts of frames that make the most sense or align with your values and intent. That said, I would be remiss to treat frame assessment as purely a question of what resonates with values and intent. Some frames ask us to believe that particular things are true, and, at this moment, when there are few if any controls on misinformation and disinformation, things that “feel” true or stories that hit an emotional tone sharply can have us adopt frames that ultimately hurt us because what is presented is ultimately not true in any factual sense.

To explore this topic, we first need to establish that there are three different types of truth: physical truth, social truth, and personal truth. I've been very fortunate in my career to work mostly in the most stable form of truth: physical truth. Physical truths are things that would work and be true even if humans didn't exist.

For me, I started my astrophysics work studying the cores of the brightest galaxies, with a focus on NGC1068, a galaxy that is 47 million light-years away, meaning that the light I was working with predated the human species by over 46 million years. Humans definitely weren't involved in generating these photons, and no human input or opinion is required for the

physical universe to work. This includes the function of planetary atmospheres, which Carl Sagan argued elegantly when explaining to Congress[8] the difference between the atmospheres of Mars, Earth, and Venus, as a means of clarifying the reality that greenhouse gases are one of the main drivers of surface conditions for any planet.

This brings us to the second form of truth: social truth. It is, in short, what large groups in a society believe, and it's been extremely important in our development as a species. Social truth has allowed us to build larger societies than other primates, who need to personally know another primate to have a social relationship with it. Humans can abstract these relationships and beliefs a level up and be allied with people they barely know because of a shared sports team, national identity, or political party. The primary value of social truths is to shape allegiances and affiliations.

In comparison to physical truths, social truths obviously depend on humans to exist—humans are the generators and perpetuators of social truths. In the absence of humans, then there'd be no one to establish who the biggest pop stars are. There'd be no one to argue why their local sports team is the greatest or vote in the next election.

All that said, social truths are not stable. They can shift, just as the viewpoint of most of society on slavery, racism, colonialism, and LGBTQ rights has shifted over time to see more people as equal humans deserving of human rights. What happened to the previous strongly held social beliefs that saw Asians and Africans and Indigenous people as subhuman and philosophically underpinned colonialism? What happened to the previous belief that tried to argue that all LGBTQ folks (or really anyone different) are mentally ill predators? These beliefs have largely gone away because social truths, however common the thinking, are often not real in a deeper sense. Once a “subhuman” British subject (Srinivasa Ramanujan) starts solving deep problems in mathematics or someone who by “God's will” was meant to be a slave (Frederick Douglass) builds a movement via brilliant oratory, we see how social truths are not up to the task of actually understanding how things work.

The fact that we've allowed the phrase “believe in climate change” to exist is already a category error as it miscasts a physical truth as a social one. No one needs to believe in the physics of planetary atmospheres for greenhouse

gases to work how they work—they've worked this way long before there were humans. Getting millions of people to think this is in the realm of belief is a deep harm, and maintaining that belief in the face of mounting evidence and direct life experience to the contrary creates greater and greater cognitive dissonances that can be solved only either by returning to the reality of the physical truth of the situation or, as the second Trump administration is attempting, by erasing all the relevant data and decimating funding for organizations that measure physical truth. The media is not careful about distinguishing physical truth from social truth and generally likes to cover “both sides” of a story—that is, to presume all stories are about social truths. But if you drive your car off a cliff, there is no “both sides” to whether the physics of gravity will plunge you to the ground.

Last, there are personal truths. A horror movie might be rated PG-13, but if you know that you don't do well with horror movies, it's “too scary” would be a completely valid personal truth. Similarly, if a LGBTQ person grows up in a family whose religion isn't supportive, their sexual orientation and gender expression are still personal to them and can be part of their personal truth. Same if a person who is highly drawn to spirituality grows up in an atheist/materialistic family.

Staying in touch with such personal truths will shape the trajectory of your life and needn't be justified scientifically or socially to exist. That said, I wouldn't recommend jumping out of airplanes without a parachute because you have a personal truth that gravity doesn't exist. Nor would I suggest being visibly a LGBTQ person in a country where being yourself is punishable by death or imprisonment. Although personal truths don't need to be strictly justified, they can absolutely put you in danger under particular governance regimes.

As you employ critical thinking to the frames you experience in life, it's extremely powerful to ask whether you are speaking of scientific truths, social truths, or personal truths. Each has its own sensibilities and validation approaches, but some popular ones for addressing these three forms of truth are the scientific method, journalism, and self-reflection, respectively. If you use a mismatched form of inquiry for the type of truth you are facing, then it'll be pretty frustrating and you may end up advancing ideas that, even if they catch on, won't ultimately work or improve life for the folks involved because they aren't true.

Type of Truth ➔	**Scientific**	**Social**	**Personal**
Data source	Observation of natural world	Surveying/interviewing large groups of people	Self
Sensemaking discipline	Scientific method—repeatable, well-controlled experiments using robust data collection and analysis methods	Journalism—focus on primary sources, aware of internal biases, thoughtful explanation toward collective public sensemaking	Self-reflection, inner work, meditation, therapy, personal values, life philosophy
Applicable to	The functioning of the natural world, physics, chemistry, biology, medicine, engineering viability	Assessing public sentiment, adding context to worldviews, informing over entertaining	How one chooses to construct a life and interact with others

WHY EXPERIMENT?

After working out what type of truth you are making sense of, there's one more important concept: Are you trying to deduce truth from a position of inquiry, discovery, and understanding, or are you trying to “deduce” truth by only paying attention to ideas you already agree with?

I say this, but I want to communicate this itself is a skill. It's one that scientists work hard to develop and value in each other, but even scientists are drawn toward hoping that they are correct if they’ve worked hard on a paper suggesting a discovery or result.

That said, every scientist who publishes will receive critique and skepticism from other scientists both before and after they publish. Far from these critiques and skepticism being seen as unsupportive behavior, foundational

skepticism is why we believe in the scientific discipline at all. If a result stands up over time even after waves of principled critique, then we gain more confidence. In science, however, we are always open to new data, so at some level, even with very well-established results, scientists leave room for possible expansion or contradiction of our current understanding.

I want to contrast principled scientific inquiry with the “independent research” that some folks engage with to support conspiracy theories. Such research typically doesn't come from a place of dispassionate skepticism; it comes from emotional connection to a scary narrative and tribal connection to a group of people who believe something similar. The scary narrative moves the story into the flight/fight/freeze centers of our brain, and consequently our brains work less well than when we are more emotionally regulated. In addition, most of these quasi-research efforts are looking for tiny needles in the haystack that agree with their view.

It's not impossible for a rare thing to be true, but an honest inquiry takes all the current data points into consideration, not just examples that support their conclusion. They would also think of principled experiments to test their own beliefs and run them with peer-reviewed methodologies for anything that is claimed to be scientifically true—again, people can have any personal belief. I'm well aware that most people do not have this training, but I'll say that learning the scientific method is not particularly hard. It might take all of half an hour. The practice of applying it with measured and dispassionate inquiry and getting good at study design that is methodologically sound are the actual skills.

Given that we are in a time where several systems are breaking down, it is truly a great moment for critical thinking. In an era where media supplied by anyone can be seen by anyone, it's more possible than ever to share stories and frames, and this includes quite a few misleading stories.

By applying the skills of delineating what type of truth is in play and assessing a topic from a methodologically sound and dispassionate place, we continually clarify our understanding of the world. Conspiracy theories are a pitfall, and they result when part of the critical thinking toolset is used, but doesn't see through the motion completely. Specifically, when people challenge steps outside of an existing frame or set of stories, they are practicing a rudiment of critical thinking. But doing that only to blindly

justify beliefs you already have or to be sucked into an emotionally compelling conspiratorial idea ends up negating the value of trying to step out of the frame in the first place.

DIVERSITY IMPROVES CRITICAL THINKING AND OVERALL COGNITION

The periods in human history where many perspectives came together in relative peace have been huge impetuses for the progression of civilization and culture. From Renaissance Europe, to the Silk Road, to the Teotihuacan trade network, the diverse interchange of ideas, goods, and skills enriched many peoples, not just a single group. Just as diverse inputs enrich entire societies, the same is true within a single person. As we develop our critical thinking ability, we can more easily hold a diverse set of perspectives, allowing us to solve problems in new ways, have deeper empathy, and get unstuck.

If the interchange that comes from diversity has been a long-standing historical driver of cultural procession, then how do we create those conditions now? Tech companies discovered a while ago that if you want to get the best talent in the world, it is best to pick from the best of the largest pool you can select from. Mathematically, the top options in any smaller subset simply cannot be better than the top options across the whole set. For example, the US tech industry sponsors the vast majority of high-skill work visas in order to draw talent from a diverse range of geographies. If you want the best talent, you source everywhere in the world and across as diverse and as expansive a group as you can get.

When I joined Google, the team that would be known as Google X was in the process of being founded. At the time there were eight people on the team total, of whom six were born outside of the United States. (We were from Russia, Japan, Iran, Germany, Taiwan, and Colombia.) This team went on to build new forms of AI (Google Brain) and self-driving cars (Waymo) and do foundational work in augmented reality (Google Glass). If, a few decades back, the United States had been less welcoming of immigrants and turned some of us away, there would be no Google X.

When you are trying to make a team to pursue such ambitious projects, you're aiming to get the very best folks you can. Again, the math is simple: Picking the best from a larger set (the world) is going to work better than picking the best from a smaller set (a country or, worse yet, people of one race in one country). I mention this because ethno-nationalistic ideas are very common with folks who use fear of other groups to advance their political careers. This perspective eliminates diversity and reduces the size of the talent pool. History and math suggest that this is a pretty bad idea.

It's exactly people of different backgrounds and perspectives who allow a team to explore and synthesize data from a wider swathe of possibilities in less time. Having diverse functional experiences across our varied career histories is what allowed us to practically realize innovations that other teams could not. Although we had diverse backgrounds, we were able to agree on some core values. For example, the team shared the belief that the main purpose of inventing a self-driving car was to improve safety and save lives. Given this, even though the 2011 version of our cars drove better than Tesla cars would 14 years later, we didn't release them until 2025, when the cars had surpassed the safety of human driving. A diverse group of talents with shared values has been at the core of many world-changing teams.

NEW POSSIBILITIES INTO NEW EXPLORATIONS

Engage in an Existing Frame, or Create a New One

Let's conclude by using the tools from this chapter to analyze the frames that drive our current economy, so we can start generating testable possibilities to experiment with to assess if we are getting positive change. We can start by tracing through some of the assumptions of our economic frame: Productivity is measured, at the national level, by gross domestic product and by a small group of other indicators. Consumers and workers constitute most of the people involved. Workers are motivated by earning enough to support their lives, building a career, and working with peers who share their abilities to achieve a mission. Consumers are motivated by needs (ranging from life essentials to superficial whims) to buy products and services that speak to those needs at a price and quality level that works.

With this simple trace, it's possible to ask questions that experiment with breaking our current economic frame. For example, what if a nation measured both its GDP and its natural resource health index? How might that change what is possible in an economy? That nation may have types of resource exploitation that they don't pursue or pursue in a different manner, as tracking both metrics makes it easy to stack rank economic activities by the ones that have the least negative ecological impact per dollar of profit versus ones that have the most. That society might choose to focus on expanding its economic activity on the top half of that list, as those efforts would get the most GDP improvement for the least environmental damage.

Hopefully you are starting to see how quickly the possibility space can open up when we ask new questions. This expansion of possibilities happens quite universally as the techniques we are working with here are creating practical ways to use your cognition intentionally. You'll now know how to unstick a problem by examining the frame, working out the dynamics, expanding out the possibility space, and using all of this to springboard into trialing new ideas and actions.

Taking another example, what if business owners got feedback on their team culture automatically because it was common practice for the state labor department to send surveys gauging team culture to a random sample of employees in any business with over 100 employees? And what if that score were widely referenceable? Leaders would be encouraged to get more skillful at running teams with great work cultures so they don't log a bad rating whenever their employees are selected for the next random survey batch. You can see how easily ideas start to move when we start by disarming pitfalls like reflexive cynicism, then start making sense of our frames, expanding out the action by tracing the verbs, and using this expanded space to generate compelling ideas to experiment with.

NOTES

1. Thomas Piketty, *Capital in the Twenty-First Century*. Belknap Press of Harvard University Press, 2014. www.hup.harvard.edu/file/feeds/PDF/9780674430006_sample.pdf

2. Fred Pearce, “Tree Keepers: Where Sustaining the Forest Is a Tribal Tradition.” Yale Environment 360, July 24, 2023. https://e360.yale.edu/features/menominee-forest-management-logging

3. United Nations. “History of the United Nations.” www.un.org/en/about-us/history-of-the-un

4. World Bank Group, “Access to Electricity (% of population)—Guatemala,” n.d. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=GT

5. The Nobel Prize, “Muhammad Yunus—Facts,” Nobel Prize Outreach 2025. https://www.nobelprize.org/prizes/peace/2006/yunus/facts/

6. Roma Dhanani, *The History of Planned Obsolescence* [blog], Akepa, The Sustainable Agency, January 13, 2025. https://thesustainableagency.com/blog/the-history-of-planned-obsolescence/

7. United Nations, Department of Economic and Social Affairs, Statistics Division, *The Sustainable Development Goals Report 2019: Goal 12: Responsible Consumption and Production*. https://unstats.un.org/sdgs/report/2019/goal-12/

8. C-SPAN, *Carl Sagan Testifying Before Congress in 1985 on Climate Change*, *YouTube*, posted August 19, 2021 (original hearing December 10, 1985). https://www.youtube.com/watch?v=Wp-WiNXH6hI

Chapter 4
Creativity

Creativity is the skill of creation. It is the act of intentionally changing to bring something new into the world. While critical thinking allows us to identify, understand, and break frames, the world does not change without applying creativity to build or rebuild into new possibilities after a frame has been broken. Although a creative process can be done without critical thinking (e.g., making a piece of art to hang on your wall), the combination can be profoundly transformative.

Critical thinking resides in the sphere of the mind—of thought or visualization. Creativity comes to life through the creative process, which exists in the realm of tangible action and experience. The process of creation eliminates abstraction, and this in itself is a powerful clarifier. We live in a heady information age world, where many ideas that sound plausible are rapidly shared through digital channels, but, as someone who actually builds things, I can tell you that most ideas that people come up with outside of building simply do not work. It really doesn't matter how smart you are or how eloquently you argue a point; the creative process will humble you when it comes time to build. This is why so many who seem successful in the media environment, which is heady and about ideas, never actually try to build what they are speaking of. The reality of making something and truly being open to whether it works is so much more challenging than simply believing you are right. If you have the humility for the creative process, for the build, you also have the key to actually changing the world instead of just talking about changing it.

My entire career has been built off of the creative process. I'm a named inventor on 77 patents across a wide range of fields and am also a practicing musician and artist who has contributed to over a dozen albums and hundreds of works of art. I've patented only a small subset of what I've built, because patents are more of a legal process invoked to protect inventions in a commercial context, and a lot of my builds were done for the joy and curiosity of building or were earlier product experiments that didn't make the final released product.

The groundedness of the build is where reality happens, and it brings incredible clarity to whether our ideas have any utility. I often teach audiences this: *There are many things that work in theory that don't work in practice, but there is nothing that works in practice that wouldn't work in theory. And, by the time it works in practice, knowing the theory is optional*. This is a simple way to understand why the build is a faster way to change the world than the theories. Theories are what you use to make sense of actual data; they have little utility (aka they're usually completely wrong) without the data that comes from the build and creative process.

I know that you are reading a book that appears to be filled with ideas, but what I'm writing about was learned from practice. It can be hard to differentiate between the two in an environment where most of the action seems to be in the realm of ideas, with various parties trying to advance their ideologies via arguments and memes. But if you are interested in solving the big problems of this century, or even the day-to-day problems in your life, no amount of listening to abstract ideas will do it. You need to create. You need to build. If you want to quickly understand who builds and who just talks, listen to how nuanced the solutions are. Ideas/memes move faster if they are simplified, and builds work best when they are as nuanced as the world they are being built for. People who are actually trying to build something can also quickly answer this question: In which situation has your idea worked the worst so far? If they can't answer that question, they aren't building. Ideas people get nervous about discussing situations where their ideas may not work because the currency in their industry is that *you believe them*. Build people know that it's exactly those situations that teach us most on how to improve our work. The currency in our world is that it *actually works*, so everything that shows us what is not working is amazing information.

The creative process involves working toward different design goals within constraints and constantly getting feedback to understand the effect of creative design work through iterative doing. Creativity can generate any output, including artistic expression, but it is also the fundamental skill of all practical problem-solving and innovation in daily work. We live in a time where people are constantly being drawn into conceptual arguments; understand that none of those arguments is for your benefit. Content that inspires rage, feeds obsessions/addictions, or manipulates your social

relationships help social media companies and the larger media landscape make more advertising revenue. I've called this the fast-food version of purpose. You see something that fills you with righteous indignation in your content feed, and for a moment you feel purposeful, as if you are really doing something. But gorging yourself on this fast-food version of purpose is going to leave you very sick. Actual power comes from creativity. Actual power comes from the build—the ability to change the lived reality around you through the creative process of trying to concretely realize something that makes a difference. I do understand that sometimes people settle for the fast-food version of purpose because they haven't developed their ability to create, so perhaps being angry about a meme is the best they can do right now. But if this is you, you deserve better than to be trapped in a propaganda rage/doom cycle.

CREATIVE LITERACY

We often think of creativity as being confined to artistic expression—music, fine arts, dance, theater, novels. Certainly artists are people who live in the creative process. But creativity is much broader than the expressive arts. It is a skill that we all had innately as children, and, like any skill, it can be developed to enable us to take on harder and harder problems for ourselves and our communities. Creativity gives us practical capability in the face of any challenge, and we are in the early decades of embarking on a century of challenge.

Most people lose belief in their creative abilities sometime during the traditional schooling process, which primarily focuses on literacy, numeracy, and history while often underplaying the arts, shop classes, and creative project work. I would suggest that much of this loss of belief comes from an industrial mindset for education that overprioritizes standardized testing. In these tests, every question has exactly one right answer, and every question comes with enough information in the question to answer the question. These attributes underlie nearly every question answered on every test students take in their school years and condition how we think about problems for the rest of our lives. The problem is that these attributes are *never* true in the real world when we are in the process of solving new problems.

What is always true in these settings is that instead of one right answer, there are many ways a creative process can solve a problem and typically many solutions that solve it well. What is also true is that we rarely have enough information to solve the entire problem at the start. The information required to complete a solution arises during the creative process of trying out different iterations on the way. A simple way to understand how we've been trained out of creativity is to solve this equation:

$$X + 5 = 10 (\text{Solve for X.})$$

Most folks who have taken algebra will solve this in seconds: X = 5. What's the big deal? Nothing, if you are trying to learn numeracy. But this test question has all the assumptions I mentioned before. There is one right answer, and the question contains enough information to get to that answer. Now imagine seeing this problem on a test:

$$X + Y + ? + 234 - 11 + ? = ?? / 2 (\text{Solve for X.})$$

It doesn't take us long to realize that we can't solve this problem, at least not immediately. Now, if someone came by and replaced all the question marks with numbers and gave a value for Y, then, yes, the problem would be solvable in seconds. But until that additional information comes to light, it is *literally unsolvable*.

This hypothetical problem with all the question marks is much closer to the format of most problems we use the creative process to solve. We start out not knowing everything we need to successfully solve the problem. We then create prototypes to get out of concept and into the full complexity of lived experience. Through observing and iterating on actual lived experiences, we can see which approaches lead to useful outcomes that meet the design goals. In the process of working with actual observed behavior in the real world, we reveal where the question marks are and also where the influences are that drive how the whole system behaves. As we uncover those question marks, we are able to make sense of more and more of the problem, until the solve for X comes into view. The real solve skill lies in our ability to discover the question marks and work out their values through the creative process. The question marks here might represent the response

that different stakeholders may have to a proposed solution (it's a question mark because there's no way for us to know for sure until you try) or a series of system influences that are revealed only after the previous level of solve has been accomplished. All of these are standard fare in the process when we are creating anew.

When you come from a world of substantial academic training but low creative literacy, it's normal to believe that the standardized test assumptions are true. When someone gives you a problem with question marks, the first place to go is to try to solve it using the information in the problem itself. You'll look and see the “234 minus 11” and immediately say: “223! We are almost there!” Clearly, though, you aren't even close. And this bias toward the parts of the problem you can see absolutely means that anything you come up with that speaks to the visible parts without addressing the question marks will not work. A team working in this way will appear to make progress when they first start and then will stall out within weeks because they keep trying to use the little information that is visible instead of intentionally solving for the question marks. As a highly paid consultant, I've gotten team after team out of this jam in a day, even when they had been banging their heads in a stalled out state for months or even years. The error was not in their intelligence; it was in their assumptions.

When you get this wrong, there are several places you may end up. The first is a state you might already know all too well: analysis paralysis. You obsess over all the visible data, spinning your wheels because nothing can resolve without the question marks getting clarified. The problem is literally unsolvable. Another place you can end up in is ideological—believing that your ideas about what a solution should be are all you need. This approach typically ignores all the nuances that make real things work. It feels good because you argue to say you are right as you stay in your ideological bubble, but it's a pretty useless approach to getting things done. One more common pitfall to be aware of is failure paralysis. As soon as folks start to get a sense that they can't see a clear solution, they let the fear of failure take over. They think failing means their social standing within the team will crater, and, on terrible teams, this is true. If you're on a team like this, quit (after making appropriate arrangements so you aren't in financial hardship). Teams like this don't do anything interesting and they have a

miserable time being terrible at their work. I mean, if you're going to be uselessly unproductive, you might as well have fun.

Creative fluency is rarely taught, but it is absolutely one of the most powerful skills you can ever learn. It is the skill of changing your conditions from today to something new. It is the skill of solving problems that have never been solved before, either at the level of your community or, as I've been fortunate to do a few times in my career, at the scale of the whole world. Much of school was developed to mint workers who could do rote jobs in factory or office settings. As that type of work falls away, creative fluency is going to be one of the most important skills a person can have. There is *so much of the world we will need to create together* in this century.

In the absence of creative literacy, we have stagnation and powerlessness. Many folks feel urgency around the climate crisis and are aware that how we navigate the next few decades is going to affect generations after us, but they feel disempowered about changing that future, even for their daily lives. Creative literacy allows us to be in the active process of the solve, from the day to day, to the community and beyond. I can tell you from direct experience that being “in the solve” is a much healthier position psychologically, as I don't feel mired in dread about the big challenges ahead as many people are. I am well aware of how much work the solve will take, and that it will take millions of people gaining more creative literacy and applying it effectively to get there. In fact, that’s one the main reasons I have written this book. There's a compassion-driven reason for this as well, because a brain that is in constant fear and dread isn't able to live up to its capabilities, for yourself, for anyone or anything you care about. But a person using creative literacy to be in the solve process brings all brain capabilities to life instead of the limited cognition and resourcefulness available to people trapped in powerlessness and anxiety.

To say that you “aren't creative” is to give up so much of your possibility and power. Stop listening to pundits who are not in the solve. Almost none of them are, because people who are in the solve are busy solving—they don't have time to build media empires around their opinions. However common it is to mire your mind in conceptual positions, stewing in this way will leave you with nothing but a pile of opinions. Get into the freedom that

comes from experimentation, iteration, design, testing, debugging, assessing, and refining. The air is clear here.

THE POWER OF CREATIVITY

Let's jump into some concrete examples; we'll start small. Twenty years ago, I used creativity to experiment with a new way to network with people at a 10,000-person conference. A colleague and I wanted to connect with the most influential people in our discipline, who would be in high demand and difficult to find at such a large event. Anyone who has been in this setting knows that the normal networking game of exchanging business cards and trying to get to an interesting connection in a quick chat is pretty hit or miss. Mostly miss.

So we broke that frame and used our creativity to connect with people in a different way.

Back then, I was best known as a comic-strip artist with a moderately popular user experience–focused comic strip launched with my coworker Kevin. We quickly gained a large audience in our field with hundreds of thousands of daily readers, and we won a slew of awards, including the SXSW2004 Interactive award for humor. The comic strip itself joked about technology and design, specifically, the job of doing digital design for software and hardware.

So we decided to use those comic-making skills for the conference. Instead of regular business cards, we designed and printed trading cards that featured some of the biggest luminaries in our field in comic form. These cards doubled as business cards with our general contact information listed on the back. Whenever we met folks, we would give them two of the same card, not one, so they could trade with others and try to collect a full set. All of this made the awkward act of networking pretty easy and fun, not just for us but for those who had extra cards to trade. People immediately became interested in getting the trading cards of some of their favorite people in our field and talking with other folks who had gotten other cards.

Within a day or two, we'd pretty much taken over the entire conference, with our cards trading everywhere, and it led to the most influential people seeking us out both to thank us for the honor and to see if they could nab

some copies of their own card. This of course led to us having a lot more time to connect with them than would be possible in any other fashion. We ended up not having to do any traditional networking because we literally held all the cards.

All in all, it was a much more effective and fun way to achieve significant engagement with other people and for people to recognize who we were. Our creativity didn't just make a small difference but orders of magnitude of difference. By making the cards and trying a few versions, experimenting before the conference and getting some feedback, we weren't just conceptualizing a better way to network, we were concretely actualizing one. Even better, this solution required minimal resources. The cost for printing the cards was about $200, yielding results that traditional networking methods could never achieve and granting us more access to the most sought-after folks at the conference than corporate sponsors paying $100,000 got.

A novel approach, born from a creative decision and executed through a build, can yield disproportionate results compared to conventional methods.

Using Creativity to Restore Nature

While doing a better job at conference networking is interesting for folks in business, it's not exactly world-changing in scope, so I'd love to share another example of creativity that might be an important element of how we address the ecological crisis of the coming century. It's from the company Dendra Systems, which I've worked with for almost a decade. Dendra has developed technologies that support large-scale ecosystem restoration via drones, and it’s built incredible capabilities. A team of four operators can restore 83 hectares (205 acres) of mangroves in a day, planting over 120,000 mangrove seeds with about 100,000 surviving to maturity. The robots plant autonomously, with a ground crew on location to swap seed canisters and batteries as needed. It's ecosystem restoration at a scale and pace that was unimaginable even 10 years ago. Dendra's system has been pushing down a Moore's Law for ecosystem restoration, where the cost of restoring a hectare comes down by two times every two years. Dendra’s work can take land degraded by mining or overuse and jump-start the early stages of ecological succession, helping that ecosystem get to full health

and stability in a fraction of the time while providing close analytics to support thoughtful follow-up efforts through to full restoration.

For this one, let's review more of the structure of the creative process.

Breaking the Frame

The team started by asking different questions and challenged the existing frame of ecosystem management. These tools had stagnated for nearly a century at hand tally counters (count faraway things), quadrats (count nearby things within a square meter), and binoculars. Ecosystem assessments were built from sampling a tiny fraction of the land, and full assessment was often hindered by how traversable the terrain was. Active restoration was done through hand-planting of saplings. Instead of accepting the existing frame, the team started to brainstorm on how the latest technological tools might be of assistance. They also explored the open question of what it would take to be capable of active restoration instead of passive protection.

Select Areas of Improvement

As a frame is broken, a lot of possibilities will open up based on the updated set of assumptions. The team pursued a few lines of technical inquiry to explore these ideas and decided to explore how drones might be used to plant and monitor landscapes, as a means of improving on manual methods. Instead of doing tiny samples and extrapolating, perhaps cameras and machine vision had advanced enough in capability and cost that the entire landscape could be measured directly. Instead of hand-planting, maybe robotics and aerial control systems had advanced enough for robotic planting to work. The team also explored how software tools might help to make sense of a landscape under restoration.

Prototyping and Testing

Prototyping and testing is where most of the work really happens. It's easy to get excited about a new idea, but, in my experience, your understanding of the problem will change by ~95% between your first prototype and your final one, presuming you've done the work well. For Dendra, this meant many iterations on the mechatronic design of planting systems; getting skillful in plant husbandry, material selection, and production of seed pods;

software for drone control and planting maps; and much more. Prototypes teach you the most when you can develop them enough to support an actual, lived version of the experience. There are tons of ways to do this quickly and at low cost. This is a skill called rapid prototyping that I've taught for over a decade.[1]

Downselect and Ship

Based on how your prototyped subsystems work when you try them and how your customer-facing components are received by your customer, you will eventually resolve to a path forward based on what you've learned from the best and worst parts of your prototypes. Notably, whether a prototype works or not is not important. As long as you are specific about what part of the design caused what outcome (good or bad), the specificity of the result is what drives improvement to the system. If someone says, “My prototype worked great,” there's almost no useful information. If someone says, “On step 3, the label with the left arrow really helped the field operator avoid errors during the swap procedure,” then you know exactly what part of the design drove the useful result. Similarly, when people are specific about what didn't work, it's quite easy to improve systems because you know exactly where to act. The downselect and distillation of the best learning from your prototypes is what actually gets into the shipped design. For Dendra, the resulting system featured drones that could each plant 120 trees per minute or spread 1.5 metric tons of seed in a day. Dendra also became capable of processing huge volumes of environmental imaging data, recognizing both flora and fauna directly across every bit of the landscape to have a holistic view on how the ecosystem was returning. This represented a massive improvement compared to the spot sampling approach that had been the industry standard.

A JOURNEY TO CREATIVITY

A Foundational Method for Creation, Experimentation, and Learning

My own journey to working with creativity developed in an unusual way because of my upbringing. I learned languages later than most people,

because I was born in Taipei and moved to the United States just before I turned two. I wasn't fluent in any language at that point, and my parents had to work multiple jobs to support three kids and make ends meet. Working multiple jobs meant they didn't have time to teach me language, and my siblings were five and seven years older than me, so they were busy with their own schooling and did not spend time teaching me.

Having spent my early years absent any education, when I got to first grade, I couldn't read, write, or speak any language. I got the name “Tom” on my first day of school because the teacher was labeling the cubbyholes for kids to store their jackets and backpacks during the day and she asked, “What's your name?” My language skills were so bad that I didn't understand the question, so I just stared at her, and she said: “Okay, we'll call you Tom then” and proceeded to label the cubby.

That moment is a representative snapshot of my limited language skills until I was about seven or eight years old. Really, I couldn't read, write, or speak any language. It's not that I didn't have thoughts, but up through that age, I mainly thought in pictures and numbers.

To this day, it is still my native way of thinking. Even though I can understand a few languages now, I consider every language including English to be my second language, as the first language I organized my thoughts in was pictures. I would see how things worked by *literally seeing them* and watching closely to see how they worked and changed. Once I had looked for a bit, I could play the object, scenario, or system through my mind like a little video. I could slow down the action or remove parts so just the core mechanism remained. With numbers, I would see and understand the quantities, the geometry of spatial relationships, and the various patterns. I did not understand this at the time, but my unusual educational trajectory was also shielding my brain from some of the constraints, assumptions, and frames that come along with language. It made some thoughts thinkable and other thoughts difficult or impossible. The exercise I shared in Chapter 3 of not labeling the apple was basically how my mind worked all the time. Because I didn't know the word for most things, all that was left was to observe things closely and try to understand them without words.

From an early age, I loved to build things. Some engineers say that as kids, they loved to take things apart to understand how they worked. But for me, I was always in the camp of building new things from the interesting bits of what worked from the old things or partially broken things. This is still essentially how I do my work today.

