

*LIVE FOREVER &
FIX EVERYTHING*

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& FIX
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*A Practical Plan for a Future
That Works for Everyone*

JAMES BAKER



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INTRODUCTION

The future of humanity can go one of three ways:

1. We annihilate ourselves and go extinct.
2. We continue to muddle along.
3. We learn to live forever and fix everything.

This is a book about option number three.

It is my vision of a positive path forward, which shows how we make a future in which today's global problems get solved. Along the way, we create a glorious new world for ourselves. My tastes are not universal. You may disagree or prefer a different path. That's okay. I describe a future with multiple aspects that fit together and reinforce each other. But the parts work independently too. And each part can be improved independently or replaced with something better. Everything in this book is based on technology we

have today or technology we can reasonably expect soon. No new scientific breakthroughs are required.

Undoubtedly, the future will not turn out exactly as I describe. Maybe it shouldn't. Take what you like and feel free to reject the rest. Or better yet, use your skill and imagination to replace the parts you don't like with something better.

Before we move forward, I must acknowledge that I'm making several assumptions about you, the reader. I think you agree with me that business-as-usual is not the right path forward. I assume you know in your bones that better alternatives are possible. I'm assuming that you want a world that is more just, fair, secure, and sustainable. I'm going to guess that you are not an ascetic, renouncing worldly pleasures, but that you'd prefer a comfortable life for yourself and others.

While individual choices are important, collective action and public policy are also key. This book explores a future shaped by both individual and collective actions, with an emphasis on collective actions. Collective actions often flow from the introduction of new products and services—social media, for example. This book includes descriptions of new inventions that can foster meaningful collective action.

After you read this book, my hope is that you will see the world differently. Where you previously saw intractable problems, you will now see practical possibilities. Where you previously imagined problems to be tightly wound knots, impossible to detangle, now you will see solutions. Living in harmony with nature will no longer equate to giving up modern luxuries. Instead, you'll wonder

why we have so little to show for our impact on the natural world. Addressing inequity will no longer mean giving up what you have for the benefit of others. Instead, you will see a world where you benefit because others have greater opportunities to contribute.

You will likely have ideas about how to improve my plan, or you may have concerns that call for further research. Ideally, that's how the future gets made: collaboratively. Today's common view of the future is often an internal conversation between vague hope and deadly inertia. I aim to provide you with your own clear and positive vision of the future. I hope, after you read this book, the conversation in your head becomes one between competing positive outcomes. Most of all, I hope that the future actually becomes something like what you are about to read.

In this book, you will visit a future that is possible in the next several decades. That means within your lifetime. We will discuss extending your lifetime, but even with conventional lifespans, this book is about a future with you in it. This is not a tale about some distant possibility. There is discussion of new technology, but technology is not the focus; human nature is. I describe actions we can take to maximize our genuine well-being. Of course, well-being means nothing if the world we live in becomes uninhabitable, so I also focus on ways we can improve our relationship with the natural world as well as with each other.

The world around us also includes technology, so I've accounted for that as well. Included in my vision are virtual reality, artificial intelligence, brain machines, and a futuristic city, but these things are probably coming anyway. The difference is that these

technologies will work for you, not simply as parts of the larger economy. The economy will no longer be a giant machine with workers and consumers as minuscule parts. Instead, we will each be full-fledged owners of our situations.

I also describe ways we can organize a system not terribly unlike today's economy but designed to deliver the more ephemeral aspects of genuine well-being. Psychologist Abraham Maslow described a hierarchy of needs in which physical needs occupy one of five levels. The other four levels are safety, belonging, esteem, and self-actualization. Today's economy is optimized to deliver physical goods but doesn't do a good job addressing our needs on the other four levels. What if we had an economy that delivered on all five levels with the ease and reliability of ordering a pizza?

I can't quite promise that. Emotional well-being is both a matter of systems and a matter of developing ourselves internally. But there's a lot that systems can do to help. Longer lifespans give us time, motivation, and the energy to tackle big issues, plus a surprising psychological advantage. I'll describe all that and explain how we escape death.

Who am I? I'm a sixty-six-year-old self-taught engineer, inventor, and technology entrepreneur living in Seattle, Washington. Does this qualify me to invent the future? Maybe. As a child I liked to take things apart to see how they worked. That might be the best qualification I have. All human knowledge either comes from our animal instincts or because someone originally made it up. Much of what is made up is later proven wrong. But each time we make something up and prove it wrong, our overall understanding

grows. Understanding what is possible and making the future better is what I'm interested in.

This book is one person's integrated plan for the near-term future. It is based on science we have and numbers that work. The plan is compelling because it delivers what I think people, including you, really want. The plan is not complete or perfect.

However, this book is not a prediction. I describe what is possible, not what is inevitable. Bad choices can continue to be made. Hopefully our bad choices will not lead to our annihilation and the end of the human experiment. I hope just having this one viable plan in print will help inspire us to make better choices.