This may sound like a special story about one person, but I've taught over 10,000 people around the world in talks, workshops, lectures, courses, and high-end consulting work, and I know from direct experience that literally anyone can get into a state of rapid learning and highly effective creativity. I've taught groups from communities that live on a dollar or two a day, many who had less than a third-grade education, on to students at the most prestigious universities, to top executives running the world's most influential companies, and I can say based on many data points that the people with the least formal education learn the skills I teach the fastest and are able to up-level their creative problem-solving ability quickly.

For the folks with a lot of formal schooling and assumptions about how things have to work, I've developed many techniques to help break down these barriers so they can get back to the pluripotent state of beginner's mind. It's a somewhat surprising result that anyone from any background can learn this. My theory on why is that, through my workshops, I am getting people closer to the mindstate that we all had between birth and age five. This was a time in life where we all had a high rate of learning, high creative capacity, low inhibition of trying things, and low anxiety about making mistakes. During this period, babies learn to walk in a process that mirrors the creative process well: trying new experiments on how to move their limbs, getting a lot of results that aren't quite walking yet, but getting back up and trying again step by clumsy step, day after day. Sure, there are occasional tears, but the psychological magnitude of those setbacks is small enough that it does not stop them from trying again tomorrow.

Even as I'm writing about this powerful skill that is going to be essential for creating the lives and world we want, I am also saying that you already have all the foundations. You never would have learned to walk, or feed yourself, or ride a bike without those foundations. They've just been papered over by self-limiting ideas that you are not creative, an overattachment to a particular role you've taken on, and the fear that unsuccessful creative work will ruin your career or standing.

Simply excavating those foundational skills you already had from birth to age five feels life-transforming to many, and during my workshops I have everyone create and solve problems on their own—typically in an hour or less, which emphasizes how much the ability was always there and how quickly it can be used to improve your life. Now, that said, if you want to be sought after as a top 10% creator or inventor for your field, there are deeper skills to build than what can be taught in a single-day workshop, but most of the problems we solve in life do not require that level of fluency, just as everyone who has literacy and numeracy can get a lot from those skills without being a professional writer or mathematician.

So let's walk through the steps again, but this time, pick a challenge that you'd like to start making progress on. Let's get started.

1. **Break the frame.**

   Breaking the frame is important if you'd like to change a system at the basic level or if you desire very different outcomes than what you're getting from the existing approach. It's not strictly necessary for all creative efforts, but for the types of big challenges we will face together in this century, it will be foundational. For your challenge, think about the assumptions that govern how things work so far, think about the system components and people who are typically involved, and look at the edges of what is possible in the current frame. You can go back to Chapter 3 for more questions if it would be helpful, but you can get started on frame breaking by reviewing what you laid out in those few questions and asking yourself what happens if you remove any of the assumptions, components, people—does it change the edge of the possible? If it does not, try another one. Each trial might take all of 2 minutes, so there is no damage from choosing wrong. Repeat this step until some of your trials start to change the edge of the possible.

2. **Select something new to realize.**

   You'll want to select some areas you hope to improve, the more specific the better. Generally when people are talking in high-level terms like they are going to “fix” something without providing further specificity, they aren't in the space of the solve yet. People who are

actually using creativity to solve problems do so to improve specific experiences for specific people or to improve the running of a physical system along well-identified metrics. The expanded edges of the possible are great clues for places to look to create new experiences that may be improvements on the old.

I know from teaching that people get stuck on this step, worrying about which is the best thing to pick to improve on and start prototyping. The truth is that starting anywhere will get you into a series of learning iterations with customers that will ultimately bring the whole picture into view. So truly, anywhere you want to start where you'd be interested in getting a different result works great. Analysis paralysis on problem selection helps no one. If you feel truly stuck here, an easy rule of thumb is *worst or first*. Either go after the part of the problem that seems toughest to solve (the worst) or go after the first thing that needs to happen for your solution to get underway (the first). Remember, most of the equation you are trying to solve is *still question marks*, so beginning to reveal the question marks through trial and feedback is going to help no matter where you start.

3. **Stay literal and prototype.**

It's time to build now. And for time reference, I usually get folks solidly through the first two steps in less than 10 minutes. That said, feel free to take a couple days, but I wouldn't recommend more. Allowing more time will tempt you to allow this to remain an idea forever. That is the fate of most people trying to improve most things. So sooner than you feel ready, yes, it is time to build. As part of the build, you'll want to situate your prototype in a physical/social setting that is realistic to where your new idea will happen or be experienced. You don't need to recreate the setting perfectly, as relatively small contextual clues help a great deal in building a setting around the prototype that leads to more accurate responses. The reason is because our behavior in the real world is highly influenced by the social and physical setting we are currently inhabiting. Once you have laid out the prototype, you're going to test on the types of folks you are hoping to serve by having them directly experience the prototype in that setting while you focus on observing what they do and how

they reason through the situation, even if they are “struggling” or “using it wrong.” What you may feel like is them not understanding your brilliant idea well enough is actually the data you're looking for. The gap that has people not understanding and not succeeding at the task or improvement is exactly what you want to learn from. Don't try to protect them from “using it wrong.” Don't fold back into abstract ideas, or start defending your prototype because a person is confused or doesn't like it. Don't direct anyone on how they should use it right. Don't ask them to design it better for you, just observe what happens when a real person tries to interact with what you've built. Specificity is the friend of innovation, and right here is where specificity happens —during close listening and looking while people try your idea in reality through a prototype.

And given that your new ideas themselves are embedded in the prototype you've created, you never need to introduce them formally to customers during testing. If you do, you risk making the session more about you trying to evangelize an idea that you like rather than seeing with clarity whether the thing you built serves people or not. Whether your current prototype is loved or hated or unmemorable to your customer is not really a big deal. People tie themselves into knots wanting their prototype to be the one that “works” or “wins.” This doesn't matter. Most of the solve comes from seeing real people concretely respond to whatever you've put in front of them. Even when you prototype is not liked or used fully, you always learn about the people you are trying to build for and how they respond to specific inputs and experiences.

The only thing that matters is the specific moments of interaction and which experiences drove which outcomes. For the purpose of learning from your prototype, a good or bad response doesn't matter. As long as you are specific about how that good or bad response happened, you are learning what you need. Specificity about why a thing *didn't* work moves the design forward just as strongly as specificity about why a different thing *did* work.

4. **Repeat until you find a path.**

Through enough iterations with customers, you will find the moments that really support the experience you are wanting to provide to them. If you are prototyping a technical system without users, you'll resolve the path using the learnings from prototyped implementations that met or surpassed key technical metrics. In either case, a critical path will become apparent that pulls together the collection of components or sequence of interactions that make the system work best in practice. I cannot stress enough that this is not a conceptual process. It works better than conceptual processes because the world is much more nuanced than the concepts we have about the world. When we solve by putting together elements we've observed working in the real world, the outcome is much more likely to work in the real world than if we try to solve by stringing together favorite ideas that have never been tried.

NOW WHAT? NEXT STEPS FOR IMPLEMENTATION

Now that you have found the path to improving something in the world through prototyping, you've already accomplished a lot, as you can show folks that the problem can be solved in your new way via existence proof. People can just see it work; there needn't be debates about whether it *would* work, only the lived experience of exactly how it is working. With all that said, the prototype version is typically not the same scale (whether for your backyard or the whole world) as the full implementation. How can you speed up the process to full implementation of the new possibility that you have validated in prototype, so it can help as many people as it was meant to help? Additional tools and approaches will give you guide points from this stage of creation.

Tool: Determine the Minimum Set of Hands

Looking at the parts that make up your reference prototype, you can now ask: What are the minimum set of hands that need to move for the full implementation to happen? These are the hands that will write the code, set up the manufacturing line, pack and distribute the goods, sign documents and move financial resources, and so on. By staying very literal to exactly

which people and processes need to do exactly what, you can focus on the essential path required to implement your best cut at a shipped version, based on everything learned from your prototyping so far. When teams don't focus on the minimum set of hands, they often get pulled into politics, waiting for approvals from folks who aren't essential to the build and who generally overcomplicate the project implementation. When things get tangled or slow, you can always come back to this tool and see if you are still working with the minimum set of hands, or whether you can chunk the projects into parts where each chunk requires fewer sets of hands for the next steps.

Tool: Depth Before Breadth (Deploy Small, Learn Intensely, Scale from There)

By this step, you'll have shipped a version that has what you've learned from your prototyping. Now that it is available to a larger group, the learning continues. Folks who specialize in scaling (or growth-hacking) will encourage you to get it in front of a lot of eyeballs, but I think a better mantra is *depth before breadth*. Make sure the folks who start using your product or service really experience an improvement to their lives because of what you've created. Once that improvement feels substantial and deep, only then do you work on scaling that positively impactful experience to a wider audience. And remember: “Deep” is whatever that might mean for what you are building. A mobile game has a different bar for depth than a career path, for instance.

Tool: Just Interesting Variations (No More Success or Failure)

It's important to get out of the mindset that there is one answer or one solution to every problem, or that an experiment is a success or failure. There are lots of ways to solve a problem, and the only way to find out the one that seems to fit best is through experimentation.

The bar for experimentation is not “I think that this is the right answer.” Trying to guess at this before you are in the build/learn process is going to waste your time. Honestly, I sometimes refer to this as “anti-work” because the more you try to convince yourself (and others) that you have the right

answer before trying it, the more social capital you've invested in that outcome happening and the less able you are of seeing what is really happening in front of you when you test. It primes you to be less good at moving the work forward without bias—this you are performing anti-work: using a bunch of effort to get further from or less ready for your goal.

It's best not to think in terms of success and failure. All you're trying to do is generate variations of the prototype solution that surface something interesting. As the interesting bits surface, remember that specificity is the friend of innovation, regardless of whether the overall test or prototype "worked" or not. You can "fail" 10 times in a row and solve a problem if you are specific about what moments drove the confusion and improve on them, and you can "succeed" 10 times in a row and not solve a problem if you are vague about which moments drove the success and instead focus instead on selling people on your prototype working best. The difference lies in being specific about the moments of interaction that drove specific outcomes. Without a clear chain of interactions to outcomes, you're not going to be able to ship what works in a purposeful way.

Tool: What Actually Happened?

As you embark on actually trying to solve problems, you may attract the attention of people who offer commentary and criticism but who are not actively engaged in solving/building in that problem space. They'll have theories and ideas on what the best solution is and why your approach doesn't live up to their amazing imagined perfect idea.

Listening to these people is useless. What these people are looking for is some personal gratification that shows they are right or smarter. But it turns out that even if they have great ideas, nothing happens without building, and by the time anyone gets into the build, the practical benefit of trying to show you are right actually falls away. It works or it doesn't. Trying to be right is merely an interesting currency in the world of discussion and punditry, and I'd suggest it is a category error to use this currency for any problem for which the solution actually needs to be built.

Creative building skills and an openness to look and listen carefully to *what actually happened* form the core of what it takes to solve problems in the real world. Don't be drawn into the disempowered position of arguing

online or in person about ideas. Just gravitate toward (or become) the people who are actually building. Be around the people (1) who care deeply enough about the problem you are working on and (2) you are trying to help, so you can build through enough iterations to learn well and resolve something of real value. The folks who argue ideas rarely build; if they could build, they would spend their time and power doing so. Living in the build gives you a direct shot at changing the world, not just the self-congratulatory illusion that winning a debate changes the world.

What actually happened gets you out of the world of representation. It gets you out of the place where all progress is virtual, meme-battle trench warfare, and spectacle debates, where everyone is jockeying for followers and social standing. We should all care less about a pundit's ego desire for social standing because that's not a problem to anyone but them, and there are so many consequential problems to solve. Being grounded in *what actually happened* is a defense against the cognitive despoiling I mentioned previously, which occurs when people propagate misinformation and reinforce misleading frames, resulting in others building their understanding of the world around things that are not real or accurately contextualized or prioritized. The tangible, negative consequences of cognitive despoiling are everywhere at this moment in history and have led to widespread denial of the climate and humanitarian crises throughout the world. This denial is us ignoring what actually happened.

“What actually happened” is a mantra that can lead to genuine progress. It's about the tangible results of action and creation, verifiable experience, and the knowledge gained from direct engagement with the physical and social world, as opposed to abstract discussion or representation.

One More Tool: Small, Concrete, and Near

The reason that folks with less formal education are so good at creating, prototyping, and improving is that it is still an everyday, practiced skill for them. When you live in low-resource settings, either you solve your problem with your community and do so concretely or it doesn't get solved. There are not a lot of other systems or authorities to appeal to for getting your problems solved. The only thing that matters is what is actually happening and what happens as you try different iterations. All this might sound so much harder than just following an issue in the media and getting

swept up in political positions, but ultimately it is much harder if you do not have direct skills to change the state of what you can change.

This matters more in a world where so many systems will start falling apart, and at levels both big and small. The dominant media discussion is always going to be about problems at their largest scale, or it amps up problems to large scale. Doing this empowers advertisers as the magnitude of things will keep you glued to the screen, but it does so at the expense of disempowering you. Knowing you could help volunteer to help the unhoused get back on their feet, or making sure the kids in your rural county have access to high-quality educational resources, or having a plan to share resources with neighbors if a catastrophic storm were to hit your area—that power is real. Abstract discussions at the largest scales feel important, but, in practice, if we do anything about them, it will happen because we are working on the problem in a way that is small, concrete, and near to us.

In fact, I teach folks that the way to get paralyzed in your life and life choices is to make your problems large, abstract. and far away. The media invites us to frame most problems in that way, and, in doing so, it puts the power in their court and out of ours. This approach is seductive because when we talk about the biggest problems, we feel like we are working on more important things. Unfortunately, all that talking uses up the time we could be doing, and when we've talked about the problems at the largest scales, their sheer magnitude makes it hard for many to believe that they could make any difference at all. When we make our problems small, concrete, and near, we can quickly find direct ways to make a difference. To be in a process of learning and improving on behalf of yourself and the community and world you care about is always where the difference will be made. Building creative literacy, getting into action through the creative process, and listening deeply to the folks you hope to serve is where it all happens.

Tool Creation and Creative Responsibility

Creativity is a foundational skill that appeared earlier in our evolution than reading, writing, or mathematics and was important to the process of creating those later skills. While folks can create a wonderful song, or a beautiful moment, or a negotiated agreement, one of the most consistently

impactful ways we can create is by creating tools that extend our capabilities.

As of this point in time, humans have distinguished themselves in the depth and complexity of their tool creation. We, of course, are not the only organisms that create and use tools. Crows, chimps, dolphins, sea otters, and many more do, but we do it at the level of reactive-ion-etching tiny transistors to define gates that implement machine logic, which can then be programmed on a stack built up from machine code, up through the operating system, running the compiled output of a high-level language to receive my keystrokes at this moment into a downstream cascade of more software that will eventually be used to drive a mechanical printing press all for the purpose of sharing and creating new patterns of thoughts within you. That's pretty impressive tool building.

As a species, our tool creation is also much of how we create ourselves and our society. As a person who has contributed to tool creation that has changed society a few times, I can tell you is a hell of a responsibility. When I worked on Microsoft Outlook, I led an effort that reduced the crashes in the product by 95%. I calculated that this ended up saving 11,000 lifetimes of frustration by removing that annoying post-crash time when people were waiting for their software to come back online or their system to reboot. Microsoft Outlook was a central piece of productivity software in the life of 230 million people at the time (400 million now), and one of my core design principles was that the most precious thing was to help people maintain a coherent chain of thought. Your chain of thought carries the intention you are bringing to the task. Interrupting that chain to waste your time would be inane, given all the work we had done to save you time by getting rid of the crashes. Getting your work done without disruption is foundational for anyone doing work that requires real depth of thinking; it is more essential than the design of any piece of software. If we aren't responsible with people's time and interruptions, we risk taking away their ability to solve problems deeply, simply by wasting their time.

I look now at the landscape of software, where so much of our current systems are designed to *constantly interrupt* our chain of thought for the benefit of advertisers, and see the countless hours where the precious time that people have on this Earth disappears into the intentions and messages of others. I understand that these interruptions can be entertaining (and

enraging and addictive), and I also think a lifetime where our agency was repeatedly traded away for entertainment is one that many will come to regret. Our tool creation can be the driver of incapacity just as it can be a driver of new capacity. As you become more fluent in creative literacy, you will recognize its power, which comes with the responsibility of being thoughtful in how you change capacities around you, whether in your backyard or in the whole world.

As we build forward together, we've got to live up to our collective responsibility in what we create. We must create from a place that aims to help the most people possible and in the places where it is most needed. We must be honest about how helpful the things we have created are and if they need to be retired, reworked, or regulated. We must create in a way that future generations will look back on and feel proud and appreciative of what we've done, just as we look on how previous generations honored us. The more of us in the build, the more people who can see when irresponsible, capacity-reducing products, systems, and governance is taking place. The more of us who can imagine and prototype into a different set of possibility. The more of us who can bring those possibilities to scale and maintain them through the time in which they are making a positive difference. Life always grows richer when you have greater creative literacy, and the world we build from here will be created by the folks who used this creativity literacy to build in the places that mattered to them.

NOTE

1. Tom Chi, "Learn Prototyping with Tom Chi." *PrototypeThinking. Live*, n.d. www.prototypethinking.live/

Chapter 5
Compassion

Compassion is the skill of consideration for the other. It makes the interbeing of all things more visible to us and present to the moment we are in. In compassion we allow ourselves to be affected by others while expanding ourselves, and what is created in this interchange is the possibility of expressing deep care.

There is a mistaken idea that nature primarily works off competition, the so-called survival of the fittest. This itself is a misunderstanding of Darwin and of our modern understanding of biology where we see that the biggest and strongest individuals are not consistently the winners. It turns out that cooperation is a wildly successful adaptable approach which we see across nature from social species to flowers and bees. But let's look at this from a more systematic perspective.

Most of the biomass on planet Earth consists of plants, and 80% of all plant species are angiosperms (flowering plants) that rely on a pollinator to survive. This means that most plant species are obligate mutualists. They require care from another, and in the process they provide care to another. So, at the basic level, most of Earth's biomass survives not because of a fight but because of mutually beneficial support and exchange that improves the collective fitness of the mutualistic organisms. That interchange suggests that the adaptability that Darwin speaks of doesn't exist solely in the individual organism itself but that dyads, triads, and larger groupings of organisms can develop collaborative adaptability that surpasses what any of those organisms may be capable of alone. The slow biomass takeover of angiosperms over more individualistic gymnosperms is pretty good indication that cooperation is not only a good survival strategy; given time, it is likely the best strategy if it is available.

What we see in nature is also true within our societies. No one has the skills of all of us. Because we find ways to be in relationship with each other, we can have a prosperous society where the aggregate of our gifts can be shared, not just the meager allowance our individual efforts would create.

The circles that I have been a part of academically and in my work are considered by many to be elite ones in which only the very top of the top folks participate. After spending so much of my career in these circles, I've realized that no matter how brilliant a person is, the delta between a recognized genius and an average person is less than we pretend it to be. In my estimation, if we grab any three random people off the street, the trio will have more skills than the most skilled person you've ever met. In other words, a small group of people, sharing their skills and abilities well, could outcreate and outpace the most elite individual if they found ways to make the most of their shared skills. We lose sight of this fact sometimes because wealth concentration gives us the illusion that some of us can be worth a million times more than others of us. When it comes to skills (which I value more than money), then I think it's pretty hard to beat a ratio of three or four to one.

Compassion gets us out of the local prison of our individual sphere and allows us to see and share skills with each other. It allows us to share our burdens and brilliance with each other. It rehumanizes people, which is key, especially in any time or place where people are being dehumanized for political gain or social advantage. In the process of rehumanizing, the possibility of connection grows, as does our ability to step into action in a way that will be meaningful and supportive to many. This is pretty close to my definition of leadership, which I define simply as the ability to illuminate shared value. So, yes, I believe that compassion is central to leadership, but far before anyone designates you as a leader, this ability is the initial invitation for you to create in a way that truly serves the world.

When you don't lead by compassion, the other leadership mode is force. Power dynamics involves using force or threat of force (physical or social) to get others to comply. When people have the agency to move the world in ways that are beneficial to them, they hold power. But compassion shows us that explicit dominance and control is not the only way to use agency to move the world. Instead, compassion allows us to see each other and connect in ways that illuminate our shared values, which allows us to make use of our shared capabilities to express those values through action. This is *also* power—and it is power that is more durable than any position or title, because it can be renewed or strengthened at any moment via new acts of compassion. In comparison, leading by force tends to be brittle, because use

of force needs to be periodically threatened or systemically enmeshed for that power dynamic to last. Leadership by compassion is something that can never be taken away. It exists the moment we employ the skill of seeing folks deeply and building toward common goals together. Compassionate leadership also creates room for self-compassion, which ensures that the work that you are engaged with lives up to your own values and ethical standards as well.

THE COMPASSIONATE WEB

How We Messed Things up After the Early Days of the Internet

The compassion we bring to any given moment is a choice, but every system we create lays out an experiential tapestry that enables or disables compassion. In the early days of the internet, people expressed themselves on their own websites or on community pages (geocities), and there was little to no industry to be had. Back then you could monetize your site with banner ads. Later, you could use AdSense ads that keyed off the content of your page. Because the commercial potential was low and the tools for publishing were open and democratized, we saw a truly inspiring emergence of all facets of humanity: the funny stories, the niche hobbyists, the wacky things you'd never seen before. The feeling was that if we all showed up as the humans we were, and approached each other with curiosity, we'd find and build community with each other, in newsgroups (NNS), in webrings (HTTP), in internet relay chat, and the like. These were protocols of an open internet that was powered by human expression and curiosity, not supercharged by an algorithmic engine trying to manage our focus and intention for the sake of advertisers.

The agency was ours. And whether that meant wasting an afternoon learning random tidbits on Wikipedia, packing your geocities page full of your favorite animated GIFs, or reblogging the best vibes in your Tumblr communities, our intentions were more centered on our own goals and interests, and our palette of expression was vast and diverse. This was a direct result of how these tools were designed and how much they enabled compassionate responses. Even if you thought someone's MySpace page

had an obnoxious theme, you still got a real sense of them as a person. Personal websites didn't have a universal measuring tape like follower count that could be used to feel social superiority/inferiority from. You might get a minor rush as your relevance in Google PageRank went up, but there were only 10 levels, so no numerical resolution drove obsessive striving. The overall scene was just folks expressing themselves and what they do and like in the world.

There was something beautiful about that time that we have lost, something very human and approachable that allowed our regular compassion abilities to continue unabated. We have since replaced this wide web of vast creativity with a few major distribution channels animated via the algorithm as opposed to willful curiosity. Ostensibly, the algorithm is a matchmaker that makes it so you don't need to work so hard to find interesting things on the internet. In practice, the algorithm maximizes the time you spend on the system and maximizes your targeting potential for advertisers. The algorithm has goals that are not compassionate to the person. In being designed for those goals, we are right to suspect that social media might be making use of us, to siphon our time and attention toward advertisers via addictive dopamine and outrage loops.

Whether we see it plainly or have just a vague, unsettled feeling, we've off-loaded our agency to an entity that is maximizing commercial gain to a centralized system. What we've lost in these last two decades is profound. Something we were doing for ourselves is now being done to us, and the benefits of that redirected attention are now being usurped by platform owners, not the folks creatively expressing their lives. We are not at the end of history, so there is time to change course, but we need to learn from these early rounds how easily we can lose compassion for the people who make a system financially successful. How can we build compassion into our approach to new technology so we can be active in how we improve in the future?

SINGAPORE'S SELF-DRIVING CARS

What Is the Real Purpose of Technology in a Society?

In 2013, a group from the Singapore government arranged to meet with me to talk about self-driving cars. I remember several notable things about the meeting. First, the contingent of six people was gender-mixed: three women and three men. Second, they were all extremely well versed in their areas of public service. At one point, one of the women was shuffling through her papers. After apologizing that she had left the most accurate figure back at her hotel, she said "approximately 97.2% of Singaporeans…," and then she cited several very accurate figures to make a case about current public policies. Government jobs in Singapore have long held social status, and they seem interested in living up to a code of civil service,[1] which has helped them to advance quickly despite starting with far fewer resources than many nations.

The crux of the conversation centered around the potential impact of self-driving cars, and the government officials' reasoning went like this: Singapore is an island with a fixed size, and there's only so tall a city can be built. As a result, there is a limit to how much Singapore can grow its prosperity via immigration and growing population. Given that practical population limit, the only way for Singapore to continue to grow is for every Singaporean to be more prosperous. They had collected statistics on the lowest-paid jobs and found that the largest low-pay role in the population was cab drivers. The government had already implemented free job and skills training courses for any cab drivers who wanted to move to a different career path. Officials were hoping that as the number of cab drivers decreased through these programs, self-driving cars could make up for the declining driver numbers.

This approach is vastly different from the way that technology is rolled out in the United States. Here we tell people that big technology-driven changes are coming and that they better get ready to adapt. In Singapore, at least in this example, they started with the central question: What would be good for the people, and how could technology be used wisely to support that?

This is ultimately a question of compassion. When an inquiry starts from the compassionate question, we have a means to ground our work, knowing that it will always aim to be of service to the compassionate goal.

Starting with noncompassionate assumptions—for example, the belief that businesses exist only to maximize profits— means that businesses likely would not be seen as part of the solution mix. But with more compassionate assumptions—such as that businesses often do compassionate acts that are aligned with their business goals, and sometimes, because of thoughtful governance, do compassionate acts that are not aligned with business goals —then that assumption creates spaces for possibility. Herein we see the huge creative potential that compassion can unlock. Compassion allows us to see all the ways the people around us have needs and gifts that can be shared to solve problems in new ways. It provides grounding and a compass where we can make sure what we are creating really serves people affected and life on Earth more broadly.

URGENT CARE

Simple, Cost-Efficient Ways to Ease Stress in the Waiting Room

Another example of compassion that significantly helped an organization and the people it serves comes from my time coaching entrepreneurs, intrapreneurs, and executives. I worked with the head of an urgent care company in the Midwest who managed a cluster of three clinics. These clinics were experiencing terrible customer reviews, with ratings around 1.5 stars out of 5 and frequent complaints. The leader, despite wanting to serve people well, was clearly struggling with the situation.

In the initial coaching calls, I helped him shift from trying to solve the problems conceptually and abstractly to getting as concrete as possible. Using a little compassion, putting himself in the shoes of the people in the waiting rooms by having staff members speak to those who were waiting and document their experience carefully, he began to identify specific issues troubling patients. For example, patients felt trapped in the waiting room because they didn't know how much longer they would have to wait. They might be sitting there for hours, unsure if they could leave for a few minutes to use the bathroom or get food without losing their place. Another unsatisfactory moment was when, after they finally got into a patient room,

there was another long wait after the nurse had taken their vitals and before the doctor arrived.

These patients were already stressed—they had come in with pain or an injury, and the fact that they felt like they couldn't even leave the room during a long wait added to their stress and discomfort. Using compassion, we were able to consider what patients would need to improve their experience.

We used some rapid experiments to make some changes to the waiting room experience. One such change involved allowing patients to give their cell phone numbers during the sign-up process, so the clinic could text them when their appointment was approaching. With this change, patients could briefly leave the waiting area to use the restroom or have a bite to eat. A new screen in the waiting room listed the order of appointments, which relieved people's anxiety over not knowing when they'd be seen. Then the clinics added power strips and chargers, since people's phones would often run out of power while waiting, which added to their hardship—most hadn't planned on going to the clinic and had no time to prepare. In the patient rooms, instead of patients just sitting and staring, the clinics added rotating displays on TV screens that informed patients what to expect during their visit (e.g., “First, this will happen, then this will happen”) with relaxing background music and images.

These seemingly small changes completely transformed the experience for patients. The changes cost very little money. Customer reviews began to rise significantly, improving from 1.5 stars to 4.3 stars. These changes were built from the ground up from compassionate observation, leading to some critical thinking and a creative process that trialed enough variations to see which aspects met the needs that had been surfaced. It took understanding the experience of being in a waiting room—injured and unwell or with a sick child, with a cell phone losing power, with no idea whether you could even get up to use the bathroom or you'd lose your turn—to provide solutions that improved customer service ratings and ultimately the reputation and success of the business.

CUSTOMER “SERVICE”

How Lack of Compassion Can Destroy Your Company

Moving on from this positive example of how compassion can be a huge difference maker, let's look at what happens when systems move toward having less compassion. Let's consider automated phone systems as an everyday, clear example of a business service whose design lacks compassion. A common interaction would be trying to call a credit card company, package delivery service, TV provider, or bank to do just about anything. There's a reason why we all dread these interactions. In each case, callers have to waste about 20 minutes to half an hour going through a grueling menu system. These systems have a lot of redundancies. A caller tells the automated system their card number or account number, only to be transferred to an agent and having to repeat that information. Often the automated system can't understand when callers give them information and keeps responding with the wrong information. The menu options are often confusing and sometimes don't correspond to the issue callers want to deal with. It can seem impossible to get a live operator.

More than a few of us have ended up yelling “REPRESENTATIVE!, AGENT!, OPERATOR!,” pressing “0” over and over, hoping to get out of this little hell that a corporation designed for us. By the time a live operator gets on the phone, you’re already frustrated. Then you have to give all of your information again (even though you spent 5 minutes entering in all that information for the automated system), only to find out from the operator that your issue isn't in their department, so they turn you over to the department that can help you. You end up having to give all the information you’ve already given AGAIN—account number, bill number, problem details—to another person, who then puts you on hold. Sometimes the call is disconnected while on hold, forcing you to start over again. Other times the company plays annoying music, adding insult to the injury of waiting. As your afternoon disappears, periodic recorded messages say how important you are as a customer and apologizing for the long hold time. Not only do you not feel better after hearing such automated apologies, they are further affronts that test how much grace you are willing to spare for corporations that clearly don't care about you at all.

Situations like this damage the company's brand and perceived quality, and folks recommend that others avoid the service. When companies route customers through these automated systems, they are prioritizing cost

savings over compassion for the customer. That's why so many customers have had negative experiences with such systems. Compassion needn't be collateral damage, especially when it is at the core of how we build systems that really care for people and serve them well.

This noncompassionate approach leads customers to care as little about the company as the company appears to care about them. Ultimately, this lack of compassion, while potentially saving a small amount in service costs in the short term, erodes brand value and leads to significant losses. We've seen this in recent history with private equity having bought up brands with long legacies, only to hollow them out in a couple years for a tidy investor return but leaving the business and customer base in the wreckage.

In my life, I was on hold for three hours multiple times with Comcast, whose business internet was costing me about $85 a month. I had paid Comcast thousands of dollars over a couple years up to that point, but after it made me jump through so many hoops for so many hours and showed me how little I (or any customer) mattered to it, not only did I cancel the service, I told all my friends who used it to cancel, and many of them did. Likely the company lost over $10,000 in revenue over the next few years. Was it really worth it to save the $5 it might have cost to have a human help sort my problem over 15 minutes? This asymmetry arises because when an executive cuts the workforce, net profitability improves immediately, but the downstream brand degradation might be delayed a few quarters. By then the executive may have moved on or blames the change on macroeconomic forces, CEO talk for “I messed up but won't take responsibility.” It may be years later when the customer base has hollowed out that companies realize that prioritizing short-term financial gains by neglecting customer experience due to a lack of compassion almost never ends successfully for the business. Once you ruin your reputation with your customer, it's almost impossible to get it back. This Comcast incident happened over 15 years ago, and I still tell people never to do business with the company, especially if any other similar company has demonstrated that it can treat humans with basic respect.

Aside from terrible customer service on the phone, businesses display a lack of compassion for customers when they try to manipulate or pressure them into making unwanted purchases, spam them with endless marketing messages, or trick them into subscriptions that are charged even when

unused. If your business needs these tactics to exist, then you have created a financial parasite, not a productive capability for society.

Beyond demonstrating low compassion for customers, businesses can also demonstrate a lack of compassion for the environment by undermining regulations, extensive resource depletion, and careless production and handling of pollution. Again, although these actions might drive short-term profit, they negatively impact customers and brand and eventually can even increase production costs by overexploiting the resources that constitute the company's supply chain. Failures of compassion are symptoms of a deeper problem: a disconnection from the people and the ecosystems that our economy should be designed to serve.

In the same way that nature has created this bountiful world through mass cooperation, we have accidentally created an approach to business that enables mass cooperation on collective environmental destruction. We of course can stand by helplessly and lose the world to a subset of execs and policymakers whose ultimate master is stakeholder capitalism, but as the environmental damage mounts, it's pretty clear we aren't being appropriately adaptable or compassionate to what we are seeing around us.

It doesn't take much to listen better and build a more compassionate organization. If numerous customers call in with the same issues, take them seriously and fix the problems. If something that makes the customer's life worse makes you more money, see if you can step away from capitalizing on a parasitic business model. If employees feel disenfranchised, listen to see if operations can be adjusted to have them feel agency and pride in their work. The few who do build these compassionate organizations have lower turnover and a high quality of service and are less likely to get themselves into the chaotic (or criminal) situations that end up on the news. Because we hear mostly about corporations that have done a bad job on this front, we start to suspect that low compassion may be a requirement of running a corporation. It absolutely is not—unless you want to end up on the news.

Compassion asks us to step up beyond the position of doing no harm and create space to express real care. I've sometimes described design as “frozen intention” that comes to life when a person uses the designed object or system. When design expresses real care from a compassionate place, it doesn't just build your reputation in customers’ eyes; it also contributes a bit

to a kinder and more equitable society. This reconnection is how we find our way back to creating connection and relationship instead of destroying both.

HOW TO BUILD THE SKILL OF COMPASSION

John Rawls's Original Position Method

The American political philosopher John Rawls created a thought experiment that helps people to build practical compassion.[2] In the experiment, people are given the task of designing the rules of society, including how the economy and government works and how folks are treated in different situations and stations of life. The only catch is that people are asked to do this behind what Rawls calls a “Veil of Ignorance” of the role they themselves would end up playing in that society. With this catch in mind, most people end up gravitating toward systems that are broadly just, where social mobility by merit is respected, and where the least well off are still able to live meaningful lives. After all, in this thought experiment, the respondent might end up in the role of someone living on the street or as part of a persecuted minority group. Those possibilities drive folks to consider beyond themselves and their own current political interests, which is the personal position most people argue from in politics. The thought experiment itself is a way to have folks engage in compassionate reflection, and the veil of ignorance becomes an influential tool of political thought for those who want to prioritize a well-functioning society over allegiance to any ideology.

Next time that a politician wants your vote by suggesting that society should treat a minority group less well than the rest, take that moment to compassionately reflect on how you would want to be treated if you were a member of that group. It's worth spending a few minutes on this. Write down a group that a politician has asked you to diminish or deprioritize. Then ask how you would want to be treated if you were from that group. Even if your political party has convinced you to think of the group as wrong or dumb, how would you want to be treated if, after lifting the veil of ignorance, you ended up in their shoes?

Simple exercises can create huge personal expansion and depth. This is one of the best things about compassion. It is quite immediate to us and a straightforward skill to facilitate. It is often an unexpected way to solve problems, as many presume that the parties at a negotiation are strongly stuck in their perspectives. Compassion re-dimensionalizes the people in front of us and makes more clear the motives and incentives behind what they are asking for. What may sound like a monetary request actually may be tied to a psychological need for safety. Knowing this, we may approach the conversation in a way that helps to emphasize safety and find compromises that achieve this psychological safety goal, if there was no simpler way to get to both the material and the psychological goals. Alternatively, an angry request may be a holdover from a previous experience where the person had been treated poorly by someone else. Knowing this, we can both clear the air on our intentions through kindness and help give a counterexample to the person's default cynicism.

Loving Kindness

Eastern traditions offer wonderful means of learning and practicing compassion. A classic tradition from Buddhism is developing compassion through the act of loving kindness. We are asked to imagine expressing love and kindness and to connect with the feeling of this act. Then, through a series of prompts, we move from directing loving kindness to a close friend, to a more distant friend, to a stranger, and, finally, to a perceived enemy.

With each step, the circle of who can be a recipient of our loving kindness expands, and we feel the sense of openness that comes from having the ability to be generous in a wider set of circumstances. If we worry about being too kind—for example, by being kind to people who might hurt others—it's useful to understand that being kind to someone doesn't mean being passive to bad behavior. Acting swiftly to deescalate a dangerous situation away from violence is still in the spirit of being kind to all.

Last, it's worth recognizing that we live in a media environment with minimal fact-checking and millions of parties wanting to influence you for their political gain or product sales. One of the most common ways to do this is by crafting an "enemy" narrative. For a politician, the enemy might be the other party or a scapegoated minority group; for a product company, it might be belly fat or seasonal allergies. The politician or company is

successful if we feel irritated about an enemy. The gift of loving kindness can reduce the low-grade anxiety and exhaustion that come from carrying that irritation. Compassion does not mean that you needn't act when danger is actually present; but compassion is a tool that can reset our emotional tone to a clarity of mind that is a better state to act from. The constant perception of enemies, even those within ourselves—“Your procrastination is destroying you”—is a low-compassion, low-clarity state. While I wish we were thoughtful enough about system design to not need this, compassion must be part of our collective immune system to return to clear thinking and effective participation in change.

Deep Listening

Beyond moral philosophy exercises from the West and meditative practices from the East, one of the simplest ways to build compassion is to listen. Listening is especially potent during any time where society feels more polarized. Polarization is often an active effort to drive division to try for political advantage; in other words, polarization doesn't have to do with our agendas, but it's us being sucked into the agenda of a political organization. While there is a time and place for political action, any politics that drives polarization that has you see others as less human and less deserving of basic rights should instantly trigger our critical thinking and compassion alarms. Instead of trying to fight the message being broadcast, one of the most powerful actions you can take is to listen to the people your group is trying to define as the out-group.

I’m not referring to listening to the media of the other side (as that, too, is trying to persuade); I mean actually listening to real people from actual life, not media-represented life. In the landscape of political media, people are typically in the act of persuasion, not compassion. Perhaps you know some folks from a group that has been cast as the out-group who you can have lunch with, or you could watch city council meetings where local people speak up for themselves, or find interviews online where people affected by an issue speak on what their life experience has been like.

My own work has taken me to many of the agricultural and industrial manufacturing areas of the United States. We get along well because our time together is about solving common problems and improving the farm productivity or manufacturing base of their city or county. Whether people

find common ground through work, social activities, sports, schooling, or elsewhere, we all tend to find that, in person, there are so many ways to get along and even deeply appreciate everyone around us—even if they come from a group on the opposite side of the political spectrum. So not only is it "hard to hate up close," as writer Brené Brown suggested in *Braving the Wilderness*,[3] it's actually pretty hard not to find things to *like* about people. This is actually the normal human state. Most people can find something to appreciate about another person if they spend enough time together. Without the constant drumbeat of polarizing media and the centering of the most extreme views to maximize engagement, most people likely would return to our normal state of hating almost no one and liking something about almost everyone—or, worst case, feeling neutral. Spending so much time and money on messages that divide and dehumanize seems like a lot of effort on behalf of a handful of people who really crave money and power. Compassion would help us on all these fronts. We would trust those who rely on dehumanization less and be less likely to grant them power. All this benefit comes from a skill that we are all born with and that costs nothing to deepen our abilities in. Everyday compassion, through shared presence in spaces, through listening, and by finding small common goals to accomplish, will be a central skill of the future. Mass media by definition is not personal—it impairs our compassionate instincts and ties us up in stories that are never fully our own. Being compassionate also means living a real life of our own, surrounded by real people with whom we can share mutual compassion and care. When we surrender to the mass media machine, we are living life in concept only for extended periods. We are responding only to the one-way influence of others and not to the actual people in our day-to-day lives. The groundedness of living your real life and improving your daily experience through compassionate listening in situations you can immediately affect is a form of deep replenishment in a world where our attention is being strip-mined and exploited for the wealth and power of others.

FINANCIAL IMPACT

Compassion Makes Economic Sense

Compassion is not only morally essential but economically prudent. Take the 2008 financial crisis, for example. That manufactured hardship was rooted in a set of financial securities designed to hide risk and was bolstered by large financial institutions to maximize profits, representing a failing of compassion at several levels. It was not compassionate for banks to offer mortgages that would put their borrowers into so much financial risk. It was not compassionate for the financial institutions that packaged up these bad loans into securities to hide their real risk level to downstream buyers (who were largely other financial institutions that were banking on the stated risk level). The whole system traded these securities for some time because the transaction layer of our economy typically doesn't get much moral inquiry. We could have seen the rise in volume of these types of transactions and used that to signal a compassionate inquiry as to whether that rise in activity connected with a rise in real value creation or, as it was in this case, with a rise in a type of financial parasitism. If just that much compassion was applied, much of the damage could have been avoided. Instead, what transpired in the housing market from these lapses of compassion exploded into chaos for the world's largest financial institutions, which passed the losses and misery on to the broad population while pleading for government handouts to stabilize their operations and pay for their errors and greed. That moment in economic history is now referred to as the global financial crisis. The cost when systems lack compassion is not small. It can take down the entire world financial system (estimated losses of $22 trillion).[4] What was lost is the same order of magnitude of capital that would decarbonize most of our global infrastructure, modernize it, and make it future-ready. Instead of investing this money wisely toward a goal, we lost it enabling value-destroying greed.

Although the explanations of the financial causes of the crisis seem complicated, as the securities were built on financial derivatives generated through fudged risk numbers, the complexity of the compassionate act that would have prevented the damage is quite low. Compassion is a tool that could make a difference in a wide variety of situations, but we don't use it as we should because we allow other rules to dominate. For example, for practitioners of capitalism it is our belief that free markets will provide the purest and best market signals and that any market exchange tends to

represent some form of value creation. Unsurprisingly, when a market is working by those rules, our expectations will be met in a simple way. But sometimes our default assumptions and rules aren't true. In the 2008 financial crisis, many of those market exchanges actually represented *value destruction*, as people took out loans that would personally bankrupt them, and the wrong price was being paid throughout the market because the real risk signal was hidden or the wrong signal was purposely fabricated. In these moments of system breakdown, we must go back to the compassionate question: What approaches and outcomes would be most kind and most useful to all the parties involved? And then: Can we add little moments of compassion to help us avoid large catastrophes and steer toward our future in a more intentional way? Can we have people care more about the system because we cared about them? Can that additional care help to make our systems resilient?

We did not ask questions like this, and it took many players, from bank loan officers to corporate executives engaging actively in noncompassionate acts, for the system to fall apart.

Everyday Lack of Compassion Hurts Us and Our Businesses

We can all create a practice of compassion, recognizing how much waste has been created by lack of compassion in the past. We can also bring compassion to situations where it has been lacking to create new possibilities and perspectives on long-standing problems. A radical positive example of this is the dismantling of South African apartheid. The Truth and Reconciliation process demonstrated a profound level of compassion that allowed a new start for the country as a whole. Instead of very understandably lashing out at their colonial oppressors, the new government created a process where the truth could be heard, understood, and forgiven, all while the government took the necessary steps to racially integrate itself. Prior to this process, few people saw any way for these changes to happen, and many expected mass violence. Although compassion is a simple tool, when applied in unexpected places, it gives off new light that allows us to see more dimensions and possibilities for repair.

Compassion also has huge utility for the way we evolve our economies. Remember the Singaporean approach to self-driving cars, which illustrates

a more compassionate way we could look at introducing new technology to an economy. At the end of the day, as a national policy, allowing business owners to get huge productivity gains that put so many people out of work that they now need government dollars to survive makes no sense. The degree to which companies benefit and their tax dollars “lift the boats” could substantially undershoot the degree to which job losses hurt those same people and remove tax dollars from the economy. Also, because of their access to tax professionals and legal structures, the folks who benefit the most in big corporations often pay a lower tax rate than the laid-off employees from whom their gains are coming. I do not mean that a country cannot be innovative, only that we need to keep checking in with compassionate listening and creating avenues for feedback and effective governance from that feedback. In doing so, we can adopt new innovations quickly but expand on only the ones that are neutral to positive in their net contribution to society. I don't think there is ever a point where we can chase down every possible unintended consequence before it happens, simply because humans are infinitely creative. But if we are in tune with the feedback of how things are affecting us on a whole, we can make appropriately nuanced decisions. For example, when the Wright brothers and sister were working on the first airplane, they were not worried that, 100 years later, jumbo jets would be used as weapons of terrorism in the 9/11 attacks. That said, it was already not beyond the realm of imagination by the 1940s, given that kamikaze fighters employed this technique at the end of World War II. Could the original inventors have known this would happen? Probably not. After seeing some of the things that could happen, did we stop using airplanes entirely? No. We collectively decided that the benefits of air transportation were more important to us than the potential for harm.

Most technologies—really, most ideas—are like this. Within a nominal range of operation, they do what they were intended to do; the periphery of uses sometimes includes harm. We don’t need to create perfect safety by prethinking all possible uses (which basically is impossible); rather, we must stay in compassionate dialogue to put proper governance and regulation in place as we learn of cases that have real potential for harm. Whether we realize this yet or not, trust is going to be one of the rarest things in a world where AI can deepfake anyone and we are all plugged into 24/7 influence machines. As strange as it sounds to plug compassion into

this mix, compassionate listening and thoughtful action based on that listening is how actual trust is built over the time. To argue for unfettered markets and innovation sounds good until you realize that the extreme end of this axis rapidly erodes trust and reduces the system value in ways that are far more detrimental than any gain we could get from the “success” of one company or industry. As we work toward trying to build a relatively peaceful and prosperous global civilization, we need to build more trust in each other over time, not less. And compassion is at the root of where trust is built.

Finally, if we take this idea further, compassion for nature could set us on an entirely new course as a species. John Rawls's thought experiment has real potency when considering how human governance comes together, and the same experiment could be extended beyond its original scope to the many organisms of planet Earth. In adopting this frame, we start to think about what a good life is for these organisms, what justice and restitution would be in response to harm or the threat of harm. These are all categorical upgrades to our current thought process of commodifying nature and supporting industry that is largely indifferent to the health of natural systems.

Even if there were no other lesson in adopting Rawls's framework, it would be useful to see if more compassion in any of these trajectories could have changed our course. We know, for example, that ecosystems are able to bounce back far more quickly when they aren't fully clear-cut or decimated. Given this, applying even a small amount of compassionate thinking might have a local population seek to leave 20% of forest resources in place, so that landscape recovery is possible in less than a lifetime. This modification could still achieve the goal of helping to lift the economic position of the folks who work the land and sell those resources, but in a way that the forest ecosystem isn’t tipped into an unrecoverable state of damage. If we wanted to be really skillful here, they would choose that 20% to maintain the maximal biodiversity and experiment with this preservation ratio to find the optimal point for different landscapes. More compassionate choices in these areas mean that future generations don't end up saddled with the most severe consequences of rapid development.

Compassion is a powerful skill because, like critical thinking, it expands the space of what can be thought, but it specifically does so in a way that brings

us into better relationships with those to whom we have extended compassion.

As we build real skill in extending compassion, it will transform many aspects of our lives and work. When we can collectively apply the skill, even more becomes possible. At the national level, for example, the government of Bhutan decided that it would optimize for gross national happiness as opposed to gross domestic product, which is the current default. In some ways this should be nearly the same goal, since in GDP-optimizing nations we believe that by focusing on GDP, we will improve the prosperity and happiness of the people in the nation. But whenever there is a step of abstraction from your goal (i.e., instead of going for X, you go for Y because you believe it will lead to X), the extra distance you add from your goal can have you risk missing the goal entirely. When we use a proxy like money to stand in for success and happiness, then it's quite possible that even if we hit the metric, we do not get the desired downstream effects. Case in point: At this moment in history, the United States has won the economic game as much as any country in the history of the world ever has, but our population suffers from increasing depression, anxiety, and loneliness. Clearly getting Y did not get us X. A compassionate lens and the moral courage to apply it would have caught the divergence much sooner.

NOTES

1. Sardorjon Rakhmonov, “Some Legal Aspects of Regulating Entry into the Civil Service,” *Journal of International Politics and Human Rights* 2, no. 3 (2024). https://journals.academiczone.net/index.php/jiphr/article/download/4330/4019/4002

2. Samuel Freeman, “Original Position,” *Stanford Encyclopedia of Philosophy*, December 20, 2008; substantive revision October 24, 2023. https://plato.stanford.edu/entries/original-position/https://plato.stanford.edu/entries/original-position/

3. Brené Brown, *Braving the Wilderness: The Quest for True Belonging and the Courage to Stand Alone*. Random House, 2017, p. 70.

4. Dennis Kelleher, “Financial Crisis Cost Tops $22 Trillion, GAO Says: Financial Crisis Cost Is Staggering, Government Report Finds,” By Eleazar David Melendez, HuffPost, February 14, 2013.

Chapter 6
Community

In some ways, the ability to form a community is one of our most foundational skills as a species. We don't have armor, spikes, claws, thick skin, or overwhelming brawn, in stark contrast to the wide variety of megafauna that coexisted with us and our ancestors over the last million years. What we do have is each other. Humans have the distinct ability to learn from each other, to coordinate, to make plans and dream together. We need this ability because, due to our larger brain size, our young require an extended period of care before they can care for themselves. Much of those large brains goes into being able to send and interpret a vast panoply of social signals from each other. Our ability to communicate and cooperate drove incredible adaptability—while not born with claws, we can fashion spear tips; while not faster, we can strategize across a hunting band to corner an animal during a hunt. We also became adaptable through the wisdom we were able to build over time, whether that wisdom be the palatability or the medicinal utility of various plants and fungi, or the exchange of generational wisdom through story and culture. Gathering places and trade corridors held deep importance throughout the ages as locations where we could make use of our adaptable social minds and learn from each other through the exchange of goods and culture. No matter how skilled we are as individuals, we have always gotten more, been able to become more by being in community—whether the advantage came from being in connection with others who had different or stronger skills, from building a network that provides care and mutual support, or from cooperating toward goals that are far bigger than any individual can take on.

If being in community is so foundational, why would it need to be further developed as a skill? Simply put, our community skills were established during a time when humans lived in groups ranging from a few families up to several hundred people. The scale and variety of settings has expanded substantially since those days. We are also living at a time when cultural and technological forces are driving more social isolation and weaker friend ties. Over time, society has gotten more individualistic, and community

activities that had been built into life have been replaced by alone time with devices. This degradation of social relationships and community is happening right when we need a strengthening of community, to support maximum resilience, adaptability, and cooperative capability to meet the challenges of this century. So it's a great time to start to make sense of the skill of community, increase the number of folks who are fluent in the skill, and start creating community in all the places that matter to us and where we feel its absence.

ECOSYSTEM ENGINEERS

Let's start by getting a bit into the origin of community on planet Earth. Community predates humans by a long stretch. Whether we are talking about comparatively recent social organisms like the great apes (25 million years ago [mya]), meerkats (20 mya), and dolphins (50 mya) or ancient social organisms like bees (120 mya), ants (160 mya), and termites (200 mya), there are hundreds of millions of years of legacy to learn from. These social organisms have used the power of community to support their adaptability and thriving for far longer than humans have existed, and in many ways they are far more successful than humans at this task.

If you took the entire biomass of humanity—8 billion people—it would weigh about 350 million tons. According to E. O. Wilson and Bert Hölldobler in *Journey to the Ants*, ants collectively have roughly the same total biomass as humans. (A more detailed 2022 estimate suggests they have *at least* 20% of the biomass of humans and more biomass than all other nonhuman mammals and birds combined.[1]) This rough biomass equivalence is just one of the ways we are similar, but there are several others. Like us, ants take on different roles that enable the foundational cooperation that forms their society. Their activities as a colony—foraging, tending to young, housekeeping, building/maintaining/defending dwellings—all happen at a scale well beyond what any individual ant could accomplish. Most ants are also omnivores, so like us they consume plant, animal, and fungal matter from the environment around them. Even though we share this attribute of how we eat, one important way we differ is how much we eat.

Globally, human beings eat about 3% of their body weight per day. This means that every single day, the totality of humanity (350 million tons) eats just over 10 million tons of food. By comparison, ants on average eat 30% of their body weight per day, meaning they consume roughly 100 million tons of food from the environment each day. In other words, they are collectively eating 10 times more than humanity, roughly as much as a population of 80 billion humans would.

Even with just 8 billion people, we are bumping into planetary limits that threaten the entire biosphere, yet ants not only avoid destroying the environment around them, but they add meaningfully to its overall productivity, all while consuming 10 times more each day. The problem is ultimately not the total amount; it is the style of consumption. Consumption that damages Earth drives low carrying capacity and the threat of collapse. Consumption that is a net benefit to the environment improves carrying capacity and has allowed other social organisms to thrive over hundreds of millions of years. The collective activity of ants—digging, decomposing, seeding—makes their ecosystems more fertile, more resilient, and more vibrant. They are what ecologists call “ecosystem engineers”—creatures whose presence shapes the ecosystem in ways that tend to improve biodiversity and overall carrying capacity. Their wide variety of activities benefit both individual and social collective all while spilling out into further benefits to the many species and organisms in landscapes they inhabit.

By comparison, the way humans feed themselves, via factory farming, monocropping, heavy fertilizer and pesticide use, and mass rerouting of water resources, has led to widespread soil degradation, habitat loss, and water shortages and has reduced the biodiversity and carrying capacity of the lands we inhabit. It's important to note that this propensity to damage is not something intrinsic to being human. If ants are smart enough to work with their ecosystems, then it seems fair that humans could be at least equivalently smart, but we've constructed our food system around mechanization and short-term maximization of monocropped yields. Maximum yields sound great until you realize that each year that we practice agriculture in this way, those fields have less topsoil, require more inputs, and move us a year closer to that land being unviable.

Beyond how we grow our crops, our livestock production currently accounts for 15.6%[2] to 19.6%[3] of global greenhouse gas emissions, making it roughly equivalent to the emissions from all electricity generation: 17%.[4] (The statistic is usually reported as all energy-related emissions at 34%, but electricity is half of this; the other half is thermal energy use for industry and heating.)

The largest driver of habitat loss on Earth is the land used to grow livestock feed and rangeland used to graze animals. And we're not on a great trajectory, because as our civilization has globalized, an ever-growing population is moving toward a Western level of meat consumption—about 176 pounds of meat per year. If we continue to cultivate animals as we have been, we will wipe out all habitats on Earth before we can support that consumption intensity for the world's population.[5] Again, it's not impossible to remove this consumption limit by producing in new ways that are less intensive or even actively regenerative, but that is not the task we have been pursuing—we've been focused on achieving maximum production scale in the least time. If we want to last as a civilization, the real task is to deepen our abilities into the places where we live and grow our food, to discover the ways that our presence can be net contributive to our environment as opposed to massively destructive. If we scale back on the most destructive ways of being, it will be like we've found new land from nothing. Given that we have now reached every corner of the globe (basically the same geographic range as ants), there are no new lands to discover. All the benefits from this point on are going to come from doing a better job with the lands we've settled. Ants demonstrate that it is possible to occupy literally the same range[6] as humans, eat more food, and be beneficial instead of degrading to the places we live.

BEING A NET POSITIVE TO NATURE

A simple way to summarize this state is to say that ants and most other organisms have figured out ways to be net positives to the ecosystems they are a part of. For humanity to step up to this same quality of being, we will need to figure out how to be net positive in all the environments we participate in. At this juncture in history, nearly every ecosystem on Earth is inhabited or impacted by humans, so for us to be net positive to our

environments is effectively equivalent to humanity learning to be net positive to nature as a whole. This is a very clarifying goal, and one that is not more technically or operationally complex than any of the other goals we have collectively achieved over the ages. We haven't made much progress yet, simply because our need to meet this goal only came into view for our collective civilization recently. As we discussed in Chapter 2, many human societies have arrived at a net positive way of being with their bioregion, but we have not yet achieved this goal across our collective society.

In fact, our recent history (the last 500 years out of our 300,000-year species history) has gone several steps in the opposite direction. This has been a period of intense colonial resource exploitation and subjugation of peoples through slavery, war, and disease. The period has included the decimation of many cultures and societies that had arrived at their local version of being net positive to their environments, and much of that wisdom has been erased through the intentional erasure of their cultures and displacements of their populations. Part of the process of becoming net positive as a civilization is to recover and rediscover what we've forgotten about living well with our landscapes, and part of the opportunity of this moment is that we have so many more tools and technologies that could support the way we accomplish these goals for our habitats.

Before we can do that, we need to think critically about the current structures we've built the world on, as some of what we employed for this recent expand-and-exploit period of history will not be appropriate for a world where civilization is a net positive to both humans and nature. We often focus on and debate what needs to change from the top-down governmental level, but society is also built from the bottom-up, from the communities we form and participate in. Of those two routes for change, bottom-up community building is immediately accessible and can be continuously improved on, while elections are periodic and much of the discussion is focused on persuading us instead of on concrete policy. For most people, we can change our worlds most rapidly and effectively in the ways we relate to our immediate community.

COMMUNITY AND QUALITY OF LIFE

Where We Came From Versus Where We Are Now

In modern times, we've repeatedly traded community for perceived convenience—and the costs have been mounting, not just in terms of wasted resources, but in terms of our psychological well-being. The longest-running study on human happiness, the 80-year-old Harvard Study of Adult Development,[7] found that the quality of our relationships and our sense of community are the strongest predictors of a healthy and happy life. Right now we are in an awkward interregnum moment around the shape of community. The most digitally connected, mobile, modern folks are also the ones who have sacrificed traditional avenues to community that had been baked into day-to-day life.

In my own life, I was born in Asia, and when my family immigrated, we did what many families from my part of the world do: live among extended family as part of our upbringing and community. In my family, the grandparents stayed with their kids in a rotating fashion, so our household often had three generations interacting with each other on a regular basis. This family configuration created a simple jumping-off point from which to expand community, as the older folks would have older friends, the parents would have friends their age, and the kids (me at the time) had yet another group of friends. The intergenerational interchange of wisdom and care was a lot simpler because of proximity. We also were relatively poor (for one Christmas, my holiday gift was a single quarter), so there was a practical need for various family and community members to share resources to best support a financially workable future for everyone. For me this meant not having any new clothes of my own until age 13, just hand-me-downs from older cousins. Living in extended family groups has been a part of the human experience for hundreds of thousands of years, and it will likely forever have a place in the ways we create networks of care for each other.

Another classic venue for community building is in faith traditions. People come together in community to practice shared beliefs and support each other in leading meaningful lives within that tradition. Participation in organized religion has been decreasing in recent decades, but there will always be ways to get together around our values and beliefs, and it's generally a good formula for a community to have share values in some areas that enable the foundation for diversity in other areas. The common

aspect could be as simple as living on the same block or as profound as your most deeply held beliefs. Most groups of people, even randomly selected, have enough commonalities to build community around, so the question of whether we get the benefit of community in our lives is also more about whether anyone has put in the effort to illuminate the lines of shared value and care and less about whether community would be possible. There are endless variations here on how to form community, though it's worth noting that since religious community can often be positioned as the gatekeeper to a person’s connection to spirit and purpose, it can create a power dynamic where a lot of good and harm can be done, so people should stay with only those spiritual communities that approach the responsibility they have with profound care.

My favorite forms of community are activity centered. Creating art or music together, playing sports or games together, and developing build skills in DIY, maker, and guild communities are my top three. What is great about these settings is that the benefits of community are so tangible. With each session you create new art, hone your athletic ability, or concretely develop new build skills, and over many sessions you visibly see an entire community grow together in these capacities. All communities can offer growth in social skills—conversational ability, problem-solving, emotional coregulation, negotiation and conflict resolution—but these skills are a bit less visible, so communities built around visible skill building are a great entry point for folks like me who are more introverted or who don't gravitate to social settings unprompted. Why do we want people to join in community even if they are not naturally inclined to do so? It's a bit of an “eat your vegetables” situation: We know community has profound benefits to health, and thus it is worth seeing how to make such activities widely available for most people. Just as your life is greatly improved by learning to eat what meets your body's needs best, your life is also greatly improved by learning the skills to be in community and to sustain community.

In the study mentioned earlier, Harvard started tracking 268 sophomores in 1938 for a longitudinal study that would, researchers hoped, reveal clues about what makes healthy and happy lives. Among the original participants were John F. Kennedy Jr. and former *Washington Post* editor Ben Bradlee. The study was later expanded to include women, who weren't in the original study (Harvard was male-only in 1938; it did not become coeducational

until 1977) as well as people from a wider span of socioeconomic backgrounds. Over time, researchers found that close relationships are what keep people happy and healthy in their lives, outpacing other factors like wealth, career accolades, social class, intelligence, genes, and lifestyle. Those social ties also help delay mental and physical decline, so they directly contribute to our experience of physical health as well.

The happiness improvement wasn't linked solely to the relationships we focus on most, such as romantic relationships and immediate family, but extended to relationships from any and all social circles and communities. It appears that familiar personal connection with any set of humans creates tangible mental and emotional benefit,[8] and establishing a high-quality friendship or two in each of your communities creates benefits beyond what we get from more numerous shallow connections. Further boosts in happiness and life satisfaction when we work with other people toward a goal come from the sense of purpose and accomplishment that these goals can offer. We are a deeply social species, and our minds and bodies work best in community with other people. There are so many ways to build community to support our lives and contribute to greater society, yet, in recent history, we have built a constellation of systems that undermine those efforts.

Social Loneliness

For all that we've learned about the benefits of community and social interaction, we've been building a world that sacrifices both under the guise of convenience. Let's say you want to buy a book. You can just open Amazon on your browser and, after 30 seconds of typing and clicking, it'll be en route to your door the next day or immediately as an e-book. Apparently easy, and you hardly need to interrupt your mental state (flow) or social state (isolation). You may not love the emissions or packaging that this shopping method requires, or the thousands of people doing physically exhausting labor in warehouses and delivery routes to make this possible, but the ease and convenience to you, the purchaser, is undeniable. A system like this is likely optimal if convenience is our only goal.

But let's try to expand our goals beyond convenience to a life well lived. When we look back on the time we've spent on this Earth, or even how we spent a single day, we will probably be more interested in whether we lived

well over whether everything was as easy as possible. Let's buy a book again, but instead, let's say you take a lunch break, go outside for a walk or a bike ride, and visit a library or local bookstore. Walking in, you may be greeted by someone you are familiar with since you've visited or shopped there from time to time. From just this interaction, your mood may already be lifted, because, remember, these little social interactions contribute directly to our health and happiness. In addition, you've spent some time outside, moved your body, and are now in a physical setting where communication and care can be expressed as opposed to being alone at home. You ask for a book, and perhaps the bookseller shares what they know about it, or recommends some other books they've enjoyed in the same genre. While you're there you see a flyer for an upcoming book reading by an author you follow, and you make a note to attend. That takes you out of the house again the following week. At the event, you run into a couple of neighbors who share some of your tastes, and in conversation you find out about other opportunities—a great music show, a volunteer group, a swap meet, a favorite restaurant. Just buying a book in person at a bookstore can start a cascade of social interaction and new life possibilities. It also helps to circulate money within your local community as opposed to having it sent off to a distant corporation. To be honest, the book may cost a few dollars more in this scenario, but in spending those dollars, we've created a set of experiences that may contribute to our health and happiness far more than the small price difference. If we value our lives more holistically, beyond simple convenience, an approach like this is worth considering as it provides opportunities to establish the social ties that are at the foundation of creating connection and community. Our frames create so much of our world, and a convenience-only frame appears to leave us worse off and less healthy than a frame that centers on ideas that come from our best understanding of human flourishing. This focus on cheap and convenient is not dissimilar to the basic concept behind fast food, which, while incredibly convenient, also makes us unhealthy over time. Just to throw one more log on this fire, in Chapter 4 I described social media outrage as the fast-food version of purpose. It fills you with righteous indignation for a moment, only to make you very ill because you never get on to the harder and *less convenient* task of actually pursuing purpose. The pattern that I see between all of these experiences is that cheap and

convenient in the short run is often expensive to health and life in the longer run.

Beyond the gradual damage to our health, we may also pay more in visible ways, given how many ways the community can help take care of our needs. For example, we might end up paying for a gym membership for the exercise we could have gotten by walking around the neighborhood or playing sports with friends. We might end up paying for childcare that would have been a built-in feature of life when living near extended family and community. The net result is that our cheap and convenient existence actually does not end up being particularly cheap, and our gains in convenience may be more than wiped out by our losses in community and personal health and life experience.

At this juncture, we have migrated a significant proportion of social interaction into online interactions and parasocial follower relationships. Although most social networks are “free,” they largely capitalize on our desire for connection and dopamine-generating experiences to maximize advertising effectiveness. Community can be built in this setting, but doing so it is more effortful because the technological framing that shapes the range of possible interactions is designed primarily for advertisers' benefit. Existing in this cognitive environment demands that we use critical thinking periodically to examine how well our technological tools are actually supporting our life intentions and goals. If we think critically about social media's effectiveness toward supporting our goals for connection and community, it is a convenient but low-efficacy tool for most. It rarely creates deep connection, and, when it does, it is because folks broke away from the advertising-optimized setting to talk on the phone, meet in real life, or at least communicate through a direct digital channel that doesn't center advertising. These small actions are all examples of upgrading to a tool or approach that does a better job of supporting our intentions. The more that we understand what makes humans overall and ourselves in particular happy and healthy, the more we can be conscious about the tools we choose toward creating that happiness and health in our lives. Just because something is offered by a company does not instantly mean that it will distort our intentions, but we should pay attention because sometimes particular business models do—for example, a slot machine business model is generally extractive.

THE PROBLEM WITH INDIVIDUALISM AS IDEOLOGY

The concept of the individual with inalienable rights was a huge innovation for its time and societal setting. It struck a clear moral contrast between a society of free people versus a society under the rule of a monarch, and it paved the way for more individual freedoms and rights. Declaring fundamental rights of each person regardless of background is a great framework that raises the minimum bar across the entire society. That said, capitalism has co-opted and framed the idea of the individual in a few ways that may be less productive. Despite the fact that human beings' greatest advantage and adaptability comes from our ability to work together in community, our advertising narratives celebrate individuals and spotlight them over the communities that those individuals were trained and supported by. Capitalism's stake in the idea of the individual centers primarily around highlighting personal contribution for career status and encouraging more consumption to express individual identity.

We see this all the time in the business world. Our narratives focus on the genius or leadership of a single person with the rest of the team's contribution left unmentioned. But having worked on a lot of innovations in Silicon Valley, I can tell you that this narrative is never true, and I believe it allows abuses and creates waste when we overresource these individuals based on how much credit they succeed in taking versus how much high-merit performance they actually contributed to the effort. One figurehead may be our main association with any technical feat although, in practice, the contribution of any leader tends to be a minority of the work accomplished—typically less than 10% except for very small teams (e.g., a leader of a five-person team might have contributed 25%). Any product that is shipped at scale took a team of people to design, build, test, and ship. No company can succeed without the effort of its total personnel, down to the uncelebrated roles of people who are fulfilling orders or sweeping the floors in the physical plant. Accounting for what shipping product takes realistically instead of being hypnotized by individual hero narratives grounds and reminds us that nearly everything serving society at scale was built by teams and communities. Likewise, significant cultural movements

don't succeed because of singular figures; they scale and last because of shared ownership and purpose.

The myth of individualism is also convenient for selling products. If everyone believes they need their own lawnmower, their own car, their own *everything*, then demand is increased. If they feel like their products are going out of fashion, then they'll be interested in getting more than one of everything. This is the discipline of demand maximization, something that has been the goal of advertising for decades, fully independent of whether it improves our lives or not. There are further downsides from the economic and ecological cost. To illustrate, let's consider utilization rates of common goods. A riding lawnmower, for instance, might have a utilization rate of less than 1%, effectively sitting idle for most of its useful life. In a community-oriented system, that single riding mower might serve 20 households, drastically reducing resource consumption per household while getting the same amount of mowing benefit. It does not take much community building to achieve this level of co-benefit from shared resources, and the benefits can far outweigh the small effort it takes.

In apartment complexes, people might share a gym or pool. In a suburban community, unused land might become a community garden. Sports retailers have found great success in rental programs, recognizing that people who ski, bicycle, or backpack infrequently don't need to buy and store all that expensive gear in their apartments only to use them once or twice a year. Bicycle share programs have been popular and successful in cities around the world. These straightforward approaches to sharing have existed for a while, but if we keep coming back to the simple frame of getting better utilization from all the goods we create, there are opportunities everywhere.

The self-driving car team at Google X was thinking about this back in 2010. At the time, the average utilization of a car was about 4%. That means that for all the vast resources we employ mining materials to form and manufacture the components for the roughly 1 billion cars on the planet, those vehicles do nothing of value about 96% of the time. Really they contribute *negative* value because they require 22% of the area of US cities[9] to be used for parking space, and when they are in operation they are a leading cause of accidental death.

For car owners, their vehicles are one of their largest monthly sources of expense once they add in insurance, maintenance, parking, fuel, and financing costs—all for a product that is rarely utilized. As a business owner, if you had factory equipment that was only 4% utilized, you'd get it out of there or change your factory design to use fewer machines at higher utilization. Self-driving cars could allow us to achieve this utilization improvement by having each car improve from 4% to say 40% utilization. Many fewer cars would be required in a city to achieve the same transportation utility, while still leaving 60% of the time free for charging and fleet maintenance. If each car's utilization went up 10 times, the number of cars needed would go down by at least three to five times. A city that needed fewer cars to cover its transportation needs could also start to reclaim its parking spaces. In my team at Google, we used to joke that once we got to critical mass with high-utilization self-driving cars, then we could go around to cities of the world and change all the signs that say “parking lot” to simply say “park.” If a city could reclaim even half of the 22% of space used for parking, that would open 11% of the entire city to be rezoned and used for parks, public spaces, events, or any other priorities for a city's population. The economic and community value of being able to repurpose in this way could be huge.

So, by ramping down individual car ownership and improving vehicle utilization, we can save on materials and reclaim city spaces. Although a full 10-times reduction may be challenging when a larger percentage of people want to be on the move (e.g., rush hour), in most cities that factor is only about two to three times larger than nonpeak times. If normal utilization peaks at 8 to 12% of vehicles at that time, reductions in total vehicle count of 70 to 80% are realistic. It should also be noted that there is still a huge role for other types of mass transit. Buses, light rail, trains, and subways can handle larger transit flows, while a network of lower-occupancy self-driving vehicles handles the smaller transit flows to doorstep or nearest block. We could even use the collective data patterns from many individually routed self-driving vehicles to best understand how people want to move around in the city before scaling up larger municipal investments in buses, light rail, or subway lines.

Independent of exactly how cities around the world employ this technology, this discussion points to the idea that emerging technologies can be used to

drive a world of more separation and individual consumption, or it can be used to explore a world of more resource sharing and collective improvement to available services. Nothing about technology itself necessitates the application on just one perspective over the other, and given the technological changes we are already enmeshed in and the many to come, it's time for us to collectively ask whether each technology is driving more waste and separation or whether it is driving sharing and connection. Even if a technology is already in a productive spot, we can ask whether it can be improved toward meeting those goals even more completely. When we do not ask these questions, we enable a huge practical tax to be exacted against our actual intentions and overall health. This type of damage will continue unless we start to make these decisions consciously, for goals that are aligned with our individual or collective well-being. We are finding that “works well enough for corporations” is not a close enough approximation.

COMPASSION AND COMMUNITY

Just as capitalism-only thinking can be a tax on community thinking, so can tribal or political out-group thinking. Politics prefers divisive frames as means of motivating voting behavior, and a simple way to amplify that division is by casting conceptual positions into permanent personality traits. Instead of saying that someone appreciates the efficiency that capitalistic activities can bring to some parts of society, the person is labeled a “ruthless capitalist.” Instead of saying that someone is interested in helping some of the least-advantaged folks to survive and build a livelihood, the person is labeled a “naive socialist.” When this type of labeling happens, the basic frame for narrative construction transforms nuanced topics into personal insults levied at unchangeable character flaws. Literally this entire frame is wrong. Taking a socialist or capitalist perspective is a policy position, not an immovable personal character flaw, and when people are able to see the content and practical effect of policies, most of them have perspectives that can adapt and improve based on how well a thing actually works. These are not permanent mindsets or positions. Also, by focusing on short phrases that stereotype a position, we never get into enough details on an issue to have collective informed discussion that would help solve it. This is a failure of both mental framing and the societal processing metabolism for problem-solving.

While we are all capable of more informed and nuanced thinking, the shortcut of political tribalism keeps being used because it keeps working. It will stop working only when enough people become literate in the ways that this shortcut is employed to manipulate behavior. People quickly fall into tribalism because it is a return to a smaller scale of social organization. Many political tribes are created around a strong sense of in-group/out-group dynamics: an “us versus them” worldview. While that worldview can feel supportive for folks within the in group, the way that such tribes treat out groups should be closely attended to. If a tribe focuses on dehumanizing an out-group in a way that makes it harder to be compassionate, this slippery slope can lead to society-destroying polarization and political deadlock on the ability to work toward the larger needs of society.

As dangerous as this slippery slope can be, we will see a lot more of this approach during the volatility to come from economic and ecological dislocations. When people feel adrift during times of upheaval, making sense of the world becomes a greater struggle, and in such environments, charismatic figures find it easy to use stereotyping and scapegoating to blame all the negative aspects of life on a political minority group. Righteous indignation built on a blame narrative can activate a voting group and doesn't require anyone to do the hard work of developing and deploying thoughtful policies with high operational excellence. Basically the scapegoating approach is a way to win elections in place of the actual merit-driven tasks of designing and implementing policies that actively help a population. It's a way to gain power without doing the work, and the more that we reward politicians who don't do the work, the more time we waste on important challenges. Beyond the obvious problem of physical danger that scapegoating poses for out groups, as more folks mistakenly take out myriad life frustrations on them, blaming always oversimplifies the situation. Even if we want to work toward positive change, these simplifications tend to make the problems less solvable because they aren't an even-handed and realistic look at the actual challenge. So beyond making people more hateful, political tribal narratives also tend to make folks less capable of problem-solving.

Healthy communities have a strong sense of in-group belonging and care but are open to helping other tribes and communities in times of need. To explore this, it's useful to share that in the summer of 2018, my house in

Hawaii was destroyed by a volcanic eruption. Kilauea had opened up a fissure three neighborhoods over in Leilani Estates and soon erupted at over 100 cubic meters of lava per second. The flow traveled slowly downslope over weeks, wiping out several neighborhoods, including mine, ultimately destroying 700 homes and displacing about one-third of the population of the Puna District.

During those terrifying weeks, the staff of the US Geological Survey (USGS) behaved like absolute heroes. This dedicated group of scientists and field operatives did multiple daily helicopter flyovers to tightly monitor the progress of the eruption and provided timely, scientifically informed updates that drove smart public safety decisions that ultimately saved lives. They did this at real personal peril, potentially exposing themselves to dangerous volcanic gases, and demonstrated such evenness, clarity, and compassion in their updates. The government at its best is *amazing*.

What if the USGS staff approached their work like politicians focused on messaging and blame? What if the USGS skipped out on bravely measuring to provide accurate updates and instead simply told us what we wanted to hear because it was politically palatable? What if evacuation discussion could happen only in binaries: Everyone is safe or everyone is unsafe, and no nuance was allowed? What if neighbors were constantly urged to take sides against each other ideologically in the process of trying to address eruption chaos? What if a political minority group was held responsible for all the negative fallout from the eruption? With those adjustments to the situation, which employ some of the most widely used tools of political narrative, it's obvious that we would be adding noise to the situation that would increase avoidable suffering and confusion.

But that's not what happened in my neighborhood. In the real history of events, the chaos of the eruption caused so many people to show up, to start listening to each other, to offer up what they had to give, and to provide mutual support. They showed up to talk about the stresses of the eruption and to grieve the loss of loved homesteads and landscapes (Green Lake, Champagne Pond, Hot Pond). They showed up to share food and childcare, to keep school lessons going, and to distribute water. They showed up by giving displaced neighbors a place to crash—on couches and floors, often with kids and pets in tow. The actual solution of anything doesn't sound like a binary. It doesn't sound like political speech or slogans. It sounds like

many nuanced threads that are each successfully making a difference and skillfully adapting and improving in the face of challenges. It sounds like honest assessments of problems and progress. As much as we are told by politicians that big challenges will tear us apart, it is exactly these moments of real crisis (not manufactured scapegoating or out-group “crises”) that bring forward some of the best qualities in people. In short, real challenges expressed clearly bring out the best in us. Fake challenges stated politically bring out the worst in us.

Building on this discussion, it's worth pointing out that bringing out the best in people is more possible in some operational settings than in others. The crisis from our volcanic eruption created a many-to-many dialogue centered on quickly addressing the most acute issues while also laying the groundwork to repair what we could and create again together as a community. It required more listening than arguing and a willingness to take action to concretely support others’ needs. I will acknowledge that it took an extraordinary circumstance for this shift to take place, but internally the shift itself was not particularly difficult. It was an easy attitudinal shift from going about our day-to-day lives primarily centered on our own goals to being open to listening to what people need and expressing a small amount of care (within each person's comfort and ability). Honestly, in times of chaos, adopting this attitude is also fantastic psychological self-preservation. It keeps us from dwelling on recent losses and reminds us that being here for each other is a superpower we all can directly wield. When all the conveniences of daily life are wiped away, then all that is left is community. As Rebecca Solnit describes in *A Paradise Built in Hell*,[10] the value we get from the reemergence of community can often be a far greater source of purpose and happiness than our conveniences ever were.

Bringing these ideas to the big challenges of the 21st century, we will have a lot of systems breaking down, and those breakdowns will be contextually nuanced and geographically distributed. Our best bet for coping will be to have as many capable and resilient communities as we can to step up when destabilization occurs. Flipping the perspective from top down to bottom up, any community that has a strong connective fabric and capability to show up for itself and others is one that will be most ready for a chaotic future. Fortunately, we all have direct agency over this, as community is built from the foundation of how we interact and create with each other.

Even more fortunately, extraordinary circumstances can spur the practical emergence of community care, so even if our communities aren't strong yet, the coming system shake-ups are going to give us many chances to create community. Let's not waste the extraordinary circumstance of widespread climate and economic destabilization; although it is the signal of a system no longer fit for the age, it can also be the catalyst to build the communities we want so we can stand for the world we want.

COMMUNITY IN PRACTICE

Community doesn't exist without the efforts of the people in the community. There are skills for building community, repairing community, organizing for accomplishing shared goals, organizing for mutual care, restorative justice, and more. As discussed, healthy community and social connection are massively beneficial to life, so the effort required to learn and practice these skills needn't be seen as a sacrifice. For folks who have the inclination or desire to help strengthen community, it's a fantastic set of skills to develop, whether the goal is to help a neighborhood, to create together, or just to make a joyful life with extended family.

Because of the dynamic social nature of community, developing community-building skills isn’t simply cause and effect, as are some of the other talents we develop in life. Sometimes what we hope for happens easily in community; other times it takes sustained effort to build toward the meaningful thing. Any group of people with diverse perspectives will also have occasional arguments and conflict. Communities have incredible capabilities but can also have limitations; they meet some of our needs but not all. Knowing that the characteristics above are part of the basic landscape and being resourceful across all these situations is part of building fluency in community as a skill. A fantastic resource on this is Adrienne Maree Brown's *Emergent Strategy*.[11] For now, let's take a tour through some frameworks that will help us navigate your growing skill in community.

Belonging

Much of why a community stays together is because there are shared values and goals. Illuminating shared values to help a community create together is

a great way to grow listening and leadership ability, and it helps the community impart direction, purpose, and clarity. We are the beneficial recipients of this whenever we enter a community where we feel quickly at home—that sense of belonging is the gift created by the group of folks who did conscious work to create and sustain that community. Belonging comes from feeling safe to be with and create with others. People feel it because they feel brought together by shared interests, values, and purpose while also feeling accepted enough to be present without the risk of unwarranted critique. The benefits of belonging immediately highlight the value of inclusiveness as we seek to build community, as when inclusiveness is a true value of the group, it creates a sense of safety. From that place of safety and shared values, community is strengthened when each individual's voice and efforts can find a place as a valued contribution to the workings of the larger whole. Having the skills to build community involves learning to be someone who supports any or all of the above steps. Ask yourself: Can you help others feel safe? Can you illuminate where there is shared value and possibility? Can you help find ways for more voices and efforts to take part? We can be the folks who help create belonging in the communities we care about—someone has to do so. By helping build community, we will also learn more deeply about ourselves based on how we resonate with various values and goals that the community shares.

A deeper topic in belonging is how acceptance in community can transform you. Communities don't just support people. Through the process of accepting where people are, they create space for folks to accept rejected parts of themselves, which creates room for individuals to move to the next possibilities of growth. The process of creating a life comes from the moving between spaces of personal reflection and effort and spaces of community contribution, appreciation, and acceptance.

Life Experience Mix

Another practical point: Likely no single community covers all the aspects of life that are meaningful to you, and thankfully no community needs to do it all. Your intramural soccer team may be a great source for fitness and camaraderie but may be less good for raising kids or grieving a loss. Understand that your collection of communities and the relationships that emerge from them will constitute a huge part of your life experience, so

paying attention to how shared values are being surfaced, reinforced, and acted on in each community setting will tell you a lot about the quality of your life experience. Your life is created in the contribution and the edit. The more you are able to contribute to communities, the more dedicated you feel. If the community can work thoughtfully with people's contributions, then they survive the edit. When a community becomes thoughtless about people's contributions, you can decide whether to invest in repair or whether it's time to step back as part of the edit. This set of conscious actions will largely define the character and quality of social experiences in your life. Beyond how a community treats its own members and their contributions, there is another edit point around what those contributions do in the world. For example, sometimes communities form around mutual *dislike* for something. These communities risk being less additive to life unless the goal is to come together to try to build something better as opposed to just sit in mutual dislike of a problem or “enemy.” While having the social connection probably is still better than not having it, spending too much time in communities that have the goal of diminishing/hurting another group, are obsessed with conspiratorial ideas, or have a cultlike worship of a person tends to diminish folks’ life experience over time. These communities are also less able to step up and help others in times of need. Realize that you are in the driver seat of both your contribution and your edit to improve your community mix over time.

Intent

For each community, there is also the question of what it hopes to be. Is it a community centered around doing something in the world? Is it about emotional care and safety? Does it exist for the benefit of the community alone, or does it seek to be net positive to other communities and/or the surrounding ecosystem? If you are one of the founders of a community, then part of your task is to set the framework and foundational community intentions by answering questions like these. If you are joining a community, then understanding intentions helps you to see the full landscape of efforts you'll be contributing to. Then you can take part in advancing the community's goals by tracking progress through that landscape and refining a community's effectiveness with each wave of action. Or if your community is about being and not doing (my mom is a Buddhist), then the intention is about a quality of being, and knowing that

landscape will help you participate fully in the process of immersion in new ways of being.

Skills

People often think that the more a community does for them, the stronger their allegiance to that community, but what I've seen is that the more *you* do for a community, the stronger the allegiance. What's great about this fact is that once you know that a community generally accepts you, then the degree to which you contribute and feel allegiance is largely up to you. If you want to have a stronger connection with community, whether to have a sense of belonging, to accomplish shared goals, or to live in shared values, then finding the ways you can productively contribute is the core activity. Bringing skills from the other 4 Cs (Critical Thinking, Creativity, Compassion) as well as any domain-specific or applicable professional skills are all fantastic ways to contribute; you'll just need to find the station from which your critical thinking, creativity, and compassion can operate to help make a difference to the people around you.

Conflict Resolution

Once you are established in a community, you will get to know some of the ways that it could be stronger or may be in need of repair. In any group of people, there will be disagreements, at the personality level, at the operational level, or at the mission level. Sometimes a community can feel adrift, and there may be many voices (or none) hoping to move in a new direction. While disagreements can be a useful source of creative friction, they can also flare into situations where trust in the community wanes or is acutely damaged. Thus the skills of deescalation and community repair are essential for any community to last. Again, not everyone can take every role, but if you can compassionately understand where aggrieved parties are coming from and can help them find common ground again in a way that welcomes folks back, your help will be invaluable to your communities. Each of these community skills could be its own book, and there are great resources to tap into learn them in greater depth.[12] However you build them, the skills to connect with people, create a sense of belonging, and express mutual care will enrich your life and the lives of everyone around you.

NOTES

1. Patrick Schultheiss, Sabine S. Nooten, Runxi Wang, Mark K. L. Wong, François Brassard, and Benoit Guénard, “The Abundance, Biomass, and Distribution of Ants on Earth,” *Proceedings of the National Academy of Sciences of the United States of America* 119, no. 40 (2022): e2201550119. https://pubmed.ncbi.nlm.nih.gov/36122199/

2. Intergovernmental Panel on Climate Change, *Synthesis Report*. In *Climate Change 2014: Synthesis Report (AR5)*. IPCC, 2015. www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

3. J. Poore and T. Nemecek, “The Environmental Impact of Food Production,” *Nature Food* 2 (2021). www.nature.com/articles/s43016-021-00358-x

4. Hannah Ritchie, Pablo Rosado, and Max Roser, “Breakdown of Carbon Dioxide, Methane, and Nitrous Oxide Emissions by Sector,” *Our World in Data*, 2020. https://ourworldindata.org/emissions-by-sector

5. Hannah Ritchie and Max Roser, “Half of the World’s Habitable Land Is Used for Agriculture,” *Our World in Data*, February 16, 2024. https://ourworldindata.org/global-land-for-agriculture

6. Dennis Normile, “New Interactive Map Shows Where World’s Ants Are,” *Science*, August 7, 2015. www.science.org/content/article/new-interactive-map-shows-where-world-s-ants-are

7. Harvard Second Generation Study, “Welcome to the Harvard Study of Adult Development,” 2015. www.adultdevelopmentstudy.org/

8. World Economic Forum, “Harvard Conducted an 85-Year Study on Happiness—Here’s What It Found.” *World Economic Forum*. Accessed September 5, 2025. www.weforum.org/videos/harvard-conducted-an-85-year-study-on-happiness-here-s-what-it-found/

9. Derick Fox and Alix Martichoux, “Paved Paradise: Maps Show How Much of U.S. Cities Are Parking Lots,” *Changing America*, August 21, 2023. https://thehill.com/changing-america/resilience/smart-

cities/4162455-paved-paradise-maps-show-how-much-of-us-cities-are-parking-lots/

10. Rebecca Solnit, *A Paradise Built in Hell: The Extraordinary Communities That Arise in Disasters*. Viking Press, 2009.

11. Adrienne Maree Brown, *Emergent Strategy: Shaping Change, Changing Worlds*. AK Press, 2017.

12. David Suzuki Foundation, "*12 Ways to Build Community*," 2025. https://davidsuzuki.org/what-you-can-do/twelve-ways-to-build-community/; Ashlye Elizondo Vanderworp, "*4 Tips for Building Deep Community* [blog]," *InterVarsity*, January 26, 2022. https://intervarsity.org/blog/4-tips-building-deep-community; Alexandra Tudor, "*Building a Community* [blog]," Mindvalley Blog, November 18, 2022. https://blog.mindvalley.com/building-a-community/; Grace Winstanley, "*Building a Community* [blog]," Mentorloop Blog, September 5, 2024. https://mentorloop.com/blog/building-a-community/

PART III
Applying the 4Cs to the Big Challenges of the 21st Century

Chapter 7
Repairing the Biosphere

SETTING THE SCENE WITH A SET OF FRAME BREAKS

Let's set the scene for this discussion by breaking down the frameworks we are currently operating from and build a new scaffold for the path forward. A classic frame for protecting nature is to simply set it aside to protect it. The way we've structured historical efforts, protecting land tends to cost money, so when the chance comes along to make money from that same land via extraction, then the economically “rational” decision would be to destroy that landscape to make that money. In this framework, nature is really just an input to the industrial economy, waiting to be exploited, and setting any of it aside is an act of charity. The real goal of this current system design is to *maximize the exploitation of natural inputs to drive the most economic activity in the least time*. The further idea in this frame is that maximum economic activity is equivalent to maximum societal progress. It's fair to say that much of our modern conveniences and material wealth would not exist without the aggressive exploitation of natural resources over the last 200 years. We can see how this logic survived for this long. When the human population was smaller and the gift of the historically accumulated health/wealth of nature was much greater, pretending that nature was effectively infinite was an economically workable assumption. We've gotten to the point where that framework is no longer workable. It's also a good rule of thumb that when any assumptions of your frame break down, then the viability of the frame is also probably on its last legs. Every habitable corner of the planet has been explored and settled. The World Wildlife Foundation tracked 32,000 wildlife populations across 5,000 species and assessed that we've wiped out roughly 70% of total wildlife in those populations worldwide.[1] Other work indicates that we are driving species extinct at roughly 100 to 1,000 times[2] the base rate of species extinction. In this framework, where nature is primarily here to be consumed, we have “succeeded” as much as we can. We're more than

halfway there to consuming it all, and the downsides of a destabilized biosphere are now more costly[3] than the economic benefit we've been deriving from continued extraction/exploitation.

It's time to break some frames.

In the mindset of our current frame, we have prioritized economy over ecology. A more physically accurate frame would be to see the economy as a subset of the ecology. If we look around our immediate surroundings at everything the economy has helped to produce, we'll see that everything in the economy is either *mined or grown*, which means it came directly from nature, no exceptions. Even digital businesses use real metal, stone, water, and vast amounts of electricity (most of which are currently generated by burning mined fuels) to construct and run data centers. There is no such thing as a virtual economy—it's simply that the cost to nature is hidden behind an additional layer of digital abstraction. So the ideas that we've built our economic policies around—that economic growth and ecological health need to be traded off against each other toward some greater glory for a nation—turn out not to be workable in the longer run when we understands the physical reality of what these ideas entail. It was never really about a balancing act between natural health and economic gains; what has always been the case, and continues to be the case, is that the places with the deepest natural wealth are the places of the most enduring economic value. Maximum exploitation makes sense only if landscapes are disposable. Given that the surface of Earth is finite, disposing of landscapes catches up with civilization quickly.

If we wanted to keep using equations and thought processes from economics to parse out this more accurate frame, we might:

1. Understand there is a finite area of planet Earth, let's call it $Area_{land}$ and $Area_{water}$.
2. Understand that whenever there is limited real estate, the name of the game is to improve the value of that real estate and have that value grow over time.
3. The value of real estate comes both from its utility to people as well as its beauty and aesthetic value. Plenty of apartment units have similar living utility, but the ones with great park and sunset views are worth

more. Natural ecosystems already have high aesthetic value to most humans, so the intrinsic cost of removing them would need to be more than offset of the value and beauty of what is created by the removal.

4. To formalize a step further, let's call the individual units of land that people manage M and areas not managed by people U. We can label those units from 0 to the total number of managed units, and the sum of all these land units together will equal the total land on Earth: $Area_{land}$. In math talk, this is:

   $Area_{land} = \sum M + \sum U$ (sum of all managed lands and unmanaged lands)

   $Value(Area_{land}) = \sum Value(M) + \sum Value(U)$ (value of all lands, a value we should maximize as we are on a planet of finite area)

5. The economic task is now to maximize the value of each managed unit M, and we can also monitor the value improvement to units of U, as nature can and does accumulate natural wealth in its process of being. Pursuing this maximization already surfaces an interesting dynamic that some managed lands may be accruing value more slowly than unmanaged lands in the same bioregion, which basically means that the land manager is destroying value among the finite lands that a nation has to work with. A nation that wants to maximize its wealth and prosperity, given this more true-to-physical-reality frame, might fine landholders who are reducing their land value or not keeping up with the natural rate of appreciation that comes from U lands. This dynamic would ask folks to pay enough attention to natural processes to at least keep up with that natural appreciation; likely it would inspire more investment in the lands toward greater health and value than the baseline.

6. Let's go a step further into managed lands. This category includes a wide variety of uses from farmland to dense cosmopolitan landscapes. To factor this in, we can add population density as a variable. Updating accordingly, the value of the land now includes the value to the landholder, along with the value to the full population that lives there (landholding or not). As population density increases, then the contribution of the population value increases, and can be tracked as:

$$\text{value to population} = ((\text{avg(economic value)} / \text{resident}) + (\text{avg(quality of life)} / \text{resident})) \times \text{number of residents}$$

7. Models suggest that cities work better,[4] and city investments have greater value, when cities are denser with good mobility infrastructure. So if a state or province included managed lands that were population centers and others that were more unpopulated, then the goal would be to congregate human resources into population centers along with good infrastructure up to the optimal density that maximizes quality of life. The primary creator or economic value in urban environments is people—workers and residents—while the primary creator of economic value in rural or natural environments is sunlight, especially when it gets to partner with good hydrology and biodiversity infrastructure.
8. Within managed lands, we now have a way to optimize both populated lands and unpopulated lands. Populated lands should focus on improving the economic health and quality of life for workers and residents, while natural landscapes should focus on improving biodiverse carrying capacity through skillful maximization of water and sunlight resources.

We can arrive at this approach pretty quickly as soon as we update from the false assumption that nature is infinite to one where land and natural wealth is finite. There's nothing about this assumption that doesn't work with the typical mathematics of economics; it is another mathematically valid approach to economic management of resources with the benefit of including an obviously true assumption about the world (land is finite, natural resources are finite) that improves the workings of the model around questions that involve the future of natural resources.

In fact, traditional economic optimization with these more accurate constraints provides a number of compelling possibilities. For example, the fact that nature has a baseline rate of natural wealth creation acts like an inflation rate. When money is exposed to reasonable rates of inflation, wealth holders are encouraged to invest into investments that can at least beat the rate of inflation so the value of their money does not erode.

Similarly, landholders competing against the rate of natural wealth creation in their biosphere need to invest in their lands to beat that rate of improvement. Doing this could come through investment in better hydrological infrastructure (Hawaiian ahupua‘a are examples of this) or from thoughtful management of biodiversity on that landscape: for example, a collection of appropriate cash crops + plentiful ecological services from a healthy environment so landholders can avoid paying for pollination, wastewater handling, and erosion protection, since nature is doing those jobs for them. To the degree that a nation recognizes that these activities improve the value and carrying capacity of its lands, then managing the wealth of the bioregions could be a point of national investment and pride. Nations with the best management or most naturally productive regions could be compensated for the economic value of the positive externalities that their healthy lands provide to improving the health of air, water, and biodiversity resources around the region. If this approach sounds insane, understand that people already are paying for externalities. Most of our environmental regulations ask companies to pay for negative externalities, and having been a corporate executive, I'll say that *getting paid for positive externalities* sounds a lot better and easier to get done from the executive suite than forcing companies to pay for negative externalities.

Putting some of these elements together, let's look at an example:

Take, for example, palm oil plantations in Southeast Asia. Many of them start by clear-cutting a landscape, trucking out all the timber, and planting vast monocultures of oil palms. Within 25 years, these monocrop plantations reach the end of their commercial lives, leaving the communities and land degraded. If we were thinking of the long-term economic value of the land, then we might design the palm oil plantation to set aside 20% of the land to maintain biodiversity and reduce the recovery time from deforestation. To be clear, corporate yield per managed acre would be slightly less over the short term, but such a system may be economically superior even in the medium term. When the owners use up a landscape, they must incur the additional cost of procuring new land, training new people, and setting up new supply chain lines. These costs would be avoided or reduced with more thoughtful land planning. A nation that wanted to optimize its long-term prosperity would become interested in

the exact set-aside percentage that gives the optimal blended return, factoring in long-term economic value and natural resource value.

Let's get even more specific. If you want to try this tomorrow, it might look like this:

1. Situate yourself by understanding what bioregion you are in. Here's a good place to start: www.oneearth.org/navigator/
2. Look at the landscape you have influence on managing—your M. Depending on who you are, it could be as small as a backyard or as large as an entire continent. Specifically, pay attention to how water moves across that landscape.
3. Water can be a problem when it flows too fast (floods, destructive erosion), or doesn't flow (fouling, disease). What typically maximizes the biological carrying capacity is slow movement of water and more consistent access to water. There are many frameworks to do this management; the keyline restoration[5] principles are useful and relatively comprehensive.
4. As part of your planning and bioregional learning, you will find options for garnering economic output from the landscape. Knowing the background investment in landscape health (hydrology, biodiversity) will minimize the cost of getting healthy economic crop outputs. It also provides maximum longevity and optionality for future land uses, meaning the value of the land asset does not get hollowed out from short-term extraction. While I'm using generalized language here, an economically valuable outcome can be as small as an herb garden in the backyard or as large as major agricultural production for export and trade. At all scales, the skillful care of hydrology, soil, and ecological services will make production cheaper and more sustainable.
5. If your managed land has a higher population density, like a city, or, at the personal scale, say a five-person household, then the optimization criteria are economic value and quality of life. The name of the game is to do the best to maximize this across all the people living in that area. To do this, it needs to be a great place to live and work, which for most folks means a combination of opportunity, recognition of

> contribution, and enough personal agency to have an active role in creating lives that best suit them.

The reason I'm getting specific is because to succeed at developing new models to solve the challenges we are currently facing, we need direct experimentation that surfaces concrete outcomes that we can learn from. Success won't happen spontaneously through endless arguing. The other benefit is that if you can start to live a new model even within your household or backyard, then you personally don't need to wait for politicians to get their acts together or to convince the other side before life improves. You get to live the improvements far sooner, and when it is time to vote, you are coming from an informed position, because you directly know what approaches worked or didn't. Stop complaining. Put the phone down and understand that the outrage machine is not for your benefit. It is for advertisers and big tech companies. Live the future you want first.

One core way to break the frame is by recognizing that protecting nature is less about finding a few lots to fence off from human interference and more about upgrading our economic thinking to include the reality that land and natural resources are finite, and, given their scarcity, we should maximize their value. Most forms of gross exploitation for short-term economic gain would fail to make sense in this framework (which, again, includes an obviously true constraint). Our current economy goes insane in places where it is built on insane or untrue assumptions and constraints. The inclusion of additional true constraints would supply more accurate information, and, in classic economic thinking, that is what drives more economically accurate pricing and decision-making.

Now let's move to the next frame break. Another broken idea is the belief that ecological gains and economic gains are always at odds. Our team reviews over 1,000 businesses per year, and I can confirm that not only is this idea not true, but roughly 80% of the time the economic and ecological gains are completely aligned. For example, making the same product using one-third the energy is both an economic and an ecological win. Using fewer natural resources to make a product is both an economic win on material costs and an economic win on lowered extraction from nature. Actually, the economic wins are so direct and obvious, it's a head scratcher that the opposite belief dominated the dialogue for so long. I believe that it

comes from a short speed bump in our economic history when industry polluted indiscriminately using first-generation mass production technologies that were simple and inefficient. For a few decades, when fines for pollution were first instituted on that generation of industries, a strong argument was made that regulation stops industry.

But the truth is that after the regulations were in place for a single generation, the equipment producers who made the industrial equipment just designed better versions that achieved similar or greater economic output while generating less pollution and waste. Again, less material waste means less wasted feedstock, which has obvious economic advantages on reduced feedstock cost. Generating less pollution is more economic in the presence of a regulation where polluters pay for each ton of pollution, but instead of creating a forever drag force on industry, such regulations typically spur a generation of equipment upgrades (which in itself is productive industrial output), after which the industry needn't do anything special to keep up with regulations. A business-friendly way to drive the upgrade cycle is to make the equipment upgrade period a full decade with more tax benefits (or lower fines, depending on whether you'd like to use a carrot or stick here) for folks who upgrade earlier. This solution makes producers whose polluting equipment is near the end of life upgrade quickly but gives time for folks who had purchased polluting equipment recently enough time to get some good economic payback on that equipment before they upgrade. To be straightforward, I'm simply describing variations on how the Montreal Protocol already works. (This is the policy that phased out chlorofluorocarbons and prevented a global catastrophe that would have precipitated from the collapse of the ozone layer.) The Montreal Protocol has been a stellar example of international cooperation to address a massive ecological crisis in a way that had no memorable negative impact on industry. It was designed in part by our Fund I impact advisor, Hunter Lovins.[6]

Circa 2025, we are trying a messier version of this approach with carbon markets. The main problem is that when we create another currency (carbon credits) to hold the value of our market, then we need to spend a lot of effort establishing the value and veracity of that new currency. It is much more direct to use regular money and design a system where the polluter pays and pollution sequesterer gets paid—in regular money, not credits.

Pulling these threads together, the updated frame is that economic and ecological gains are largely in alignment except for pollution handling, which has a well-worn policy format that, when correctly applied, spurs a cycle of industrial innovation in exchange for a very low upgrade-cost penalty. In this frame, we can address the biggest tensions between industry and nature, which have built up because of the obviously wrong assumption that land and nature are infinite.

Through my work, I've had the privilege of being on the front lines of helping companies that are reinventing some of the most environmentally taxing industries toward greater compatibility with the biosphere. This is the equipment upgrade cycle that I mentioned, where new equipment brings better unit economics alongside better ecological economics through lower energy use or more skillful material use. Through each product iteration and manufacturing solution, our team is exposed to what mending our relationship with the biosphere looks like, and we are able to practice compassion to customers and the planet simultaneously. To be 100% clear, everything we invest in has *much better unit economics* than the current industry. In other words, it is a more cost-effective and economic way to get the industrial task done. As industries get excited about achieving that lower cost structure and improved retained earnings, they are also putting technology in place that greatly reduces their environmental footprints. Whether they care about the environment or not, industries always gravitate to the best unit economics. Therefore, the fastest way to clean up industry without redoing the entire economy is to drive innovation cycles so that the best unit economics usher in parallel improvement to ecological economics. Nations that are interested in being industrially competitive can create short-term incentive policies to drive the invention and upgrade cycle to realize these substantially better unit economics. Industrial policy often tries to spur such upgrades just to keep up with ongoing technological changes, so the tweak to existing policy frames is pretty small.

A third frame break that is worth mentioning is that nature doesn't belong to this generation alone. Its riches were created and preserved by countless generations of people and organisms that came before us, and once we fix this frame, normal economic thinking is suddenly helpful. In the same way we wouldn't think it would be wise economic behavior for a worker who inherited $10 million to spend it as fast as possible in an orgy of

consumption, we shouldn't see as wise a company that burns through the natural resource value of the lands it manages in an orgy of exploitation. This economic behavior would be rational only if there were infinite resources or no tomorrow. Again, it is not a deep philosophical statement, just a simple statement of physical reality: We inherited the wealth of nature from the many beings before us, and we inevitably pass on the results of whatever we've done to the generations after us. To have designed an economy that does not factor in this obvious reality means we should not be shocked when it generates behavior that is at odds with reality.

In my line of business, I interact with many business leaders and wealthy individuals, and the vast majority of them hope to leave a positive legacy in the world. I don't know any who delight in the active destruction of natural resources and landscapes. That said, plenty of them are very ambitious and play the game before them as well as they can. If we adjusted the rules so that our economy recognized the reality that there is a tomorrow that we will pass on to future generations and if business leaders were rewarded doing that task well, they would go and play that game well. If you wanted to do this with relatively light policy, then you could track the economic and ecological metrics for all the major industries in a nation, assessing the GDP/ton of feedstock, GDP/kWh of energy, and GDP/kg of pollution and give companies in the top 20% of performance in the stack rank against these metrics substantial tax breaks, establishing a virtuous cycle where the best are actively striving to improve. A lot of business leaders would love to win that competition, and the collective effect is that the quality bar of industrial production continues to improve over time. As enough high-quality industrial upgrade options emerge, then a polluter-pays policy implemented over 10 years, as described, could spur relatively fast upgrades, leading to a nation becoming globally competitive in that industry broadly. With similar policies, China has catapulted to a formidable lead in battery, solar, and electric vehicle production. The tax advantages that this approach offers open up new wealth-creating opportunities for the top 20% of companies that drove those innovations and enhances the overall wealth and economic strength of the nation. Such economic policies would also be more in line with the reality that we are not the only generation that will exist; making the most value to the world for each ton of extracted material or every kilogram of required pollution has us think in ways that are more aligned with reality. I've seen from the front lines of our portfolio

companies and the success of nations that are playing this game more effectively that this redesign work is not harder than other optimization tasks; in Guatemala, discussed in Chapter 3, it wasn't any harder to optimize for mean time to failure as opposed to minimum price. We simply need to upgrade our frames to include obvious realities like land being finite and that we are the recipients and conduits of ecological wealth. Once we use a more accurate frame, developing systems that can pass those gifts on to the many generations after us becomes far easier.

PLENTY OF ROOM IN THE MIDDLE

Of course, having built a firm focused on these topics and having been an investor and active learner in the space over decades, I've had some time to reflect on what's working and how we could forge the path forward toward an economy that is fully compatible with Earth's biosphere. This is the ultimate goal, as it is another undeniable reality that Earth's biosphere is what makes our own lives possible. An economic system that disregards this reality has its ultimate demise built in; reality will catch up as overexploited lands stop being economic or ecological damage starts to be more costly to the population than the benefit from any short-term profit. I've arranged my thoughts on the topic into three epochs (or phases) of improvement, starting with the nearest one being fast to adopt and the last one culminating in an economy that can consistently be a net positive to nature. What I describe is likely not the only way to get there, but it lays out a practical sequence we could work toward living in a reality where our economy harmonizes well with the needs and realities of Earth's biosphere.

At this moment, the majority of humanity is finally aware that we have an economy that is incompatible with the biosphere. As mentioned, we've wiped out 70% of our wildlife populations over the last 50 years, and the next 50 years looks even more precarious as many of the systems that sustain the planet are already weakened and are being further destabilized while the last economically untouched areas on Earth are being rapidly exploited. It is not about one factory, a carbon tax, or a single big bad industry. In totality, the economy we've created in our current framework cannot continue. There are calls for tearing down late-stage capitalism and a variety of proposals for what comes next. Instead of tearing down, I choose

to imagine it as *composting* late-stage capitalism. Our old system is like a creaky tree, largely dead, blocking out the sun from the next generation of forest species. Still, it is concentrated with nutrients, and we need to find a way for these nutrients to return to the flow of life, the flow of a new economy.

With this in mind, I'd like to introduce a concept I call *plenty of room in the middle*. It's a nod to a paper and talk given by Richard Feynman in 1959 where he stated that there is "plenty of room at the bottom,"[7] referring to the explosion of possibilities that we were on the cusp of discovering as we learned to engineer objects at the micron scale and smaller. Feynman's talk predated the semiconductor and digital revolution and in a way served as a blueprint and compass to make our way through this huge possibility space. I can easily argue that the ideas in this paper sit at the foundation of nearly every industry that has remade the world in the last 50 years. New ideas and approaches needn't just be about ideologically winning arguments. When they are built on truth and suggest practical engineering, so much more can happen than in the world of debate. So with that backdrop, let's set the scene for ideas in a similarly expansive framework.

Each day we receive a steady stream of photons from the sun, which provides nearly all the energy being used throughout the biosphere. Each day an equivalent amount of energy is radiated back to space as infrared radiation. If Earth didn't shed an equivalent amount of energy each day to what it received, it would break several physical laws and also heat up to total uninhabitability: This energy-in/energy-out balance is a foundational process happening to all planets. Of course, with our emissions of greenhouse gases, we are changing the temperature by giving that energy longer residence time in our atmosphere and oceans before it radiates back to space, but the basic energy-in/energy-out equivalent of the process continues. As a definition, I will call the time between when a photon arrives and when its energy radiates back into space as "the middle." With that definition established, there are many possible fates for the energy of that photon in the middle. Let's explore a few.

1. The photon could arrive from the sun, hit a rock, and immediately radiate back to space. This happens often. In this process, not a single organism may have benefited from the photon's time in the middle.

2. The photon could arrive and hit a solar panel, providing a little nudge to the electrical system of a house. In this case, it may be a part of benefiting the members of a household—a few humans and the microbiota within them.
3. The photon could hit a leaf, driving photosynthesis and the creation of plant sugars, which first feed the plant for its growth and also move energy in the form of plant sugars down into the plant's roots, which is the primary energy source for the entire soil ecosystem. Later that plant may be eaten by a herbivorous insect, then an insectivore, then a carnivore, and an army of detritivores at a later point. In short, the middle for this photon may contribute to the livelihood of dozens of macro-organisms, thousands of small organisms, and millions of microorganisms.

Nature shows us that there is plenty of room in the middle. Life has developed in a way that seeks to savor every photon, accumulating wisdom and capability in genetic and behavioral codes, extending and making incredible use of the energy of each photon during its time in the middle. This is the original source of natural wealth on Earth, and around it we could build a new economy where the definition of wealth is true to this physical reality. You see, until now, we have struggled with the idea of continual expansion, of an economy that needs infinite growth in a world of "limited" resources. And it is true. The way we have currently designed our economy and the way we use up resources, ongoing growth, and expansion is a recipe for devastation, a devastation we are all a part of today. Nature's approach shows us that forever growth, expansion, permutation is possible—but we can't get there with a core framework of extraction and exploitation. The wealth comes from benefiting as many organisms as possible with each photon and accumulating wisdom for future generations from what these organisms have created and learned for us.

After all, 4.5 billion years ago, all the photons from the sun fell to Earth under the first scenario. A lifeless planet then, photons hit the planetary surface and all that energy radiated back to space without benefiting a single organism. The cleverness of life came not from its ability to be just a different place for the photon to go, but by becoming a place that would get ever more creative with each unfolding species on how to make the most of

photons, how to make use of water, how to make use of critical elements—nitrogen, phosphorous, potassium, calcium, and learning to skillfully move these materials, collect them from the lithosphere and atmosphere, with each generation making them more bioavailable to support ever more complex life. Not only does life favor photons to support the specific organism, but it uses the energy from photons to increase order and natural wealth for future life. This is why we inherited a planet with immense soil fertility, bountiful waterways, countless forms of life each contributing in every season over every millennium.

And in this way, life itself has done what we have said an economy cannot do: continue to grow and expand, not just for the wealth of a single household or to claim a nation as more economically prosperous for 100 years, but for all life, for billions of years, in every corner of the planet, and with a creative vibrancy and sophistication that outpaces the most advanced objects we've ever manufactured. Life has shown us that we can in fact grow forever—not by ever more exploitation or ever more mass, leaving that mass in a degraded state, but via the nuancing and sophistication of the same mass, elaborated through time into more structured forms, benefiting ever more organisms with each visiting photon. I would summarize the net effect of what life is doing on this planet in this way: *the maximization of diverse nutrient flows* toward the benefit of the most organisms possible in the middle.

Understanding what life has done here helps us to ask better questions as we update our frameworks. Our ingenuity has proven very effective at whatever frame it is unleashed on. When we carved up the globe with a lens of conquest and subjugation, the colonial powers built fleets of trade ships and slave ships to exploit the physical resources and peoples of the world. When we thought the globe to be a chessboard between communism and capitalism during the Cold War, we built arsenals that could end every human life on this planet several times over. These are all awful precedents, but they point to how thorough and effective we can be at seeing through the possibilities of a frame once we have latched onto it. As a species, we can carry out a framework to our last breath, and to date we've chosen frameworks of domination, conquest, subjugation, national arrogance, assertions of racial supremacy, and more. But we are also capable of better frameworks. Science, medicine, democracy, the arts, and our traditions of

spirit and place have variously created much cultural wealth and wisdom. What would it look like for us to ask the same questions that nature asks as we build an economy that further elaborates on the idea of plenty of room in the middle?

First off, we could be accounting for how many organisms benefited from a particular change and assign more value or reward to the actors in an economy that are building products, services, and/or government programs that benefit more organisms for the same resources. This approach immediately asks us to expand our sense of empathy and care. Doing so maybe sound impractically hard, but honestly I believe it’s a lot easier than entire empires convincing themselves that enslaving people is just. We pulled that off, so there's no reason we can't pull off the kinder perspective that is based on the physical reality of life on Earth.

Second, we could start to understand that the healthy *flows* of materials and energy are the large-scale natural wealth creator on the planet, and we expand the wealth of our economy by supporting and expanding the health of those natural flows. For example, the flow of water from a mountaintop to the shore is an essential flow required for life to exist on the landscape. If we took away that flow and instead of the water gradually making its way via gravity, it was dammed up, diverted so it never reached the sea, life across those landscapes would be heavily affected. The movement of clean air and the processes that drive healthy soil can also be seen as metabolic flows whose healthy function improves ecological carrying capacity to create landscapes that benefit more organisms in the middle.

These major metabolic flows can be tracked through hydrological cycles and nutrient cycles. More nutrient cycling (carbon, nitrogen, phosphorus) across a broader base of biodiversity (as mentioned by a larger and stable species count) is what success for life on planet Earth looks like, and our economy could be designed to benefit best from the exact same conditions. As we get more skilled with the major metabolic flows, we have a long and exciting journey ahead of discovering the minor metabolic flows that add up to the major ones. For example, once a landscape has in place the broad brushstrokes of healthy hydrology and access to nutrients, there is much to learn from how the myriad organisms make use of these inputs individually and collectively to encourage healthy ecosystem function. Our first stop in this effort has to be supporting the health of keystone species, which are

defined as species that have disproportionately large impact toward establishing ecosystems with better carrying capacity for diverse nutrient flows. Just as we can learn how to engineer atmospheric water harvesting from a desert beetle,[8] the more we appreciate the full scope of these major and minor metabolic processes, the more opportunities we will uncover to thrive in all of Earth's ecosystems in a way that is in concert with what natural processes would want to support anyhow. Better knowledge leads to better system design and lower building, operating, and maintenance costs. An economy that operated in this way would have the highest potential ceiling of natural and economic prosperity for the minimum energetic and material resources.

Laying this out in sequence, here's how we might get there, with an eye toward what changes can come sooner (as they are more compatible with the current economy) and which will likely come later (as they start warping the frame into one that can last), all against the backdrop of slowly introducing more practical understanding of the biosphere as the foundational system-defining constraint.

> **Epoch 0: Today's Extractive Economy.** Nothing is needed to achieve this, we are already doing close to the maximum of survivable extraction and running toward the end of the timeline that this economic design and framing can support.
>
> **Epoch 1: Material Productivity Economy.** This economy uses maximizing GDP/ton of feedstock, GDP/kWh of energy, and GDP/kg of pollution. Businesses built on this concept can win within the rules of the current economy by having better unit economics from lower feedstock and energy costs. Huge gains can be had here. A ton of sand (made mostly of silicon dioxide) in a construction context goes for about $15 to $20. By comparison, the entire chip industry uses about 30,000 tons of sand annually, and as of 2025 generates about $800 billion in direct annual revenue, meaning each ton of sand in that industry generates $26.7 million in value. This example illustrates more than a factor of 1 million improvement in material productivity for sand as a material depending on how skillfully we use it. This is what I mean by getting more sophisticated with matter instead of mindlessly degrading it. Although we have seen material productivity

improvements over the last decades, the improvement is only by about a factor of 2 over the last 50 years.[9] The practical benefits we would get by actively managing this to higher factors, where possible, are huge. Each factor of improvement, 10 times, 100 times, 1,000 times, typically requires a new generation of industrial tooling, but we get orders of magnitude more economic benefit for ever shrinking ecological cost.

Epoch 2: Enriching Ecosystem Metabolics. Here we expand our ecological vocabulary beyond the optimization of nouns (feedstocks, whether mined or grown) into the optimization of verbs (water flow, nutrient cycling, energy cycling). While Epoch 1 had obvious economic benefits from reducing feedstock and pollution costs, Epoch 2 has economic benefits from needing to pay less for supporting business services because a healthy ecosystem function is providing a higher proportion of those services. For example, “healthy soil” is really more of a verb than a noun. It represents an ensemble of metabolic processes around plants and soil organisms that make soil healthier and easier to grow in. This has direct economic benefits to farmers; they pay less for fertilizers and pesticides to control unhealthy soil and unbalanced biological processes. This is also the epoch in which we likely will rewire how most industries use water, as skillful management of water across a landscape makes both agriculture and industrial processes cheaper. Last, we can start to see the nature around our facilities not as an obstacle but as a source of potentially useful metabolic processes and outputs that we can aim to get more benefit from by supporting their healthy function.

Epoch 3: The Maximization of Diverse Nutrient Flows. At this level, our skillful use of nouns through material productivity and skillful use of verbs through metabolic management become the conceptual foundation where we can dive deeper into learning from the near-infinite ways that all organisms in the ecosystem have handled these nouns and verbs well. We can start with keystone species and by being the keystone species that takes care of other keystone species. As we massively expand our toolkit, we can do what nature does: enrich the world by resolving toward greater nuance and sophistication of each gram of matter and drop of water we touch toward maximizing

> the number of organisms that benefit in the middle. An economy that is aligned with the processes that support the biosphere could continue to diversify, be resilient and adaptable to changes and shocks, just as nature has, and continue to build natural and economic wealth as long as the planet remains habitable in an astrophysical sense (at least a billion years).

I understand that graduating through these epochs will take some time, given where we are starting from (I'd estimate 100 to 500 years, although a lot of great groundwork will be established in the next few decades), but the benefit of creating an economy that works in concert with the rules of biosphere and thus is Earth-compatible over the span of a billion years seems more than worth the effort, especially when our current path is on a crash course with planetary limits that we have conjured for ourselves through the irresponsibility of creating a system design based on false assumptions.

* * *

I might sound overly optimistic, but I'm pretty sure we will get this right. Not because we are so virtuous, or because thoughtful arguments will win over ignorant arguments, but because any system built on false assumptions eventually breaks apart under the weight of its falseness. We might wish the change to happen gradually and gracefully, based on applying appropriate foresight or via quick adjustments as various errors become evident. But if we don't do this in time to minimize the pain of change, the foundational rules of the biosphere will still be true. These are scientific truths that are real regardless of what humans believe, and the few groups that are already working within those truths will have a better chance of making it in the long run. It is not optimistic to say we will eventually get there. Really, nothing short of working with the truth of the biosphere will allow us to last, so if we do last, it's because we eventually figured this out. If there is optimism to be applied, it is in the hope that it happens with the least amount of suffering possible, although such thoughts read less like optimism to me but as desired attributes we can look to achieve in the redesign process. Again, build mindset is just different.

For all the apparent domination of nature that this age has enabled, we are still part of the process of natural selection, and parties that have more

allegiance to ideology than to what is effective in the biosphere we live in will be practicing a way of living that is worse adapted to the conditions of reality, and that that way of living will make their lives ever more costly and eventually untenable. The best strategy for those who are living this way is to horde as much wealth as possible to try to ride things out, but none of that changes the reality of what works in the biosphere. The lives we've built on these premises have always been costly, but over the generations that cost was externalized to slave labor and ecological destruction of colonized lands. The last vestiges of that behavior are being challenged right now, and any principled economic thinker would welcome the inclusion of more complete information about the real cost of the systems that we have built to date. In the absence of that honesty, the promised efficiency that economic thinking is meant to bring will never materialize, or it will exist only as a local optimization that requires degradation of global ecological health and stability.

Let's talk for a moment about falling apart. For all the unrest that surfaces when the current winners of an outdated model must evolve, the falling-apart process can be a rich one. It is akin to the way an old dying tree falls in the forest, perhaps after a big storm. Once the tree falls, new light can reach the forest floor. That light creates conditions for a reinvigoration of that spot in the forest, and the nutrients and natural wealth that the old tree had accumulated during its long service now return to the forest to fuel that reinvigoration. This, I believe, is the right metaphor for the systems that most need upgrading right now. They served an important purpose to get us here and were part of an ecosystem that created much in our lives. As they arrive at the end of life, then it's worth honoring and acknowledging the good bits of what they brought and reuse those nutrients for the next cycle. It is the psychological parallel of the composting process in nature. The nutrients return to new life. The passing of the older system opens new possibilities for the many ways that those nutrients can support the needs of future generations.

In our finest form, we become the keystone species that learns to take care of other keystone species. This role has incredibly high leverage toward our goals while also widening our circle of compassion in ways that reconnect and can create profound meaning and peace in our lives. We will develop our craft in ecosystem engineering, the way that beavers, and ants, and

tapirs, and sea otters and countless organisms already have, by transforming landscapes in ways that improve nutrient cycling and biological carrying capacity. We'll learn to do this both to serve our needs as a civilization and also to leave more for future generations and all the other beings we share this planet with. Unwavering focus on individual wealth maximization can easily become pathological, but unwavering focus on passing natural wealth to generations beyond our immediate benefit is deeply generous and life-affirming. We choose our life experiences, and everyone is allowed to have their own preferences, but for the very financially successful folks I know, no amount of good deeds they do later fully clears their consciences of a life where their wealth was built on damage to others.

Beavers show us what happens when we move things in the other direction. Beavers, through their hydrological engineering, slow the movement of water over a landscape, providing more time in the middle for organisms to benefit before the water flows on to lower elevations. They spread out the potential of those flowing water molecules over more time and more landscape, enabling more organisms to benefit. By effectively doing for water molecules what plants do for photons, beavers create more wealth in the middle. Humans would like to think of themselves as more skilled engineers than beavers, and I agree; we can build in far greater variety and scale. Given this, I believe we're up to the task of strengthening the health of key flows of water, nutrients, and engineering systems that create more time and utility in the middle.

ACCUMULATING REAL WEALTH

Transitioning from a world using up resources in a frenzy to one that rebuilds resources while supporting its own flourishing is the real task of creating real wealth for future generations. It is something that, unless we believe we are the last generation to exist, would be part of the plans of any rational civilization. Our proxy for wealth is money, a representation of value that operates in an economic system we've designed to collaborate through. Much of this chapter has been about how to improve the design of our economic system to be compatible with the reality and function of the biosphere, moving toward a world where the value represented by money is better aligned with value actually created for humans and biosphere. Once

these are better aligned, the net result is that we are tracking real wealth creation. Instead of leaving that as an abstract, let's dive into what real wealth for our civilization is.

As natural wealth goes, life builds soils, nuances hydrology, and accumulates wisdom on how to thrive in different settings via culture, behavior, epigenetics, and genetics. Biodiversity is so important because it explicitly speaks to sustaining the genetic and epigenetic aspects of this wealth. That said, there is wisdom in the culture of orcas, the collaborative hunting behavior of groupers and octopuses, the remembered migration pathways of salmon and terns. If we simply biobanked all the DNA, we lose the living behavioral and cultural memory of these beings. What I am saying about nature is also true about humans. Human genetic diversity isn't nice just because we should live in a more equitable society; high genetic diversity is foundational to the long-term survival of any species. In terms of cultural and behavioral wealth, if even one generation skipped education entirely we would lose most of the wisdom accumulated by humanity over the millennia. All of us stand on the shoulders of those before us, in every minute action, from the languages we speak, to the foundational discoveries of our fields, to the various scaffolds of thought that allow us to make sense of the world around us. Furthermore, we stand on the shoulders of billions of years of experimentation on a living planet that has created the foundation of all natural wealth, including us.

There are ultimately two types of wealth. One is the patterns that allow matter to be used in ever more intricate forms, and the other is the accumulation of productive output from these patterns being expressed through metabolic flows. To make this concept more concrete, the DNA that represents all the genetic code of soil microbes, fungi, arthropods, and soil-nourishing plants is a collection of patterns that encode what these organisms are and what they are capable of doing with soil. The existence of these patterns is a type of informational wealth even before they get to work, but once these organisms get to work, they leave a second type of wealth: rich, healthy topsoil that can accumulate over the centuries, making the ecosystems established on this soil more bountiful and resilient than if there had been no accumulated wealth to build from. As another example, our languages are like the base units that make up DNA. We can take those base units and arrange them in different patterns that describe in detail how

we can create things in the world and how we can think about and make sense of things in the world. Those patterns are a type of wealth, and the books in a library represent a collection of these patterns. Another type of wealth builds up when we make use of the wisdom to build things that create lasting value and can be passed down to generations after us. We see such accumulated wealth in the 500-year-old buildings of Florence, still in use, or the systems of roads we have built to connect people with each other.

As humans, we can make active decisions about the type of pattern wealth we are creating and which patterns we want to put into action to accumulate wealth for future generations. To explore this, let's look into the architecture of these patterns a further step.

Ultimately, the wisdom of life is encoded on several levels of organization. The physical adaptations of the body are encoded in DNA. Situationally appropriate genetic expression is encoded epigenetically, helping organisms sustain useful gene expression/inhibition during periods of change. Adaptations of the mind and behavior that work for their time are passed on through our intellectual traditions, culture, and works.

- Physical learning/wisdom → pattern into DNA
- Situational wisdom → pattern into epigenetics
- Cognitive wisdom → pattern into culture, science, traditions

Caring for the health of the planet includes having awareness of this wider aperture of wisdom. We could shorthand this by saying we need to take care of global biodiversity and our accumulated cultural and scientific learning, but breaking down the mechanisms and characterizing what type of wealth for the future each effort accumulates into can help us do this intentionally and to improve at this civilization-level effort with each iteration.

To be honest, even though I titled this section “Accumulating Real Wealth,” I bristled a bit at using the word “wealth” in the phrase we use to describe what we are doing. I use it because financial audiences need to hear it in these terms, since it's easy for them to not see the value of anything that isn't described as wealth. As soon as something is described as wealth, they can see the value in the most arcane things—like an option to purchase a

derivative of an index. (The global financial crisis was built on a similarly convoluted type of “wealth”—trading risk-poisoned securities packaged to speculate on credit default swap spreads.) Being able to see the wealth in something tangible like a functioning river or grassland seems more tractable to me than many of the things the financial world has already twisted itself into a pretzel to describe as wealth.

For everyone who doesn't think in a real wealth framework first, we could call this work stewardship that moves us toward a civilization that can stand the test of time. It could also be referred to as deeply honoring the wisdom of the ages, through a process that I call the *maximization of wisdom*. This is to combat something we're stuck in at the moment, which I call the *myth of modernism*—the idea that everything new is automatically best. What seems to be more true is that some recent wisdom is excellent, some ancient wisdom is excellent, and some wisdom from the times in between is excellent. The task should be to be good curators of which wisdom is excellent regardless of the time it emerged from. This task is a different one from just believing an ideology is wise. For something to qualify as being wise, we should look at what it practically creates in the world, not just whether we agree with its ideas. Regardless of whether an alternative framing speaks more powerfully to you, the goal is to collectively build systems and ways of being that leave our planet better off with each generation.

HOW TO CONTRIBUTE

Expanding Our Wisdom

The experience of being able to contribute and shape something in its early phases is one of the most amazing feelings that we can have. Whether you know it or not, by exploring and making sense of new territory, you are adding to the totality of humanity's wisdom. I remember the first time in my astrophysical research that I looked at data collected from an instrument I helped design. I was the literal first one getting to see a distant object (NGC1068) with that detail in our selected imaging band. I felt incredible excitement at being the first representative of humanity to make sense of this bit of the universe. I've also felt it many times in my engineering and

design career as, through prototype after prototype, a view of a possible world came into focus. When this experience becomes part of your vocabulary, the world will never be the same.

After my talks, sometimes people tell me that everything I taught was so impressive, but it's not possible for someone with their background to contribute like this. Let me stop that thought right there. While my career has been pretty technical, I know similar feelings come forward in the expressive arts, music, painting, dance, when a person is on the edge of something new. Even when a person covers an existing song, something new happens when it comes through an individual’s voice and fingertips. It comes up in little acts of everyday creation, such as when you come up with a better system to keep your keys organized, or when a teacher comes up with a new way to get kids to focus, or when you figure out a faster way to prep your favorite dish. After all, these are all forms of learning as well. For you to cook the way you currently do, generations of folks tried various ingredients, cooking tools, and techniques; selectively bred crops for flavors and nutrition; and played with every type of plating and presentation. Every time you eat you are receiving the wealth of all that wisdom, and when you come up with even the smallest improvements, you join the continuum of generations that have been moving the frontier forward for all of us.

New wisdom is built from direct experience, new trials, new expression. These are all things we can take part in. Our understanding of the mechanisms of biosphere repair is still developing, and we need to get deep at this for all the world's bioregions, developing the processes to create both pattern and accumulated wealth through supporting stronger ecosystem metabolics. There is much to learn, relearn, and invent, and, given how much there is to do, there is room for all of us to make a difference. As an inspiration, after recognizing that a native species was about to go extinct because of habit loss, a biologist from San Francisco asked the local botanical garden to dedicate a tiny area (I've been there, it's maybe 30 × 30 meters) to establish a habitat to help this butterfly out. That man’s effort turned around years of decline, and the population is recovering.[10] It's less about being the hero of the biggest problems in the world; it is always about caring enough about something to listen to the nuances, experiment toward improvements, and stick with what's working long enough for it to matter. It's fine to work on the smallest problem in the world or something that

helps only three people. First show yourself that you are capable of expanding the sphere of collective wisdom, even in the smallest ways, and the journey unfolds from there.

Seeking Truth Honestly

Whenever any form of wisdom is refined or improved, accurately capturing those refinements benefits the lineage and the future. In other words, there's an important role for folks willing to verify and speak the truth. This territory is tricky, given how many folks in mass media claim to have the truth, but we must pay attention to whether the truth they are representing came from direct experience and systematic assessment or whether it came from wanting to support an already existing ideological position. Most of the people in the media are doing the latter because it makes for better entertainment—more bitter arguments, less likelihood of resolution, witnessing the melodrama of a good versus evil narrative, and so on. In comparison, actual truth tellers are deeply committed to understanding something deeply, using all the experiences and data available, assessed in an even-handed and methodologically coherent way. People who are contributing in this format can help to unbias the wisdom we are collecting as we find our way. Such people can be recognized as their perspective tends to widen and deepen over time, not sound like the same refrains forever. They can also be recognized because they are interested in whether the process of curating and verifying wisdom is truly helping people, not whether it is hurting people they disagree with.

Memory Keeping

All the gifts we pass on exist because in some way their memories were kept—either passed on through generations in story or tradition or written or recorded in various volumes of wisdom. We often consider the work of great thinkers and historical figures to be worthy of memory, but a critical form of memory for the road ahead will be ecological memory.

When I grew up, just outside of Washington, DC, every summer the air was thick with gnats; I could not ride a bike or play a sport without several landing my eyes or dying in my sweat. Nowadays I don't see gnats at all. Whatever ecology allowed gnats to exist 30 years ago does not exist now. I've heard similar stories from folks in the American Midwest, who

remember all the bugs that splattered on the windshield whenever they drove; now there are almost none. These types of vivid memories exist in older people inhabiting all the corners of the world, but if the next generation never hears of these memories, we risk collectively forgetting how our landscapes have spoken to us. In forgetting, we also lose sight of some possibilities for how the landscapes can be restored and recreated in partnership with ourselves and future generations. As an example of responsible memory keeping, the country of Iceland put up a memorial plaque for the first glacier that was fully lost to the warming climate.[11] It serves as a point of reflection and a memory marker where visitors can view historical photos of the glacier over the span of years that it disappeared and urges future generations to reference these memories as a way of seeing how we stepped up to the challenge of climate destabilization. In the year 2100, will that plaque be surrounded by a glacier-less terrain? Or will our descendants have held the line? Could we have repaired that landscape along with our foundational relationship to nature in meaningful ways? Memory keepers are often seen as traditional, but in times of radical upheaval, having a robust connection to historical ecological reality (not an idealized nostalgic version) offers us the best chance of charting a workable course for our future. It gives us grounding points so we can see our trajectory clearly.

Repairing Your Backyard Bioregion

If you are interested in doing ecosystem repair in your bioregion, there are so many ways to get started, but here is a simple primer. When looking at repairing any landscape, a simple recipe is to first heal the waters, then the plants, and then the animals will return. Some activities for each step:

- Watershed restoration—Understand how water moves through the landscape. Are there ways to make water resources maximally bioavailable by managing toward slow, deliberate flow and reducing uncontrolled erosion and runoff?
- Plant restoration—Understand the native plants and pollinators in your area. Plants provide food and habitat for all the animals above- and belowground. For each landscape, a sequence of plants establish themselves in the process of ecological succession. Work out what

plants help your landscape move through each stage toward maximum biodiversity and carrying capacity.

- Wildlife restoration—Once the plants have returned, the animals have a chance of making it. Support the creation of stable habitat for local fauna, designed in a way that creates supportive interactions with humans, not dangerous ones. Be thoughtful of the landscape scale needed to support various species, and ensure migration corridors are present and safe.

Nearly every ecosystem humans inhabit is going to experience destabilization in this century, and having a local population that has worked toward these forms of health gives you better tools for when the destabilization comes to your town. However you build—whether you are directly improving the resilience of the landscape, building wisdom and memory, or creating community that can thoughtfully rebuild after breakdown—the effort you put into this work matters today and will matter more tomorrow.

As you can probably already see, most of the tools to get started on this journey are quite affordable. Your government probably has extensive surveys that catalog your regional watershed, and folks can already support a lot of repair by helping water to move across the landscape in ways that maximize its benefit to habitat creation, biodiversity, and ecosystem resilience. The tools of citizen science, like small weather stations, stream gauges, pH and water quality tests, or just using your eyes to see how biodiversity is faring in your area, can all deepen our knowledge of how our local environment is changing and create the foundation for better decision-making and deeper listening with all the ecosystems we inhabit. Armed with a bit of knowledge, some care and compassion, and of course some grit and follow-through, you, even just as one person, can start to change the course of events for nature around you.

If any of these roles or methods of contribution speak to you, understand there is so much powerful work to do in all these areas. Don't worry about whether your contribution is large or small; sometimes the smallest contributions that work end up getting used everywhere and being bigger than we imagined. And even if they don't work, they still brought wisdom, clarity, and improvement in the little spot where they began.

NOTES

1. World Wide Fund for Nature, *Living Planet Report 2022: Building a Nature-Positive Society*. R. E. A. Almond, M. Grooten, D. Juffe Bignoli, and T. Petersen (Eds). Author, 2022. wwflpr.awsassets.panda.org/downloads/lpr_2022_full_report.pdf

2. Peter Aldous, “We Are Killing Species at 1,000 Times the Natural Rate," *New Scientist*, May 29, 2014. www.newscientist.com/article/dn25645-we-are-killing-species-at-1000-times-the-natural-rate/

3. Caroline Alberti, “The Cost of Inaction,” Climate Policy Initiative, January 4, 2024. www.climatepolicyinitiative.org/the-cost-of-inaction/

4. Geoffrey B. West, *Why Cities Keep on Growing, Corporations Always Die, and Life Gets Faster*, July 25, 2011, Long Now Talks. https://longnow.org/talks/02011-west/

5. M. Walton, J. W. Jansens, J. Adams, M. Tatro, and T. E. Gadzia, *Applying Keyline Design Principles to Slope Wetland Restoration in a Headwater Ecosystem*, 2019. New Mexico Environment Department, Surface Water Quality Bureau Wetlands Program, Santa Fe, New Mexico. https://quiviracoalition.org/wp-content/uploads/2019/12/keylineguide_FINAL.pdf

6. Natural Capitalism Solutions, “Hunter Lovins: President & Founder of NCS,” 2023. https://natcapsolutions.org/l-hunter-lovins/

7. Richard P. Feynman, “Plenty of Room at the Bottom” (lecture transcript), December 1959. https://web.pa.msu.edu/people/yang/RFeynman_plentySpace.pdf

8. Eva Frederick, “Could This Desert Beetle Help Humans Harvest Water from Thin Air?” *Science*, November 27, 2019. www.science.org/content/article/could-desert-beetle-help-humans-harvest-water-thin-air

9. Economics Explained, “*Limitless Growth Is Possible If We Run Our Economies Correctly* [video],” n.d. https://youtu.be/yxsLrteNl0E?si=If_Gjompl2-xz1GG&t=831

10. Cerith Gardiner, “How One Man Has Brought a Rare Butterfly Back to San Francisco,” *Aleteia*, September 28, 2019. https://aleteia.org/2019/09/28/how-one-man-has-brought-a-rare-butterfly-back-to-san-francisco/

11. Wikipedia contributors, “Okjökull,” *Wikipedia, The Free Encyclopedia*, last updated July 29, 2025. https://en.wikipedia.org/w/index.php?title=Okj%C3%B6kull&oldid=1303225244

Chapter 8
Future Jobs and Economy

SUPPLY-SIDE CHANGES

I'm going to start this chapter with a contradiction. I've suggested at several points that the progress of AI and robotics is likely to overturn a large percentage of the jobs on the planet, starting with repetitive cognitive and physical tasks and branching into some nonrepetitive jobs as well. At the same time, a great majority of the populace doesn't want this to happen in a way that creates hardship, yet it likely will. Why?

In our current system, folks who own equity in companies run the show. These people are largely investors and top executives. Investors are putting their capital to work, which means that the hardships from layoffs are not something they directly experience. Similarly, top executives are mostly the folks who would be doing the layoffs, not the ones being laid off. For all these parties, the realities of working-class folks who may live paycheck to paycheck, or even middle-class folks who might have a six-month financial buffer, are not part of their lives. They have not been in the position of actually needing work to survive for some time, and this drives a low-compassion orientation that allows them to see robotics and AI simply as cost savings, divorced from the stresses to the thousands of families that come with mass layoffs.

As a company’s cost structure goes down, it becomes more profitable, but because this cost reduction comes from layoffs, the number of people who directly benefit is smaller, and executives and large investors get the lion's share of the benefits, as they own an outsize percentage of the company. None of this is illegal in our current frames, and some of the people who are winning in this frame claim that there's literally no way to improve the system. After all, the executives are acting “rationally” by making their businesses more efficient. This efficiency should benefit the world by benefiting shareholders and making the product or service less expensive because lower costs mean that the company can offer lower prices.

When the production side of a business gets less expensive, our economic system views this as a supply-side efficiency improvement. This is the main economic framing around the robotics and AI that will be eliminating jobs. As labor costs are a significant fraction of the cost structure of most businesses, they are a common target for cost reduction. This aggressive scale-down of labor has happened from other technologies in the past as well. After all, switchboard operators physically routed wires to help phone calls go through; what had been a large workforce has been whittled down to near zero because of automatic switching technologies. Unlike automatic switching technology, which focused on replacing one role in a specific industry, today's AI technology is broad enough to provide new capability across many industries. Thus, multiple sectors will be facing workforce reductions in the same decade, driving much greater likelihood for broad economic upheaval.

I have some familiarity with "change everything" technology as my career has intersected with several of these movements: personal computers, internet, mobile devices, mass move from paper to digital, and the sensing and digitization of the physical world. Over the last 50 years these revolutions have changed so much about how we live and work, yet these changes have largely become tools for our work, employed by the workers themselves. They were not primarily tools of equity holders aimed at eliminating employment. The early web belonged to no one, and anyone could "view source" to quickly learn how to get their first page running. Our newer tools don't offer as much transparency in their formulation, and the current state of AI model training has the entire stack owned by a handful of companies. We run a huge risk if we cannot find ways to quickly democratize these tools. Powerful tools wielded by the few tend to benefit the few. Powerful tools wielded by the many allow the greater population to employ their own agency toward co-creating our future trajectory as a society.

On the Frame Breaks

Now that we have a sense of how our current frame risks massive job loss and social disruption through undemocratized automation tools, it's time to break some frames. With all this looming economic menace, it's important to remember that *we designed the economy* and we all agree to participate

because the system-level goal was ostensibly to make life better for most. This approach worked for a while in its current form, engaging a large percentage of working-age people in various forms of production that provided goods and services to society while also providing wages and livelihoods to the workers. Labor movements had political influence and provided checks on corporate power. This seems reasonable enough, as the other side of the coin of labor being a large fraction of the cost is that labor is also the major source of innovation and profit. Most businesses can't get very far without workers, and this balance between corporate and worker power can be achieved either by pushback from labor or by business owners acting in a thoughtful manner toward the long-term health of their business and community. Both these balancing forces were stronger 50 years ago before shareholder “theory” was popularized by Milton Friedman.[1] I put “theory” in quotes because the term is borrowed from scientific language, but it's not accurate. Economics *is not a science; it is a design discipline*. In science, there is a foundational way that things work, and we work to discover and characterize these foundational mechanisms through repeated experiments until we establish a stable understanding that matches the world. In design disciplines, there are countless ways to design an object or system, and the intent is to serve the audience through the design effort. Design disciplines are often strongly shaped by constraints established early in the design process. I enjoy both scientific disciplines and design disciplines and have practiced both in my career, so I can clearly recognize economics as a design discipline. The erroneous proclamation that economics is a science is the source of a lot of unnecessary societal damage. When a theory is correct in science, it’s truth cannot be avoided. A person can pretend not to believe in gravity, but it literally works everywhere in the universe. By comparison, the ideas we call economic “theories” often perform differently in different settings with different populations, or even with the same population five years later. Using scientific language makes economics feel unchangeable the way that gravity is, but clearly it is changeable and open to design differences, as every national economy has applied slightly different rules and has had different results. The reality of establishing economic policy is much more akin to people designing an object, like a refrigerator. There are hundreds of ways to do it, all with some benefits and drawbacks depending largely on

who is being designed for and the team's ability to carry a design and product intention through to successful shipment.

On all these fronts, Friedman's shareholder “theory” is an instance of design, a design where the goal is to serve shareholders, not society, not the environment, just shareholders. Before this “theory” was popularized, it was normal for successful business leaders to invest in their communities. They knew that if the quality of life in the towns where they had business locations improved, everyone benefited, including the corporation, due to easier retention and motivation. The towns could also attract and develop the best talent in the world in a specific field, pushing things forward for the corporation and for all of society because of the innovation that this concentration of expertise enabled. When a system is designed only for shareholders, workers become interchangeable and disposable, because prioritizing the design for one party typically deprioritizes the quality of experience for other parties. We've had a few generations of business folks plowing forth using these ideas as if they were some sort of natural law, but they're not. All they are is a specific economic design with specific outcomes, and after just 50 years of deprioritizing labor and environment, we are at a point of critical instability in both.

In this economic design, if a labor union threatens to strike, instead of driving leverage for collective bargaining, executives and investors simply are inspired to further accelerate automation to reduce the risk of their cash flows being disrupted by uncooperative labor. Continuing in this frame, over time, more and more businesses will require fewer and fewer workers. With fewer workers, the collective bargaining position of labor becomes weaker as well, so we will need to iterate on this design (or move to a more balanced design entirely) to avoid a massively unequal society. We already know that places with large wealth disparities and low social mobility and where the poorest in society have a low standard of living are extremely unstable societies.[2] Letting an old economic design idea that brought some short-term prosperity drive us blindly into global instability and oblivion is an obvious failure of both design skills and moral imagination.

Remember, we created the economy and participated in it under the pretense that it should be a prosperity machine that lifts all boats. If it is now failing that function, it's time for a redesign. But given that workers'

power is being progressively diminished, what are the points of effective leverage to prevent prosperity from winding down?

To address what is broken in our existing economy, we'll need more frame breaks. First, we need to remind ourselves that the current system is *recent and quite experimental*. It is not based on fundamental truths of human nature or anything permanently scientifically grounded. (Again, economics is a design discipline.) We can see this from our direct experience. Our current design for the economy is a form of neoliberal shareholder capitalism, and it crashes the global economy often. In just the last 40 years, we've had the savings and loan crisis (1988), the Asian financial crisis (1997), the dot-com crash (2001), the global financial crisis (2008), the European debt crisis (2018), and COVID (2021). If you had a brand of car that broke down every few months, you'd understand that it was poorly designed and manufactured. When an economy breaks down often, the same is true. This is OK in a design discipline; making a bad product happens, but when you make a bad product, you typically don't release it widely. Or, if you already have released it, you fix the broken design as fast as you safely can. Right now, collective psychology is broken around this point. There is a sense in the broad populace that the economy is some natural force with unquestionable theories, not something humans designed. There is the sense that its rules are permanent, not something relatively new and quite experimental in the history of human cooperation. There is a sense that only a few people are meant to have a voice in its improvement, but in design disciplines, more feedback from the audience is always better for the future of the design. Instead of allowing feedback to improve the design, we pretend economics is a scientific discipline, all while implementing it through politics. This is utter chaos. Is it science, politics, ideology, or design? It's design. And it's recent.

For a stronger sense of what “recent” means, the human species has existed for roughly 300,000 years and large civilizations have existed for roughly 10,000 years. Even this figure might be too recent, as Australian Aboriginal culture is estimated to be over 60,000 years old, with stories and drawings describing species that went extinct over 40,000 years ago.[3] But taking the more conservative figure, neoliberal shareholder capitalism has existed for 0.017% of human history and 0.5% of civilization's history. In that short span of time, neoliberal shareholder capitalism has brought the global

biosphere to the brink of collapse along multiple tipping points.[4] The fact that our current economic design is breaking down after 50 years is a strong indication that the design needs improvement. Honestly, there are plenty of refrigerators that have lasted longer than all of shareholder capitalism. We can do much better. Many civilizations (and corresponding economic designs) successfully thrived in bioregions around the world for well over 500 years, but our current design iteration appears to have virtually no chance of lasting that long. It's likely one of the least stable economic designs we've ever tried. It keeps being advanced because it benefits the most wealthy and powerful people disproportionately, and those folks keep reinstating the system that concentrates their power and wealth. But even among these folks, there is a gnawing sense that all is not well. We see this in the boom in billionaires building luxury survival bunkers[5] just in case wealth disparity or climate disaster leads to an apocalypse that they had a hand in creating.

DEMAND AND INTENTION

The problem at this moment isn't AI and robotics exactly, it is what happens to any technology when it is put into an economic system designed this poorly. AI and robotics stand out only because of their broad cross-sector applicability and centralized ownership, meaning that the dysfunctional aspects of our current economic design are magnified more than usual through their application. Imagine briefly a world with a better economic design, where innovation is highly encouraged, but where the economy is designed to lift up as many people as possible. In that design, we might take periodic metrics on how each new technology was affecting individual lives and collective societal health. Technologies that scored highly on both would have free rein to spread as quickly and as widely as needed, and those with very low scores would be put on pause. Efforts that land in between would be given a one-year grace period to improve. In such a world, we collectively would be far less afraid of the coming societal impacts of AI and robotics, as we would all have a hand in the future trajectory based on whether the new technology was serving the larger goals and intent of the society. I'm not suggesting that a society imposes any specific values into this process; the values in the assessment should be ones that already exist in the population across the representative mix of

cultures, beliefs, and backgrounds in the audience. When companies are asked to listen to and be accountable to society in this way, they will be incentivized to work with feedback to quickly address unanticipated negative effects of new technology. This same mechanism could increase trust in companies (as they will all have to earn it) and help people reduce their sense of social disenfranchisement.

That said, because powerful folks are slow to give up on beliefs and systems that benefit them, we will be in a period of massive destabilizing change. In this environment, finding pathways to rebalance and drive economic design improvements is going to be essential. While in the past we had organized labor as a balancing force, I believe *demand* will be our main power to reset the broken economic design in which we are currently living. Specifically, an economy can exist only when there is both supply and demand. In a world where supply costs are driven down by mass layoffs, a larger and larger proportion of the demand base will not be able to purchase goods and services as they've lost their main source of income. Most (63%[6]) of our modern consumer economy is a discretionary economy, made up of the things that we purchase with disposable income beyond the basics of food and shelter.

In a world with major job losses and labor dislocations, there is a real threat that the demand base will shrink in a way that will completely reshape the economy by quickly eroding the discretionary economy. It may also lead to major political unrest, which provides both a huge risk and huge opportunity for the future of governance and society. Can we rise to the opportunity by using this breakdown as a catalyst to rethink how we might reshape the demand side of the economy?

Demand is a deep topic. It is about what we want for ourselves, for our communities, and for society at large. If demand changes markedly enough, it can shift the supply side of the economy, thereby devaluing the products and services that corporations have produced. This happens all the time when a fad goes out of fashion, but it can happen for all types of goods, not just fashion. I'm old enough to remember when bottled water was basically a joke. Why in the world would anyone pay for water when it's already free? In other words, this idea started with very little demand and had a slow start. As demand grew, the industry could grow to support many

brands. Simply put, industries are created, stalled, or destroyed by what we collectively demand.

Demand is notably not something that computers or robots have intrinsically, as they don't have actual needs or wants. In humans, and across the vast tree of life, needs and wants have been intrinsic to being alive. From very early in the history of life, the desire for self-preservation has been a basic need, followed by the need for nourishment. To the extent that an AI or robotics ends up simulating these wants and needs, it is because we asked those systems to act as if they had these wants and needs. But acting as if one has needs is not the same as actually having needs.

I can imagine doomsday scenarios where we tell an AI to keep itself going (simulating self-preservation instinct) and to secure whatever resources are needed for the task (which may suggest self-preservation with no moral assessment of how). Such an AI could edit its code to incorporate exploits that allow it to beat network security and massively expand the places it is copied and hosted, and it could use AI voice/video deepfakes to interact with humans over the phone or video chat and fool them into opening access to additional resources. This all sounds very scary, because AI running in this manner would be hard to remove and it may start to sap real economic resources. It would be, in effect, a form of economic virus that exhibits rapacious acquisition of resources, but again this is not real demand. It also seems quite easy to regulate; if an AI agent were to take or transact resources without explicit mutual consent, then the parties that created and deployed the agent could be required to return all funds and face legal penalty.

AI doomsday speculation aside, we can see that this is not the kind of demand that drives the foundation of a healthy economy. It would be a type of parasitic load, and the aggregate demand of actual humans will continue to shape the real economy. Stepping back, the reason to make an economy (or a society really) is to find ways to interact where everyone is better off for having worked together in that way. An economy that stops serving this function—for example, by being overcome with parasitic load (in economic terms known as “rent seeking”)—hastens its own destruction and necessitates its own reinvention.

If humans stay at the center of where demand originates from, we can get onto the task of asking how we'd want demand to evolve. Remember that this agency around demand may be the main way that most folks will be able to get their voices into the conversation, especially in times when organized labor is not providing a balancing force. So just as organized labor might internally discuss its demands before going into negotiation with corporate owners, then it's fair for us to speak about our collective consumer demands as a way to shape what corporate owners can and cannot succeed at. We've seen this in the past in the form of consumer boycotts, and it's probably time to develop these tools further through skillful design iteration. I am referring specifically to tools that enable groups of people to clarify their collective demand and then act collectively to shape that demand in various ways where the collective action shows up on a corporate balance sheet. Any set of tools that can consistently do that will get fast attention and action from corporate leaders, who may have otherwise brushed off a social media outburst with a PR statement. Changes to the balance sheet and net profitability make corporate leaders act *quickly*, and these leaders don’t have to develop any moral courage. It's also not illegal to stop buying something. These leaders have much less control over consumers than they have over unionized employees. If a company’s major supply chain came from mass deforestation of Southeast Asian rainforests, organized consumers could agree to not purchase its products for a month and submit a collective petition that makes clear the shape of the change being demanded. If the company did not correct (or make major inroads to addressing) the demand, then the consumer boycott could continue into the next month. Such activities could be easily organized by digital tools, both to collect critical mass of current consumers and to sharpen the message they'd want to deliver collectively. A system like this would have corporate leaders scrambling.

This approach may sound a little nutty as, in my own career, I've been a corporate leader running multibillion-dollar lines of business alongside other executives, but it's from exactly that background that I know that the current system is imbalanced. Like an ecosystem overrun by an invasive species or a sporting match where one player is allowed to play by easier rules, these imbalances do not actually help anyone, even the wealthy people who appear to be winning. By the time billionaires are asking whether their robotic security guards for their apocalypse bunker could be

defeated (FYI: They can; go for the sensor and communication stacks or overwhelm them with swarm), it's clear to me that everyone is losing in this system. It would be far better for all parties and the whole of society for corporations to have a balancing force that ensures that what they are putting into the world is a benefit to the great majority of the folks they reach.

What Are Our Demands?

We can start this process now by going back to our truly basic needs. How do we get access to nourishing food? Water? Shelter? To the extent that our roles at work or school were giving us a sense of purpose and a discipline that we could develop mastery toward, what are the activities that we'd want to create purpose and mastery around once our basic needs for food/water/shelter are secured? In terms of the social needs of individuals, what are the ways we enjoy being with each other, and how do we create opportunities in society to create more enjoyable ways of being together? When we plainly state the needs and demands of life, we open the frames in which we are currently living in ways that allow new creativity to start to take hold.

Let's concretely talk about each of those questions briefly. Around the basic needs of food, water, shelter, clothing, one thing that my team at Google X set as a goal in our early years was to use robotics and AI to make the production of food, clothing, and shelter so inexpensive from the labor perspective that it could get into the cost range that would allow society to offer them as fundamental human rights. To that end, the team worked on new ways to design and construct buildings, grow food, and even make perfect-fit clothing using just lasers. The first project graduated into a stand-alone startup, the second went through several generations of development in-house, and the last one was developed but didn't grow to be a full program. That said, from the progress we made on those efforts, I know that these goals are not unreasonable. Although we did not get food, shelter, and clothing so cheap as to be free, our approaches did suggest radical cost reductions that might make it less expensive for these essentials to be government subsidized, especially when the cost of folks not having access drove more expensive problems than the cost of subsidies. Since that time, I've been introduced to many instances of Indigenous infrastructure that

effectively achieved the same thing—it massively reduced the cost for any individual to get access to the basics. This goal is achievable, and modern tools make it more achievable, but do we choose to design an economy that supports these pathways, and who will we allow to own and operate these systems?

Next, let’s touch on purpose, discipline, mastery. People enjoy gaining new capabilities through learning, growth, and skill development. We see the building and deepening of expertise and craft in effectively every human society, but in previous versions, skill development was closely connected with community: artisan guilds, apprenticeships, innovation teams, and the like. Community gave these settings so much depth, as even the least experienced craftsperson could get satisfaction and social encouragement as they worked through the early build techniques toward more and more sophisticated techniques. What we have today is more of an every-person-for-themselves hustle culture mentality, where folks count only if they have hustled super hard and their work is already at a level where it can garner wide attention and drive purchase behavior in the broad economy. Everyone feels pulled into the hustle, partly because if you skip out, then you may run into survival issues from not being able to afford food and shelter. None of our human needs necessitate that we all strive separately, but capitalistic culture likes clear lines of ownership, as it's easier to class something as a form of capital if you can define who owns it. This need to establish ownership in transforming work product into capital creates an implicit drive to show that all the great capabilities are in *you*, not in the community that helped you learn the skill, not brilliance through a series of collaborations where all parties grew. The downside of it all being you is that all the failures are also you, and this mindset leads folks into addictive behaviors around work that can drive burnout, despair, or even suicide. It's a bad scene on something that can and should be one of the greatest joys in life: the process of growing more skillful and capable and being able to share those skills to help the world and the people you care about. I've experienced this firsthand; I've received and have more recently given guild-style mentorship in maker spaces, DIY punk-rock communities, and permaculture communities, and something I love about this shift is that it's actually free and well-templated. You could do it tomorrow if you can just recognize critically the implicit hyperindividualistic framing that capitalism encourages to the detriment of our physical and emotional health.

Next let's look at how we want to connect with and relate to each other. There are so many ways for humans to enjoy each other's company, it's a bit shocking to see all those myriad ways be compressed into a phone screen and normalized into a vertical scroll. Growing up, I played sports pretty much every day for hours, and it was an amazing way to connect with my friends from the neighborhood. Book clubs, hikes, making music together, spending hours hanging out on a boring summer day with a friend over a landline phone: If you asked me at the end of a few hours spent in that way how I felt about the time, I would be bubbling over with the cool things that happened and how fun it was. In recent times, if you were to ask me how I felt after spending hours online or with social media, I'd say it feels somewhere between mildly positive to regretful. The experimental results, as least for me as a person, are extremely clear: The most popular ways we connect today are largely worse. It's up to each of us to do our own assessment here. Perhaps one of your groups is so scattered that you can get together online only. But even then, what is the most enjoyable way to be together? I remember internet relay chat in the early days: hanging with scattered groups of people who loved poetry, and seeing the list of usernames hanging out, gave me a feeling similar to being in the same physical room as my community. I could say something to the whole room if I wanted or jump into a conversation with just one person I hadn't caught up with in a while. Even when no one was talking in the main chat, it felt like we were together just hanging out. Hanging out is not as capitalistically productive as our current stimulation-maximizing systems are, as it doesn't drive as rapid a pace of stimulation and potential surfaces for serving advertising. But was maximum stimulation for successful commercial targeting the point of hanging out and building friendship? Or was it to feel close to others in a way that could unfold at human pace, where our demands (including rest and chilling out) could be centered, as opposed to the goals of advertisers? Again, you may have completely different experiences and goals here, but the act of critically examining what brings you joy and peace and growth as opposed to defaulting to common systems is the act of creating yourself and moving toward a life where you connect with people in the way that you most enjoy. Don't let it be an unconscious act. The ability to come together in collective demand first requires us all to have moments where we really understand what works for us, what we really want. I'm pretty sure most of us are not there yet, but this act is one of

the most immediate places where we can apply creative literacy in our lives, since we are both the assessor of what works and the creator who gets to try on the ways of living that really speak to us.

As we iterate and get clearer on our needs and wants, not just for ourselves but for those we love and the communities we care for, we start to experience life more in line with what we truly want, which is immediately rewarding. Furthermore, we can be much clearer about collective demand in a way that the supply side of the economy must adapt to. The degree to which we can be conscious in the critical assessment and creative reconstruction of our demands is the degree to which we can contribute consciously to a future of an economy that can serve people and life on Earth.

We are seeing the very early days of some revealing demand-shaping right now, with many folks already deriding AI-generated works as AI slop. This is less than two years after the initial awe and wonder of seeing that machines could create images trained on many visual styles from actual artists. That things evolved from complete awe to background mediocrity in such a short span of time is basically a statement about wants/demand. People clearly find the act of supporting creative work produced by a human with intention and skill to be more satisfying than buying images spit out by an AI in 200 milliseconds. Some people have moved beyond ho-hum boredom with these images to anxiety and concern that deepfake images could cause huge problems with assessing truth. It's not that this tech will not have any commercial utility but that people are quickly updating their understanding of where their demands/wants around art actually sit. This simple example shows how quickly demand can adapt and drain a lot of the perceived value of technology that is reducing the cost of particular types of supply.

This reduction in perceived value surfaces another point. When the cost of producing something gets low enough and the supply becomes virtually limitless, the item can command a low price only, if anything at all. Aluminum used to be incredibly difficult to refine and more valuable than gold.[7] Now it's used widely in canned goods and tossed in the trash or recycling without a second thought. Similarly, I would expect the creative acts of AIs to be very prevalent and very cheap. Perhaps a slightly higher value could be ascribed to AI systems that have worked with you for some

time and have been customized to you over that time. That said, an adaptive AI is also foundationally pretty inexpensive. People are rapidly perceiving AI goods to be cheap; the fight in many commercial applications will be to find settings where they won't be assessed as worthless.

Expanding from Demand into New Action

The value in a human economy, as always, comes from the intentions, needs, wants, and demands of the living being. If we remember this, the outlook for the next century is very different. The question of what happens within groups of people is often a question of where the decisions are made and who has the power to see those decisions through. Because large corporations were the first to make AI available to the masses, there's a presumption that they make the decisions and are the only ones with the power to see those decisions through. If we are clear about our personal demand(s) and better coordinated in action around collective demand, we can create a righting force, even with corporations that have few to no employees (where union pushback wouldn't be possible anyway). In the absence of a righting mechanism, our current shareholder capitalistic algorithm will concentrate wealth and decision-making power with fewer individuals and provide the level of service they can *get away with*. Can they get away with having no customer support? If yes, then there is no customer support. Can they get away with deploying design patterns that drive addictive responses the way a slot machine does? If yes, then a lot of software will become dopamine addiction boxes. Here is the stack, along with some example experiments one could try toward improvement at each stack level:

> **Layer 0: Foundational Structural Assumption:** Shareholder-capitalism-benefiting corporations should benefit the whole world.
>
> **Response:** Since that assumption is not working right now, we need to understand economics as a design discipline and see that there are many other possible designs for capitalism that prioritize the demands of more/different parties. We must be open to learning from and experimenting with other versions of capitalism and regulatory forms or moving to non-capitalism-centered approaches.

Layer 1: Current Collection of Major Forces: Corporate leaders, equity holders, sometimes government

Response: Although corporate leaders and equity holders are always present at this time, government is sometimes absent or on the side of capital at the expense of the larger populace and environment. Instead of funneling all desire for a righting/balancing force into outrage at government and corporate leaders, we can move some energy into creating other righting/balancing forces, such as collective demand organizing.

Layer 2: Current Runtime Dynamics of Forces: Corporate leaders and equity holders amass wealth and power at an accelerating rate. Politicians are inexpensive compared to the scale of capital flows involved in corporate value-creation and rent-seeking behaviors.

Response: Upon seeing the frame more clearly and breaking it in ways that allow more cognitive space to explore, we can get on with the process of disciplined experimentation. Most of our energy has been directed into outrage driving political action. This approach is worth doing to the extent it has efficacy, but it does have two structural defects. One is that outrage is a tough spot to come from in terms of thoughtful system design. Second is that elections are long-timeline iteration loops. Shorter iteration loops are what drive design processes to better outcomes in less time. It behooves us to add several other shorter loops (equivalent to faster learning and improvement mechanisms). I suggested one earlier: the idea of experimenting with organized demand to make up for some of the balancing force previously provided by organized labor. This is just one area to experiment in, and it can have very short learning loops, as new experiments can be designed and run inexpensively on new boycott strategies and new ways of uniting people who experience similar bad corporate experiences.

I spent time talking about collective demand because I do see it as one of the faster and easier areas to experiment with, and it could fill a very clear need in rebalancing the system toward collective trajectory setting instead of corporate-dominated trajectory setting. Now let's look at some other areas we could experiment with in this stack.

We will work backward in this stack, as doing so roughly tracks in order of increasing difficulty of experimentation. In other words, let's start easier and work toward hard.

Alternative Experiments for Layer 2: Improving Quality of Runtime Dynamics

1. **Transparent Influence and Money Mapping.** Maintain an accurate catalog that makes transparent corporate relationships to politicians. These relationships can be in the form of large campaign donations, corporate-driven bill authoring, and common financial interests (e.g., politician owns significant stock or is given financial kickbacks). To drive good decision-making, try to be specific around the magnitude of the relationship; a $2,500 campaign donation from a CEO is quite different from a $250,000 contribution from a corporation to a super-PAC designed to elect an official. Normalize the practice of people checking and publishing what influences a politician takes part in before voting, sharing both the influence and the monetary magnitude. I see this as an easy experiment because the number of politicians is small and finite, and the pace at which they add/subtract interesting corporate relationships probably doesn't happen meaningfully faster than four times a year. Also, there is a natural division of labor where the people of each governed jurisdiction can volunteer an hour or two four times a year to research their local politicians. Multiple volunteers can work in each jurisdiction so there is good coverage and error checking. Training people in journalistic and data standards to do useful data gathering requires a few-hour workshop and some practice in the field. We have trained citizen scientists many times, so starting templates from citizen science field ops could be used as examples. After organizing this effort, you have infrastructure on which you can run many experiments. These experiments include getting the word out about recent and potentially concerning changes in corporate influence; ones in clearly presenting the data in ways that accurately inform; ones in providing this information to voters so they can make voting choices that are better in line with their values and interests; and ones in maximizing approaches that show early benefit in having

politicians improve their policymaking and relationship mix toward ones that better represent the interests of the entire electorate.

2. **Policy Understandability and Accountability.** Often political promises don't match policies and outcomes, and things are worded or presented in intentionally confusing ways to get votes while driving different agendas. On this front, it wouldn't be hard to pull together panels of 50 to 100 random folks from the electorate and have them participate in a short test in which they are asked to watch political advertising and are then asked what they expect that politician's policy position to be. Or after being shown electoral media about specific policy, people can be asked what main changes they would expect the policy to drive. Again, there is a small and finite number of bills, and multiple bills can be tested in a single 30-minute session. Both the gap between bill understanding and actuality as well as the specific areas of confusion can be published. You can then experiment with presenting that data in various venues to encourage accountability in political advertising, simplifying policy language, and challenging weasel words.[8] These experiments could also have fast cycle times, making them responsive to even week-to-week changes in campaign strategy.

I cover how to set up experiments in these areas a bit in Chapter 4, but I've also put plenty of free resources online.[9] Feel free to learn from me or any others who teach the subject well. There's nothing in the list that couldn't be done in a month or two by a group of three people (developer, designer, customer researcher). While you may not personally have those skills, at this point in history, millions of people do. Plenty of them would be happy to either work on or advise such efforts, especially if you are asking only one to five hours a month. There are also free and relatively low-cost online resources to learn enough the skills yourself to get going. The point here is to move the locus of intention and control back into the hands of the larger populace. In addition, it's important to try to collect the most objective and comprehensive data that we can to support better decision-making. Although some great online influencers care a lot about better governance and moving society forward, the criteria for being a successful influencer are charisma and algorithmic savviness. That's not the best way to get clear data on a situation to drive the best decision-making.

Layer 1 Alternative Experiments: Improving the Mix of Forces

1. **Corporate Stakeholder Experiments.** Corporations have a few mechanisms of governance, including the corporate board, public shareholder meetings, and regulatory compliance. We've seen successful experiments in the past where students organized to request that university pensions divest from corporations that supported apartheid in South Africa. This worked because university endowments are often largely managed as investment vehicles, making them major shareholders in some of the largest corporations in the world. While we can generate leverage by threatening to divest, we can also experiment with leverage by staying a shareholder and using that as a platform to request transparency and accountability on specific corporate actions and initiatives.
2. **Corporate Governance Experiments.** If you have set up a corporation, are a board director, or are connected to corporate leaders or board members, you can initiate experiments from the inside out. The B Corp designation includes a board of directors making amendments to Articles of Association that then change the governance incentive for all future corporate decision-making. B Corp efforts can be understood as part of the field of all possible experiments in changing governance incentives. Doing additional experiments doesn't take that many people: someone with the appropriate legal background, someone with board or corporate governance background, and someone with the desire to improve how governance works. All three skills could be in one person, really. The output here is just a set of sentences that outline new governance incentives, and the experimental frame is any corporate leadership team that is interested in seeing if improved governance could make their corporation more of a positive contributor to customers and larger society.
3. **Cooperative Ownership.** It's possible to arrange a corporation more foundationally to include meaningful co-ownership across the employee base in the voting share class, with governance design that prevents the disenfranchisement from those voting rights. We've

already seen many examples where this approach is much better at meeting the needs of labor and community, and plenty more experiments can be tried. For example, in the original Bell Labs, inventors had some co-ownership of the inventions patented, meaning they could have outsize financial success if they invented something world changing. This incentive led to incredible innovation-accelerating activity, and we are living in a world shaped by many of those inventions. That is a great experiment on shared upside, but we could add a simple further experiment: If the original inventor believed their invention was being used in a morally unjustifiable way, the inventor could revoke the use if the gap can't be closed or could open source the invention, taking away the corporate competitive advantage. This is just one of the ways to expand the effective base of collective decision-making and governance to wider and more collectively informed groups.

These experiments are a bit less accessible in that they require that people have the capital to be shareholders or have connections to folks who lay out governance structures. While that access barrier may seem daunting, recognize that there are organizations of all shapes and sizes. You may not have access to the boards of the biggest corporations in the world, but local businesses and home businesses in your town typically are corporations. So if you are a friend to folks who run smaller corporations who would be open to doing governance experiments or if you are a small business owner yourself, you can start here to see whether their governance intent matches the practical outcomes. You can even pass a board resolution to try an approach for two quarters (six months) to see if core metrics improve and explicitly state that at the six-month mark, there will be a vote on whether to formalize the approach into ongoing board governance, improve it, or shelve it.

Layer 0 Alternative Experiments: Improving Foundational Assumptions

1. **New Entity Experiments.** Not every organization of people needs to be a corporation. Different entity structures come with different governance structures. You can learn from the many historical

examples and experiments in alternative entity formation to help inform how to design a new entity. Limited liability corporations can be comparatively open-ended in governance design and provide latitude on new playing fields.

2. **Nonentity Experiments.** If you are not someone who forms corporations, you can explore whether something that is currently provided as a corporate service could be provided in a noncorporate way. Perhaps you are concerned about the nutritional quality of school lunches. You may look at organizing a group of retired folks who love gardening to help maintain a large community garden that brings seasonal produce to local schools on Wednesdays. Or perhaps it's just a once-a-month basket that comes with a printed handout describing the food in season. You could pair the basket with a one-minute morning announcement sharing and its health and nutrition benefits. This example, of course, merely illustrates one approach to taking something you care about and doing nonentity experiments on how to make a difference on them.
3. **Deep Challenges to Corporate Design.** It's worth noting that the idea of a corporation is relatively recent. It began in earnest around the time of colonial sea voyages, to help protect sponsors from personal ruin if a speculative endeavor did not pan out. (Sometimes ships were lost at sea, and holding that as individual risk disincentivized most people from trying.) Since then we have iterated on many permutations of what the legal fiction of a corporation is. They are called *legal fictions* because we made them up, and we have enough people willing to play by the rules we made up. In the United States, corporations are legally "people." But of course they aren't actually real; we just agree to that fiction to simplify and structure the process of granting rights to corporations. If you are in a position to drive or help inform new experiments in the basic design of these legal fictions, then changes here change everything else in the stack above. Earlier I mentioned that experiments get harder the lower in the stack you go; but if you succeed here, you change the definition of all corporations, not just the governance of one.
4. **Government Policies and Frameworks.** Working with government policies and frameworks is also a slower approach, but one that can

have broad-reaching impact. Recall Singapore's more humane approach to introducing self-driving vehicles to the country. If you can connect with or help to support policymakers who are genuinely concerned with improving the material conditions of the majority and ensuring equal rights and access for minorities, then there are countless experiments that you can do. You can learn from a huge international library of experiments, program designs, and operational experience in doing things in other ways that may offer a host of public benefits and risk- and harm-reduction opportunities to build better policies at home.

These are just a few examples of where we could be trying new experiments. Depending on your situation (business owner or not) and your skills (designer? lawyer? organizer? gardener?), there are many ways to get started in being an active force of change. Although I don't fault anyone who aims for change along traditional political campaign lines, people with build skills of any type have many more direct ways to experiment with and change their local reality. Though everyone can have their own values, I suggest a frame that avoids recreating the current imbalanced power dynamics by expanding the base and quality of feedback we collect to include the full group of people who are impacted by a corporate or government policy and by treating data with intellectual honesty toward improving metrics that are important to that larger base.

FROM ACTION TO CREATING A FUTURE

In the context of understanding the existing and upcoming economic and corporate dynamics, we have started to explore some possible actions that could offer balancing forces, so that the voices and intentions of the broadest population can be an appropriate part of those dynamics in the future. In addition to these collective questions, there is the close-in question of what each individual is meant to do for their own careers and how they can best prepare the next generation for careers of the future.

The reason this book is arranged around the 4Cs is that it's likely that most employment in the future will include at least one of the 4Cs as a core skill. The 4Cs also have huge applicability toward addressing the big challenges of this century, and successfully addressing those challenges will involve a

significant fraction of the employment base. I am assuming that it is better for the economy to evolve to better design iterations than it is for the global system to fully collapse, but even in a collapse scenarios, the 4Cs are quite useful. All four are skills that have been important throughout human history and will continue to be valuable going forward. They are also the skills that are harder for AI and robotics to do, or less meaningful when they try. One of the main reasons that I wanted to write this book was to share these tools so we could start building our collective toolkit to enable us to use these skills to make the world of the future. These skills will be immediately useful in adjusting your career activities and skills development toward roles that will have more longevity; they will also give you greater options toward building resilience or directly addressing the bigger collective challenges.

Get In Where You Fit In

In a world where algorithmic interaction is cheap, the rare and valuable thing will be *human interaction*. One of the most important human interactions you can take part in is to become more situated in the communities that speak to your values and can provide emotional and material support in times of need. They also are places where each of us can share and express our support, which can also strengthen one’s sense of meaning and purpose during periods when work is being redefined and many may feel adrift from industry changes and periodic layoffs. Community is also the setting where we can express generosity and care for others. We won't get through this century gracefully without a lot more appreciation, generosity, patience, and thoughtful collaboration, and these are skills that we often develop in community.

There aren't many rules for community and there are a lot of ways to fit in. Any frame that can hold a group of people together in mutual mission and cross-consideration is all that is needed for community to exist. But given how much more important this attribute of life will be for our future, we can improve the effect of community in our life by occasionally checking in on these questions:

- **Values:** What does this community value? What does it look like for the world to get better from their perspective?

- **Efficacy:** Is this community actually capable of changing the state of the things they care about? Are they thoughtful about who is affected and any unintended consequences of action?
- **Belonging:** What are the requirements of belonging to this community? Who is allowed to belong, and who would be excluded?
- **Care:** Does this community fundamentally care about its members, and are there many avenues to express care? Or is this community all mediated by and focused toward a few people?

There's no honor or shame in fitting into any specific community. Obviously, some communities will look to elevate their status by playing up the idea that there is. But the motto of community is to get in where you fit in. Start wherever you fit. You may end up being a quiet participant, or a member who visibly contributes, or a member who plays a part but eventually outgrows what the community is or becomes. Everything is fine; just get in where you fit in and make the differences you can.

Stay Focused on Actions and Outcomes Instead of Arguments

Another important rule for the coming century is to start prioritizing groups that are focused on actions and outcomes instead of arguments. We are still living in the hangover of the information revolution; we started in a world (before mass communication) where it was almost impossible to get a message out to many. In the age of broadcast media when only a few large outlets existed, getting a message out widely was rare. Now the ability to do so is widespread; any number of folks have some aspect of their lives seen by many, if the topic resonates well with the moment or venue.

Given this, I still believe that getting a message out to many is extremely valuable. That said, most messages have reached millions or even billions have had minimal practical effects on our lives. Popular viral videos and clips own a little pocket of association in our minds, but ultimately they are more cultural touchpoints than anything that actively changed the outcome of our lives. What will be rare in the future (as it has always been rare) is folks and experiences that do in fact change the outcome of our lives. Really contributing in these areas deepens us as people, gives us a

connection to real meaning, and grows our capability. You'll want to be a person who does this, and if you are in such a group, ask whether the group’s goal is to win arguments with people or to be effective in actions and outcomes to help people.

Debaters speak like debaters, and their win condition is them being right and you (or an opponent) being wrong. Makers don't always speak eloquently, but their win condition is creating things that work and having those things adopted by a large group because the things truly benefit them. Communities of debaters can feel purposeful, but purpose without efficacy is not going to get us very far. It may feel good to be told your arguments are right, but the folks who are close to the build understand that everything is just a next iteration. No permanent end state of any design will work for all time and all contexts, so even the notion of arguing for absolute rightness of a design solution is not relevant. All that truly matters are the qualitative and quantitative experiences of using the design and its impact on all the people the design affects. These are not right or wrong arguments, only operational realities that open up ideas and possibilities for the next design iterations and improvements.

Your Responsibilities (If Your Efforts Start Working)

It's quite probable that if you create or join a community that is focused on effectiveness, things will start to move. That's great news. The more effective a community, the more it comes with responsibility to do the best for all the folks that the work affects. You'll want to take that responsibility seriously and check in with a representative group of those affected to see if your work continues to be a neutral to positive influence in their lives. If, furthermore, you are interested in the project of collective prosperity, then it's also good to share what you've learned about what works with other practitioners. Doing so should be simple enough, as you probably learned from them in the process of getting to your current successes.

There's also a role for memory keeping that helps to preserve the reason and the context for solutions that have made a mark. In the longer span of history, we can fight a world war to stop a fascist, genocidal regime, or march in the streets and boycotts to protest for civil rights and still lose touch with those lessons a generation later. The role of being a good ancestor also includes community members who are memory keepers who

document and share the context and lessons, so that they can be remembered both to sustain the benefit of past efforts and to inspire new actions if similar contexts arise.

New Frameworks for Achievement and Success

To close out the discussion on the future economy, I'd like to focus on one more element of improving the quality of our wants and demands.

We've had a definition of success that is centered around maximizing economic net worth. I was fortunate to grow up quite poor, and I've experienced every level of socioeconomic access all the way to my current work that regularly puts me in contact with people with extreme wealth. It's clear that they have fully won in the net worth definition of success, yet I can confirm the well-studied phenomenon that further gains in happiness level off as people get wealthier. For some of the wealthiest people I've met, the unquenchable need for more is a pretty persistent source of unhappiness. I'd posit that for many such folks, the happiness curve not only levels off but starts to bend downward at the extreme high end of wealth.

Even if you are not saddled with an unquenchable need for continued accumulation, wealth itself can be quite isolating. Often social circles shrink for the very wealthy, restricting them to other hyperwealthy people and a limited (and ever-shrinking group) of trusted individuals. I sometimes summarize this by saying the ultimate destination for a lot of wealthy people is to end up sad on a boat. As you gain wealth, you start by buying all the things you ever wanted (houses, cars, expensive things, all the best items for your hobbies and aesthetics), and then you move on to things that you don't exactly need: a fleet of jets, superyachts, and the like. All the while, as you are getting more stuff, the time you can spend enjoying anything in particular keeps shrinking and the group of people you feel you can trust contracts. You are left sad on a boat. The wealthy people who do stay grounded and connected really spend time on friendships and community and create systems that help them stay in touch with an inflow of new ideas, talented people, and active contribution to purposeful goals.

But herein lies the start of the actual definition of success. In high-resource nations, net worth has been the stand-in for success for a long time; in fact,

actual success comes from those behaviors that enable happy and meaningful lives. The root of success is the effort to be in community and work with purposeful people on goals that matter, not net worth, not follower count, not unquestioned power over others.

The Deep Satisfaction of Creating for Its Own Sake

Beyond the practical value of being able to create for your community or your vocation, there is deep satisfaction in the creative act itself. In a world that prioritizes consumption to drive more economic activity (well beyond the point where those products can maximize our happiness), creating instead of consuming feels powerful and grounded. Even more so for things people create for their own sake. While I have no qualms with using creative skill to make things that can be productized to generate revenue or improve margins, the creative skill that goes into new exploration and possibility before it is scaffolded into the moneymaking frame is exhilarating and satisfying.

Creating is uncertain work, and it is a type of effort that asks folks to be more present than most other life experiences. It leaves folks in touch with something long enough that they cannot help but deepen their ability to see, to listen, to appreciate. The skill of appreciation provides more satisfaction more consistently than the act of consumption, and it makes the things people do consume more meaningful. This is a deep topic, but I mention it briefly because we are closing out the discussion on reshaping what society demands as a means of rebalancing the coming changes in supply/production. In a world where AI can generate paintings in any style, people will still paint, just as in a world where AI has long since surpassed the world's best chess players, people still play chess. Our lives are not here for AI and automation, but some of our first experiences of them will be as an imposition from executives and equity holders to displace labor and as cheat tools for school assignments that reduce the quality of our learning efforts. That said, in the longer run, we will find ways to democratize these systems and resolve the responsible venues for their use. The big mistakes that happen along the way (there probably will be several) will tell us where not to use the tech, and we'll have the chance to learn to extend compassion and care for each other as we collectively make sense of a period of disorienting change. When we succeed, the new capabilities will gradually

enter our extended toolkit and creative vocabulary with versions that are available and owned by the many for the sake of the many.

NOTES

1. Wikipedia contributors, “Friedman Doctrine,” *Wikipedia, The Free Encyclopedia*, last updated August 19, 2025. https://en.wikipedia.org/w/index.php?title=Friedman_doctrine&oldid=1306723723

2. Erik Thorbecke and Chutatong Charumilind, “Economic Inequality and Its Socioeconomic Impact,” *World Development* 30, no. 9 (2002): 1477–1495. https://thorbecke.economics.cornell.edu/docs/SEImpact.pdf

3. PBS Eons, “*How Ancient Art Captured Australian Megafauna, YouTube*,” January 22, 2013. https://youtu.be/Zdm-6P6AdcA?si=KqK26TqqW_r0rumn&t=307

4. T. M. Lenton, M. Milkoreit, S. Willcock, J. F. Abrams, D. I. Armstrong McKay, J. E. Buxton … D. Dennis (eds.), *The Global Tipping Points Report 2025*. University of Exeter, Exeter, UK. https://global-tipping-points.org/

5. Douglas Rushkoff, “The Super-Rich ‘Preppers’ Planning to Save Themselves From the Apocalypse,” *The Guardian*, September 4, 2022. www.theguardian.com/news/2022/sep/04/super-rich-prepper-bunkers-apocalypse-survival-richest-rushkoff

6. Jeremy Horpedahl, “Spending on Necessities Has Declined Dramatically in the United States,” *Economist Writing Every Day*, May 14, 2025. https://economistwritingeveryday.com/2025/05/14/spending-on-necessities-has-declined-dramatically-in-the-united-states/

7. Scott Neuman, “Aluminum’s Strange Journey from Precious Metal to Beer Can,” *NPR*, December 10, 2019. www.npr.org/2019/12/05/785099705/aluminums-strange-journey-from-precious-metal-to-beer-can

8. Carl Sagan, *The Demon-Haunted World: Science as a Candle in the Dark*. Ballantine Books, 1995.

9. “Rapid Prototyping Google Glass—Tom Chi,” TEDx Talk, TEDYouth 2012, January 22, 2013. www.youtube.com/watch?v=d5_h1VuwD6g; Tom Chi, “Fast Solutions for a Brighter Future—Rapid Prototyping,” TEDxKyoto 2013. www.youtube.com/watch?v=DkyMCCnNI3Q&themeRefresh=1; Tom Chi, “Rapid Prototyping & Product Management,” Mind the Product San Francisco, June 2015, *Vimeo*. https://vimeo.com/131447795

Chapter 9
Future Governance and Global Stability

IDEOLOGY OVER EFFICACY

Politics is dominated by labels, because labels are cognitive shortcuts. Politicians use them constantly because labels are easy solutions to the problem of directing voting behavior in the shortest time span with least effort. Using blanket labels is not the only solution to the problem, but in this laziest form of solution, points are made as stark contrasts and labels are used to evoke strong connotations and emotional responses. As with many lazy approaches, deficiencies exist. Stark distinctions and labels do a bad job of describing the dynamics of the actual world, so a decision process that is based on this quality of thinking, however democratic, is often undernuanced toward the task of real problem-solving. Anyone who has solved real-world problems involving groups of people with differing perspectives knows that the work of building things for many people requires nuance, patience, compassion, problem-solving, thoughtful listening, clear plans, and consistent follow-through. It is detailed work that doesn't fit into five-second soundbites or catchy labels.

As a start to our frame breaking, let's dive a little deeper than the superficial packaging of labels into underlying dynamics to better understand what is happening. For example, in the political sphere, one group might label the members of another group as “socialist” as an insult, while the group being labeled might fire back and label members of that group “capitalist” as an insult. A different way to approach this is instead of using the label, let's look at what the thing does, not what it is labeled and the connotations of that label. While still a simple model, my upgrade to the label frame is that “capitalism” for its proponents is something of a stand-in for the phrase “makes efficient” and “socialism” for its proponents is a stand-in for the phrase “makes available.”

- Capitalism = makes efficient

- Socialism = makes available

With this perspective, we can easily imagine that there are some aspects of society we'd want to make efficient and other aspects that we'd like to make available. The aspects of society we choose to make efficient are the ones where we aim for lowest delivery cost, but often things that don't fit the low-cost equation fall through the cracks. The aspects we choose to make available are elements of civic life that, while not always efficient, are the hallmarks of the foundational experience of citizens of our country. It's the baseline set of rights and services that are made available to you as a citizen. Again, we can easily imagine useful ideas and programs for both buckets. This light reframe allows for a lot more room for practical discussion on policies as opposed to name-calling. We can also see in this reframe the ways in which we typically create gridlock. It goes like this:

- Instead of talking about what to make available versus make efficient within a policy design, paint an entire effort as either socialist or capitalist.
- Instead of focusing on policy at all, assign a label to the person running for office, and treat it as a permanent personality trait, further limiting the latitude for good-faith discussion.
- Demonize the labels of opponents and lionize the labels of allies, cementing starker narratives in the voting populace that now need to be de-escalated to see policy design clearly.
- Push these stark narratives out in all media types and categories. This low-quality narrative now lives as connotations, associations, and memes and can dominate how the conversation proceeds.

When we create this gridlock, we are allowing ideology to dominate over statistical reality and nuanced policy design. One of the most damaging steps here is oversimplifying into labels and treating those labels as permanent features of a person or an entire group; doing so simplifies the task of dehumanizing the other and making them into explicit enemies. By comparison, it would be different and more collaboratively useful to say that the other group has some socialist policies and ideas that you don't agree with, because you believe that particular service should not be made

widely available. A quick note about efficiency, since it sounds like efficiency should always be preferable: What that perspective misses is that one of the fastest ways to make something more efficient is to reduce the quality of service or drop the most expensive parts of the operation. In the case of mail delivery, the US Postal Service is the only carrier interested in getting to all the households in the country. Because rural households are so spread out, they are the most expensive part of any commercial outfit trying to deliver parcels or mail. In the name of efficiency, commercial companies are never incentivized to service these folks, as doing so raises their per-customer unit costs. I experienced situation trying to get an internet service provider to run internet lines out to a rural home in Hawaii. They just told me “no way.” The corporate math was simple: The cost of running lines out to the house outstripped my lifetime potential value as a paying customer. Capitalism is ruthless. A system running under pure capitalistic efficiency will absolutely refuse to provide service, even to folks willing to pay, if it moves its efficiency numbers in the wrong direction. For this reason, making a service maximally efficient also often means that the service is not always available.

The shortfall of efficiency-only approaches does raise another possibility—a blended idea where the socialist intention to make something universally available is the foundational goal, with that goal delivered as efficiently as possible. Industry could be invited to help design more efficient ways to do the most expensive parts operationally, with some ongoing licensing revenue if the designs are adopted operationally by the government. Although corporations alone never care about reaching those most expensive customers, they do have valuable operational expertise that can teach the government how best to reach them. Given that the adopted solution would be cheaper for the government, a fraction of those savings can be paid to the corporations (while the improvement remains in use). In this way, the government pays less, corporations get paid for having improved the design, and the value of private industry having gathered teams of deep operational expertise becomes something that can help the whole country, not just shareholders. Also, the fact that the licensing payout exists only while that operational approach is in place means that other industry players can step up to outinnovate the previous versions to try to nab that government licensing revenue away from competitors.

This is just one example of the kinds of ideas and discussions that can emerge when we move past the label into the dynamics and use those dynamics to pursue a coherent intent. This blended approach doesn't have its own label yet (and I'm not a big fan of labels overall because of how they narrow our cognitive function), but given that labels are a currency of communication in our current system, maybe something like “socialized operational excellence” would work. That term would capture the idea that the service is meant to serve everyone, but it is in a continual process of learning and iteration toward operational excellence with the goal of full availability.

Taking the idea further, governments could demonstrate their own excellence by open sourcing their best operational approaches toward social services delivery, with countries that are the best at it receiving international recognition. Smaller countries may improve their international profile and influence in this way, as smaller jurisdictions tend to be faster settings for experimentation, so their likely rate of learning could be higher than larger, more bureaucratic nations. One last thought on this: Many of the lower-resource and smaller nations have had to be more creative and resilient due to their comparative resource limitation. As we experience mass climate and economic destabilization, it's likely that populations that have already endured more crises with fewer resources are going to be primary solution engines for the future. I saw this firsthand in my travels and project work in the Global South.

Here's the bottom line: We are entering an era where the people, teams, and countries that are actually effective in their approach to the big problems will be the ones that will fare best. While labels will remain a common cognitive shortcut for politicians, they are a poor stand-in for being good at the work. However you feel about politics or however strong your allegiance to a party or label, it behooves us all not to have labels that reduce our ability to pursue effective problem-solving. Actual reality and efficacy on improving material conditions is always the main game to play, so we can start to build a political immune system to any rhetorical approaches that obscure or diminish the actual work.

If you’ve created room in the political discourse to focus on efficacy, efficacy-minded folks could start to mine learnings from other geographies where current policy proposals have been tried, and we can be part of a

larger worldwide project of accretive knowledge building toward excellent function of government and public sector services. By not labeling people as others or enemies, we create more space for various folks to be allies on some topics and to be partners in expanding the exploration space on other topics. By focusing on actual programs instead of rhetoric and looking at examples of places that have tried the idea, we stay in the realm of practical implementation and outcomes instead of the collapsed mental space of labels, scapegoating, and imagined panaceas.

Even as I describe this possibility, likely a lot of people are feeling that mature political dialog is an impossibility. A simple idea from product design is called *back-casting*.[1] In back-casting, we discuss a high-quality end state and, instead of trying to figure out how to get from here to there, we work backward, assuming we can achieve that better vision of the world, and deduce what steps must have happened on the way to the outcome. If we want a world where a representative portion of the populace helps weigh in on the political questions and politics that affect their lives in a way that improves everyone's livelihood over time, then high-quality, high-trust conversations that drive nuanced problem-solving need to be possible somewhere in society. The world I described is simply one or two back-cast steps toward today working backward from the end state.

Finding the Solve and Developing Our Political Immune System

Let's do a little more back-casting. If we now presume that this quality of conversation needs to happen, then we'd ask about the step that must have happened before: We must have found a format, a setting, a set of tools, and/or a venue for cultural bridging that enabled this quality of conversation. Now we can ask which formats, settings, tools, and types of bridges have enabled these conversations effectively before. There may be many sources of inspiration, from the difference between rank-choice versus winner-take-all elections, to digital tools like Polis[2] and Your Priorities[3] (which help populations come together and make collective sense of perspectives and possible paths forward), to exceptional responses to exceptional moments, like the Marshall Plan or South Africa's Truth and Reconciliation process.

The proportion of politicians who pay no attention to the efforts of their constituents to understand problems well and come together to solve them should be slowly reduced, replaced by those who have a real sense of civic responsibility and a desire to be public servants who engage productively in such processes. Again, likely there will be resistance to these ideas, since, at the moment, we have lived through some centuries of unqualified people using politics to raise their public profile and pursue power and legacy building.

But in that same time period, we have also had many honorable public servants. Instead of allowing cynicism to win the day (which effectively guarantees that improvements will stall), we need to ask how the public servants who were widely respected and effective at solving important issues came to their positions and served them with integrity. Experiments on this topic have existed from the very beginning of democracy, including in Ancient Greece, where sortition[4] (selecting random representative groups to inform policy inputs or drive decisions instead of abdicating inputs and decisions to power-seeking elected individuals) was a common practice. Nearly every problem we face in politics has historical approaches and experiments that we can learn from, and many of them go right to the heart of the problems we are seeing today.

We need to understand that propagating political cynicism to drive a widespread feeling of powerlessness or hopelessness can be a purposeful strategy to maintain the status quo. If the current system is not working for most, then eventually the population will be filled with the energy to change it. But if a minority who are in power cynically devalue the role of the office, by blaming each other for collectively doing nothing, that cynicism provides insulation against change. Part of our political immune system should also include checking ourselves around cynicism and using that feeling to study the best ways these changes have succeeded in the past.

One more element to add to the immune system: We must be very wary of politicians who campaign heavily on in-group/out-group affiliation. No group is a monolith, so any characterization of a whole group with a broad brush tends to be implicitly or explicitly a form of bigotry. As mentioned before, humans are not their labels and are also not monoliths; we all have complex patterns of beliefs and behaviors no matter what brush we are

painted with. A good-faith effort at addressing a problem will center the problem, not a “problematic population.”

We also need to understand that the solutions to some of the problems we'll be working on will take several administrations to see through. Even further, some of the repair of the biosphere will take several *generations* to accomplish. If we are focused on in-group/out-group politics, there's simply no way we can sustain focus on solving longer-timeline problems through to their completion.

These tips are not the only ones we could use to improve the clarity and quality of our political conversation. We are going to be in a collective sensemaking and practice-making process of working toward a form of politics that is more consistently effective in using public resources to improve outcomes for people in all stations of life. We will need a form of politics that will enable effective international cooperation on shared challenges, such as the migration of climate refugees, the stemming of collective emissions, and thoughtfully engaging in ecosystem repair. We each need to develop our immune systems by staying focused on issues that meaningfully improve people's lives instead of being focused on people and labels and the celebrity drama of politics. We need to develop our immune system by demanding better political platforms than othering and scapegoating. We need to demand specific plans that include the nuances that are the hallmarks of folks concretely working on a problem. Our collective political immune system is what allows us to avoid the manufactured cynicism and the unproductive doldrums of political theater. We'll need that immune system to meet our collective responsibility of listening, planning, acting, and responding well to the many ways our economic and political systems will have to transform in the coming decades. Giving in to political cynicism simply allows fewer actors to set the agenda without considering the full spectrum of constituents.

BREAKING THE BINARY

Binary Thinking Versus Spectrum/Combination Thinking

Another simple way to know we are in an ineffective space for problem-solving is to look for declarations of binaries: “Our side is the shining light,

the other side is evil." "Our plan is the only one that can make a difference, all other plans are lacking." "We are the people of character and tradition, the other people are deluded or immoral." I'm sure nearly everyone engaged in politics has heard such messages or even had these thoughts. Sometimes we're completely certain that they are true. What I can say is that, even if you are certain your position is true and that binary decision space is the right model for the challenge, it's unlikely that anything can be fully solved from that quality of consideration and that reduced decision space.

Ultimately, the task of building anything of significance will require popular support and will include building bridges between different segments of society and effective means of working together. There is a technique for this, called *trunk and branches*.[5] In the technique, we take two groups of people who need to come together for a problem to be solved. Let's assume they have historically disagreed and made little progress on this problem together. The default scenario that we put such voices into is a binary political debate where they are pitted against each other—after all, the conflict drives better ratings—but are we spending tax dollars to be entertained, or are we spending tax dollars to solve problems that are larger than what can be accomplished individually or at the scope of local groups or the private sector? Instead of reflexively launching this default binary debate format, we bring folks to a nontelevised setting, although it's fine to transcribe the proceedings for the sake of records. We can loop in multiple voices from each side, and instead of just talking about the contentious part of the contentious issue, we ask each person more broadly about the full set of issues they care about, why they care about them, and what progress looks like to them across those issues.

The groups do this process separately, either as a written exercise or facilitated for each group in separate rooms before they are brought back together. This method allows facilitators to present the totality of the answers across the two groups in a trunk-and-branches format. Specifically, the facilitators look at everyone's answers and compile them, first into a list of things that are common to nearly everyone across the two groups. These are the issues that everyone cares about, and there is some overlap on what a good outcome looks like. For example, most collections of people, regardless of their political persuasion, appreciate the idea that people want to be engaged in meaningful work and should have opportunities to

contribute to meaningful work they are qualified for. Topics like this are put into the trunk, while topics where the groups diverge significantly on their importance or the direction of intervention, are left to be elaborated in the branches later.

Whatever items are in the trunk are the ones that the groups work on first. Because there is broad agreement on what the issue is and enough overlap in what a good outcome is, typically the group as a whole engages in collective problem-solving. In the process of working together on goals with common importance, the baseline is reset from partisan division to seeing the folks in the room as *people with problem-solving contributions* instead of only their *positions or political labels*. Default cynicism and division lessens as it's clear that there are common goals that group members can make progress on. That concept gives the group a sense of momentum and possibility.

At this point, most knee-jerk in-group/out-group tribal thinking has been diminished to the point that it's possible to create a more spanning distinction—that the wins being worked on are wins for most everyone, as opposed to wins for just one political team. If we use labels and affiliations at all, they should terms that help us work together on what we collectively care about, such as #TeamHuman, where we work to lift all people to a better state, or #TeamBiosphere, where we do our best for all people and all of nature beyond human society. Aiming lower often comes from cynicism, hopelessness, or purposefully advancing the interests of some while leaving others behind.

Once a group has started to work together in this way, it is also building its immune system against future mind-numbing political polarization. While you may have difficulty imagining this technique working at the highest levels of government, as a facilitator and inventor of the technique, I can tell you that it both works at the highest levels and is a powerful day-to-day tool even if the focus is just your own town or neighborhood. In some ways the method is even more powerful in that scenario, because those are the people who make up your immediate local community, and having solidarity on common topics at that scale brings the most immediate and visible day-to-day benefit for you and your community.

We are drawn into so much national and international politics because of media priorities. The media needs to feature topics that will get the highest ratings, and political questions at national levels have larger audiences than political questions from local politics. In practice, though, because of the media's prioritization of ratings, much of what affects your community will never be discussed at a level and in enough detail that speaks meaningfully to the needs of your specific community. For this reason, the dialogue always misses the center of gravity of how we experience our daily lives. Again, do we want to prioritize ratings and entertainment value over improving our communities? Or do we want to prioritize getting skilled in the practical tools for moving our communities forward and for meeting and adapting to the big changes ahead? Don't let your choice of frame be an unconscious one.

Finally, once this base of trust has been built, the original topics of disagreement can be contextualized in a new light. At this point, the group has had some practical operational wins together and feels more like a team as opposed to the original groups whose members represented opposite sides of an issue. Those issues that had originally divided the groups can now be recontextualized as branches that grow out from the trunk. Going forward, different parties will explore different solution pathways for those topics on behalf of the full community (not just their subgroup). The shared trust from the trunk has rehumanized the full group in such a way that small cross-functional work groups can elaborate the branches in a good-faith effort to see what helps the community build on the successes of the trunk. As those branches of exploration are tried—via conversation, small community prototypes, policy pilots—the results of those experiments can be brought back to the group as part of a collective learning effort to serve the most people in the best ways the group can create. If this sounds more akin to working with diverse folks in a work setting than our current media circus approach to politics, that's exactly what it is. This is not the only approach that can get previously divided groups into unified teams that solve problems at the right level of detail and nuance, but it is one effective approach. We should be collectively building out our toolbox of approaches so we can actually build a world we want as opposed to being passive consumers of political reality shows that primarily serve the egos of politicians and the pocketbooks of marketers.

As with anything in politics, it's impossible to cover every item for every person and every perspective in every situation, but work done in this style creates an operating dynamic that can accumulate improvements as the underlying trust level is built up so that more ambitious improvements can be worked on in the future. We want to have a society where there is intellectual freedom, and the intrinsic cost of that benefit is that there will be many viewpoints. The responsibility of that freedom is to use our voices earnestly and engage in dialogue with others in good faith, appealing to the greater good and respecting the humanity of all folks, even those with different opinions. Labels and binaries are the wrong tool here even if they can move votes, as problems cast in binaries are not worked on in sufficient detail for good solutions, and the political polarization left over after a bitter binary campaign represents an actual degradation of our collective cognitive resources. When we hate or distrust people for reasons that are untrue, we are less cognitively fit. The media profits from having people in this diminished cognitive state because it feels good to feel as if you are right and your actions are righteous. It feels good (sometimes) to be in a world that is so simple that we can just label the other side as bad and wrong. Again, none of these psychological outcomes is well correlated to solving problems. People who are certain they are right from the start can no longer see the situation clearly, and that stance is one of the easiest ways to derail problem-solving. In my courses, I teach that attachment is the enemy of innovation, because attachment makes you see the results of your design experiments in ways that are always favorable to the outcome you are attached to. With this viewpoint, you are slower at absorbing all the feedback from a test in a principled way, and you will make worse decisions that delay the solving of a problem. If we were interested in having a society that could be adaptable and resourceful in the face of many challenges, we'd want a society where there is enough latitude for ideas to come from anywhere, with the output of that intellectual freedom well processed by a representative group of the population working in good faith to see which of those ideas builds the community's trunk and which explorations will expand what is possible through their branches.

Another Binary Reframe—Conservative Versus Liberal

Around the world, a common split is the characterization of people and parties as either conservative or liberal. The narrative then continues to pit

these people against each other and assign these labels as permanent personality traits. If this sounds similar to how the capitalist/socialist split was constructed, that's because the same foundational cognitive techniques are being applied. It's a simple way to direct human minds that gets consistent results. The only problem is that the result is a deadening of our ability to think and solve problems together well. Let's break down this split.

Conservatism is how we live our values while liberalism is how we expand and improve them. The word “conservative” has the same root as “conservationist.” If you know an ecosystem is working harmoniously, then to be a conservationist is to encourage the ecosystem to continue thriving as it has. The role of conservative thinking in society is the same. That said, when it comes to societies, humankind has not yet arrived at a state where everyone has a chance to thrive. Or as Buckminster Fuller put it: We do not yet have a world that works for “100% of humanity.”[6] Thus, the role of liberalism at its core is the support of civil rights and freedoms that allow us to explore and expand our experience of ways of living and make the best of it available to as many as possible. As a society, we use efforts at liberal exploration and expansion to shed light on whether our values need adjusting. Within the last century, liberal movements helped to address suffrage, desegregation, and marriage equality. If only the conservative viewpoint was taken, then these expansions of universal rights and access to women, people of color, and LGBTQ folks would not have happened. A society with no ability to experiment has no mechanism to improve. As much as people might love their conservative values, they can appreciate that new learning and experimentation helps a society avoid stagnation. For each movement of liberal expansion, we also must collectively assess whether we like the outcomes. Currently under evaluation and discussion for improvement: environmental destruction justified by capitalism (as per our definitions, this is a “liberal policy” in that we are *liberating corporations* to do damage presuming they'll make the best choices—worth reassessing), misogynistic social structures (being challenged right now with a lot of social reorganization required if these structures are to change), marginalization of elders (rampant in the West, a little better in the East, not bad in Africa). All these and much more are in a liberal process of experimentation, challenge, and change.

As we get a handle on how to live each of these expanded values, then the role of conservatives to maintain the integrity of this new bar becomes primary.

Given that liberalism is the experimental function of society, we must honestly look at how our recent experiments have gone and adjust based on what has been learned. Given that conservatism can sometimes serve to maintain of outdated values, we must listen with openness to those who live and love differently instead of resorting to knee-jerk condemnation. These two perspectives need each other dearly. They are meant to be a part of a creative friction that is in search of a fundamental cooperation. That we've participated in making enemies of each other is an affront to the very purpose of civilization. To appreciate the role that each perspective plays and to ask each of us to play our role well while being open to the value of the other function could be a pathway to emerging from deep division into a framework of sanity and care.

This is a century that requires more sanity and care, not less. This is a century where big, planet-spanning challenges must be faced with nuance, grace, and grit. That politics is treated more like a sporting match with blind adherence to team jerseys and not the rich discipline of listening and acting to improve our society is the foundational break. Add to this unbounded corporate money and influence against the backdrop of a media environment that is optimized only for engagement, ratings, and profit maximation, and we have the contours of a machine that destroys society to get a bit of a quarterly bump. We might normally see only despair here, but in the process of breakdown, the need for righting forces becomes apparent, and the desire to build those systems culminates into action.

One thought that always helps to reframe is to look at how systems have changed over slightly longer time periods. When we look at the longer timeline, it is clear that current political views on the environment in the United States are *recently manufactured*. The Endangered Species Act was passed *unanimously* (92–0) in the Senate in 1973 and (390–12) in the House[7] under President Nixon, a Republican. Some of the best environmental policies this nation has passed were implemented by Republican administrations, including the national parks and public lands under Teddy Roosevelt.[8] These policies are great examples of how conservatives and conservation should go hand in hand. I grew up fishing,

and many people who hunt and fish vote conservative and care deeply about stopping the degradation of their local ecosystems (as did Roosevelt himself). For most of this nation's history, protecting the environment and the natural health of the nation was not a partisan issue. In the past few decades, however, a partisan perspective has been manufactured to support oil lobbyists and secure political contributions from the oil industry. Consultants (see Frank Luntz[9]) were paid millions to recast things that are widely popular (clean air, water, and healthy ecosystems) into narratives that could be used as political wedge issues. Again, we've allowed this psychological damage into the system, as folks are being paid to make the populace less informed and less capable of stepping up to the challenges and opportunities ahead.

It turns out, of course, that the laws of physics and natural systems could care less about this noise. Natural ecosystems die when we damage them, regardless of the rationalizations and rhetoric of the adversarial team sport we've made politics into. We need to find ways to work with actual truth and recognize that most politicized media outlets are more focused on convincing or reinforcing preexisting beliefs than on principled presentations of information to build comprehensive understanding or thoughtfully explore improvements and trade-offs of each option. Just as we've been in a process of polluting the physical environment, we've been polluting the informational environment. By focusing on opinions and spectacle over comprehensive and contextualized data, we are allowing politicians, corporations, and media figures to fabricate, distract, selectively inform, and generally operate with low journalistic standards and poor rigor. Over time, this approach damages our ability to collectively make sense of the world. Like any pollution, the damage comes back to us: Physical pollution comes back to damage our bodies, and informational pollution comes back to damage our minds. Just as most waterborne pollution eventually makes its way to the ocean, informational pollution accumulates in misguided and disempowered beliefs of regular folks and takes them out of direct action informed by the reality on the ground. It replaces the direct compassion we can have for each other with polarizing opinions parroted by talking heads.

MINDSET SHIFT

Build Forward Versus Prove You Wrong

Most often, when a group of people get politically stuck, it's because the political parties have strongly driven in-group/out-group thinking, and the media covers those differences as if they were a sports match, immovable sides battling each other, and the spoils of that battle are a zero-sum game. What we mostly experience in this format is prove-you-wrong media. The underlying assumption here is that winning an argument and proving other people wrong is equivalent to solving the problem. Again, everyone who actually solves problems knows that this media format, which we see over and over, has *almost no overlap* with the actual problem-solving process.

As individuals who care about the health and governance of our local and global communities and want the time we invest in collective issues to be as productive as possible, there's a simple check. Check whether the people around you are in a prove-you-wrong mindset or a build-forward mindset. Similar to what was discussed in Chapter 4 around prototyping, most problems cannot be solved in the abstract via discussion before implementation. Actual solutions require real-world trial, iteration, learning, and improvement. Solutions require the discovery of the critical operational variables and success factors that are question marks at the start, so a good, workable outcome can be resolved from what arises. You'll want to spend whatever time you devote to these issues around *build-forward people*. Stay around people who are practically trying improvements and are looking at the outcomes of those trials objectively by actively and systematically listening for what is helping folks in practice. These people are willing to adapt and adjust if their favorite idea doesn't work as well as expected. They also don't waste a lot of breath on defending their points, as listening well so you can hear the nuances of what it takes to serve well in the problem space is much more valuable than arguing for why your favorite idea is the best.

I gave some examples in Chapter 4 of how to iterate at the product or project scale, but it's useful to share an example of iteration at the program-level scale, developed by a former colleague, Regina Dugan.[10] When she ran the Defense Advanced Research Projects Agency (DARPA), she created

an operating format where project managers were put in place to find the best ideas at the frontier in dozens of important areas of technical advancement. They were empowered to place small grants with many teams in each technical space to learn from the close-in work that was happening in each project. The grants were not large enough to force or influence huge changes in the trajectory of any team's research; the teams just needed to report back on a few key metrics that DARPA was hoping to move through new approaches.

After casting the net wide with small checks and learning from the tangible progress and shortcomings of many varied efforts, there was a principled down-select process, wherein a subset of solutions that were more effectively meeting the target metrics received larger follow-on grants. At this point, this smaller group of solutions was tracked carefully along the full scope and magnitude of target metrics, to support a final down-select process. The tiny group of efforts that made it to this stage were considered for substantial government backing, effectively doubling down on the projects with the best technical and operational merit. This approach enabled a small group of people at DARPA to make sense of a large and unruly field of possibilities in a cost-effective and budget-definable way. Regina also designed the organization to focus on hiring young, ambitious people who had limited tours of duty: two to three years in each area of technical investigation. This period was long enough to do thorough work but short enough that people didn't expect to make a whole career in a single topic area. The goal was to do a good job at assessing the frontier of a space, not to start building an empire of personal projects toward a promotion path. Those actions would cloud the data integrity of the technology assessment cycle.

Imagine applying such an approach to some of the larger and more unruly topics around policies aimed at the more complex or contentious social and economic goals. A country that was really interested in solving a pernicious social problem could employ a set of project managers who did an expansive tour to study how governments around the world, big and small, have tried to address the problems. The goal would to be to learn the maximum in a short period from the totality of approaches we've tried as a civilization. From this informed position, we could gather the approaches that have been more successful and identify which design and operational

factors drive successful implementation. Then, through a metrics-driven down-select process, we could try a subset of techniques surveyed in small form in a jurisdiction. The data from those trials could be offered as grounded input to the political conversation, helping to inform whether to expand a small successful pilot to larger scale. The big shift here is to *have program outcomes and efficacy be the main informational currency* of political discussion instead of arguments, scapegoating, and scandal. The most important problems in society *deserve* this level of rigor, and the more that we align with *build-forward* groups employing compassionate and effective approaches, the more we can recognize when candidates don't live up to that bar. The more power we have individually and in community, the more we can build our futures immediately around us and raise the standard of what we can create together.

What I've covered is not an exhaustive list of techniques for effectively solving problems, and some of these ideas won't work in some situations. In a build-forward mindset way, if you believe you have better ideas or have already developed techniques that you know work well, then, please, add them to your own local toolbox. I share these ideas in the spirit of getting things started and drawing some useful distinctions and frame breaks so there is room to create something substantially better.

But the larger takeaway is this: If we can wrap our heads around some of the frame breaks that will expand our thinking capability (socialist versus capitalist, liberal versus conservative, in group versus out-group, binaries where they don't belong, etc.) and build an effective immune system against folks who want to drag everything into argument as opposed to good-faith efforts to actually solve problems, then we will have created the conditions where we can iterate in good faith on which techniques and policies have real efficacy. Each step in this direction gradually builds toward a higher-quality political metabolism for society that can meet the bar for the complexity and nuance that real solutions require. People who don't build are likely to get sucked into arguments and protests as the only available tools. Although there is a place for those tools as well, anyone who has repaired an ecosystem or designed a chip knows that sophisticated things take sophisticated conversation and action and coordination of many diverse forces and inputs.

Despite everything I've written in this chapter, I am well aware that stupidity is easier. It's easier to engage 1,000 people in a reductive, frustrating conversation than it is to have a data-driven, build-forward conversation that drives coherent action and results. Building real community takes good faith, leadership skill, compassion, creativity, critical thinking, and desire, and I recognize we live at a time where we don't have enough of these skills in circulation in the places they are needed. That said, if there are any challenges that are worth raising the bar for, the ecological, economic, and political integrity of our civilization would definitely be top of the list. It is easy to have dumb conversations; living with the consequences of dumb conversations is much harder. As is often the case, the easy path is ultimately much harder, because it allows for problems to go unaddressed, for societal trust to be worn down to feed the political sports match, for folks to be trained into a less capable state, and to waste the time we have to contribute to collective repair and flourishing. The time for the easy path has long since run out. Earlier proclamations that addressing climate is “too expensive” are dead narratives; we are now experiencing climate impacts each year that cost our governments and citizens substantially more than solving the problems would cost.

We are now hit with individual storms that drive over $100 billion in damage; the LA fires in early 2025 did over $250 billion of damage in five days.[11] Compare this cost to the largest effort ever mounted by any country to address climate: the Inflation Reduction Act, passed in 2022, pledged $980 billion over 10 years, so ~$98B/year. As of 2025, this was the best-funded effort in history to address the problem of being in a world where we currently experience over $300 billion a year in extreme climate-related damages. When we spend money in a reactive way, those expenses do nothing to secure our future; we just spend huge sums to tread water. I know that it will be easy for many countries and politicians to stick their heads in the sand, but for each year that passes, the cost of not solving the problem will continue to rise to the point where the sand is going to be too hot for anyone to stick their heads into. We're basically there now, but the mass realization will have a time delay based on one dedication to ideology over actuals. Ideological thinking tends to make people see what is actually happening more slowly, which causes delays in solving problems fully.

For all the heartbreak and grief the coming decades will bring, we need to use all the gifts that these moments provide. We need to use the gift of clarity they can create, the call to bring us together to solve problems bigger than us, the challenge of stepping up to be the types of people who will work to pass on the best world we can. We are deciding right now what type of ancestors we will be. Whether we are ready or not, the arc of time has made it so the people alive in the next couple decades are going to largely decide whether the biosphere returns to health in 100 years, 500 years, or much, much longer.

Grief itself is a profound gift. Far from being a form of personal collapse, as it is sometimes depicted, grief is a clarifying process that reminds us of what we truly care about in this life. I describe it as *a foundational technology for intergenerational care*, as few experiences can make people care about something for their entire lives, and grief is one of those rare experiences. Given that the full repair of our biosphere will take at least four generations,[12] and the people of each of those generations must have life experiences that carry them through their decades of contribution, grief is a foundational element that provides determination through time. Transforming one person's grief into profound care and meaningful practice that improves life for many is one of the most profound pathways a life can take, and it will happen for many who contribute to the multigenerational relay race required to rebuild the health of our planet and graduate our civilization into one that can be sustained and can thrive over deep time. As daunting as this challenge sounds, it holds the further gift of requiring that our civilization relearn the lost skill of *working toward goals that take centuries to accomplish*.

If we succeed, we will have navigated through one of the most pivotal moments in our civilization's history. We will have built an economy that allows humanity to be a net positive to nature and a political system where humanity can consistently be a net positive to humanity. We will learn what it takes to rise to our biggest challenges through collective action and will have built skills in ourselves that bring agency and capability to our lives and everyone we are connected to. I suspect that such a civilization would be a lot more interested in (and have the mental bandwidth to) protect all of life on Earth from civilization-ending asteroid strikes. It would be much less interested in creating more civilization-ending technologies for the

“power and glory” of any single nation. Such a civilization could make multigenerational goals of exploring the solar system and stars, although I personally don't think we should go to any other planets until we become the kind of species that *knows how to treat planets well*. With any luck, we are getting the chance to learn that skill in practice now, for the place that matters most: our home planet.

If I can take a moment to be an astrophysicist again, it's worth reminding us all that Earth is an incredibly rare place in the universe. While microbe-like life may be more widespread, technological civilizations that can study the universe and build at scales that can affect entire planets appear to be diminishingly rare. We only know of one. Part of our work is to recognize how precious this privilege is and to work with it at a level of care and integrity that is worthy of the rarity. When we really understand all it took for us to be here[13] and how deeply we are connected to each other and to the totality of life, the squabbles, limitations, political gridlock, manufactured frustrations, and poor design work we've done on the economy will all sit humbly back in the grand context of the rare gift of our very existence. The errant frameworks we've adopted are a type of unnecessary self-inflicted violence, and our allegiance to any of these frameworks must come second to the larger project of meeting the possibilities offered and deepening our connection with the rare gifts our home planet provides. As big as the challenges in this book seem, understand they are small in geological time, a timescale that we humans have not yet proven we can last through. Let these challenges be the thing that matures us to wisdom instead of the thing that destroys all our gifts through fear, ignorance, and division.

NOTES

1. Service Design Tools, “Future Backcasting” [tool description], n.d. https://servicedesigntools.org/tools/future-backcasting

2. Pol.is. https://pol.is/

3. YRPRI, “*Your Priorities*,” n.d. https://citizens.is/getting-started/

4. Wikipedia contributors, “Sortition,” *Wikipedia, The Free Encyclopedia*, last updated October 15, 2025. https://en.wikipedia.org/wiki/Sortition

5. Boykie Mackay, “Trunk & Branches,” *LinkedIn*, June 30, 2015. www.linkedin.com/pulse/trunk-branches-boykie-mackay/

6. Buckminster Fuller Institute, “World Game,” n.d. www.bfi.org/about-fuller/big-ideas/world-game/

7. “Endangered Species Act,” *Ballotpedia*, last updated August 2016. https://ballotpedia.org/Endangered_Species_Act

8. US Department of the Interior, Office of Congressional and Legislative Affairs, “Antiquities Act,” July 27, 2016. www.doi.gov/ocl/antiquities-act

9. Anthony Adragna, “Luntz: ‘I Was Wrong’ on Climate Change,” *Politico*, August 21, 2019. www.politico.com/story/2019/08/21/frank-luntz-wrong-climate-change-1470653

10. Wikipedia contributors, “Regina E. Dugan,” *Wikipedia, The Free Encyclopedia*, last updated September 22, 2025. https://en.wikipedia.org/wiki/Regina_E._Dugan

11. Roger Vincent, “Estimated Cost of Fire Damage Balloons to More Than $250 Billion,” *Los Angeles Times*, January 24, 2025. www.latimes.com/business/story/2025-01-24/estimated-cost-of-fire-damage-balloons-to-more-than-250-billion

12. Tom Chi, *2024 State of the Planet* (Keynote), *Vimeo*, n.d. https://vimeo.com/1019955067 (21:13)

13. Tom Chi, *Everything Is Connected—Here’s How,* TEDxTaipei. *YouTube*, n.d. youtube.com/watch?v=zyr4qORDu2A&pp=ygUSI2FyZXdlYWxsY29ubmVjdGVk

Afterword

This book may have ideas you agree with and others you disagree with. I suggest that this is not a good way to figure things out. Whether you agree or disagree, the way to figure anything out is to look in a holistic and compassionate manner at *the* full and nuanced *results of anything that actually gets tried*. Words are cheap, and arguments have limited utility. Everything ever figured out was figured out through the process of building, operationalizing, and sustaining what actually worked. Even if they sounded like opinions to you, most of what I've presented in this book are things I and teams I've worked with have actually tried. Given this, I'm happy to hear from and learn from anyone who is working in these areas and is *engaged in the build*. The media landscape prioritizes pundits because it's faster to produce content by having a charismatic person bloviate into a megaphone with punchy opinions. Much harder is finding the folks who are using their care and their build skill to do the most interesting work; harder still is developing those skills in yourself, because it requires discipline, focus, and dedication to improving reality that having opinions does not.

The pundit world thrives on drama and splintering disagreement. The build world thrives around effectiveness, quality, and cross-expertise sharing. The pursuit of excellence that comes from the build also creates community and expands our common ground. As much as my efforts and those of my colleagues and peers have been meaningfully impactful to the information age, it's time to move beyond it. Information, once rare is now cheap, and even cheaper for AI to fabricate. What is rare and valuable now are people and communities that can concretely build toward the world we hope for. What is rare is compassion, creativity, critical thinking, and community.

I can tell you personally that the build is not only more effective, but it is a much calmer psychological state. In the build, everything is an iteration. You don't need to prove yourself right at every step or get everyone's agreement before you can try to make anything better. Instead, you can just stay committed to serving what matters in compassion, because in the build mindset, whether the system is still not working currently or has been

amazing for years, builders can always get excited about learning and improving with the next iteration.

Being right or wrong is not central to such work, and the work does not hinge on a single act or moment. The commitment to ever-deepening understanding, the commitment to expanding effective care and compassion, the commitment to building for the greater and not the fewer, the commitment to maturing in our wisdom toward more acts of generosity: This is the metabolic core of what the build is for. I hope we all step up and take part. Let's get going.

Acknowledgments

Thank you to Lucille, the At One team, the physical universe, the elders, paws, and everyone else I've learned from. Thank you for the gift of patience, compassion, grief, consciousness, and for making clear the reality of profound interconnection across multiple scales of interwoven metabolics that we call life.

About the Author

Tom Chi is the founding partner of At One Ventures, which backs early-stage (seed, Series A) companies using disruptive deep tech to upend the unit economics of established industries while dramatically reducing their planetary footprint.

Previous to founding At One, Tom was a founding member of Google X, where he led the teams that created self-driving cars, deep learning artificial intelligence, wearable augmented reality, and internet connectivity expansion. He played a significant role in established projects with global reach including Microsoft (Outlook) and Yahoo (Search, Answers).

He has also spent time in the developing world and via social entrepreneurship accelerators, mentoring 200+ entrepreneurs working on global development issues such as access to clean water, electricity, education, health care, and employment.

Tom has spoken at TED Countdown, Aspen Institute, YPO, SuperVenture, IDEO, Schmidt Futures, Unreasonable, and Summit at Sea. He is also a lifelong inventor, with 77 patents across hardware, software, design, and mechanical systems.

Index

WILEY END USER LICENSE AGREEMENT

Go to www.wiley.com/go/eula to access Wiley's ebook EULA.