It's important to explain that this book is not a story of a utopia. Utopia is an end-state, a destination. Rather, I aim to describe one set of possibilities for the next few decades. The longer-term future will hopefully take us far beyond what I describe in these pages. I've kept my focus on the next few decades because this is a critical period and deserves immediate attention. Your attention! I want you to see yourself in this future and experience this future for real.

As we start our journey, please remember that this is more of a roadmap than a step-by-step plan. Any plan of this scope requires flexibility in its execution. You will read descriptions of inventions and new technology that can be built with today's capabilities. Some of these inventions offer immediate commercial and societal benefits. But these are to be seen merely as examples or hints. Often it is easier for me to describe something specific to communicate a general idea. Specifics are also easier for you, the reader,

to visualize. But when the plan gets put into practice all kinds of things can happen. Some of my specific examples will turn out to have obvious flaws: obvious when we try to write the software or build the physical items. That's the nature of inventing things. The fun is in creatively harnessing reality without losing the essence of our vision.

I will now take you on a trip for a few hours as you read this book; a trip into one vision of the future—a future that is entirely possible if we choose it. I hope it is a future you'd choose to live in with me.



CHAPTER 1

OVERVIEW

A BOOK ABOUT THE FUTURE STARTS WITH THE present. At present, we are seeing history unfold along an unsustainable path. However, many problems are easily fixed, especially with focused attention and active imaginations.

The truth is, most of our existing problems are predictable and avoidable. But that doesn't mean we will automatically recognize them and change our behavior in time to avoid their consequences. Bad stuff can always happen. People can and probably will make foolish choices. We can have senseless wars, famine, disease, and bad leaders. We can have misinformation that captures the public imagination. Inventions can have bad side effects that only become apparent later. Or inventions can have bad side effects that are obvious immediately and still become popular. Yet, all these problems are less of a threat than the threat of inaction. Inaction

can occur because of simple inertia and existing habits, but also because of human psychology.

Human psychology sometimes values comparative advantage higher than absolute gain. Human psychology has a built-in sense of fairness and unfairness. Sometimes this sense of fairness gets over-activated and sees any advantage to another as a threat to self. Our challenge is to accept what is better for us even when others get more relative advantage. Others get more relative advantage mostly because they are starting from worse conditions. In other words, people are sometimes reluctant to give up their favored position relative to others even when everybody wins—a zero-sum mindset. But that makes the benefits no less compelling for those of us currently living in privilege. The limiting factor is perception, not reality—inertia, not incentives. Our biggest limitation is a lack of imagination, not love for the way things are.

Whether through inertia or as a result of other problems, one threat stands out from all the others. That threat is irreversible damage to the natural world. We don't currently know how close we are to a tipping point where, instead of continuing to mitigate our stress on the natural world, natural forces tip. When natural forces tip, nature starts undoing nature's past mitigations. We know that the climate includes nonlinear feedback loops for carbon dioxide that make tipping possible, but we don't know the level at which irreversible tipping occurs. At least, we don't know with enough certainty, and anyone who claims to know is at best making an educated guess. There are other natural mechanisms that can cause problems if we break them. We understand these mechanisms even less.

This warning of danger is not new information, but so far, the threat of annihilation has not been sufficient motivation for society to sufficiently change course. For sufficient motivation, we also need a future that is compelling in its own right—not a utopia with all the answers, not a theme park where we're isolated from the grittiness of real life, not a structured society unable to encompass the divergent interests of different people and groups, but a place you'd really want to live.

We each need a minimum level of peace, stability, wealth, and psychological health to consistently do what is in our own best interest. Is humanity ready? I don't know with certainty, but I think so and hope so. Many of the solutions available to us have always been physically possible. Our obstacles have been what is humanly possible.

At every turn, I champion imagination over sacrifice. What do I mean by this? Any big project takes both inspiration and perspiration. The perspiration part can either be mind-numbing drudgery or satisfying and meaningful action. Satisfying and meaningful action on a sustained basis is an utter joy. I describe a future in which most work will consist of satisfying and meaningful action. But before that day arrives, can the work of building that better future be satisfying? Yes! At least in part. Effort will be required, but think of effort as an occasional push, not what you do from the beginning. Effort is for when your car runs out of fuel ten feet before reaching the continental divide, not what you do from the start.

Think of this place of imagination as the place where altruism and self-interest converge. You want a better world because you

want to live in a better world. This is a problem for those of us alive at this moment in history and living with privilege. Our preindustrial ancestors didn't enjoy a world capable of making enough physical goods to supply everyone's needs. Today we have the capacity to build, grow, and manufacture more than enough stuff for everyone. But we have not made similar strides toward the nonphysical aspects of well-being. Historians will look back on this period as the preindustrial age of emotional well-being, when only a select few lived fulfilled lives as human beings. What will it take to make a world where most of us are so privileged? Mostly imagination, some effort, some perspiration, but probably less than you think.

		ALTRUISM	
		No	Yes
SELF-INTEREST	No	Example: you engage in a drunken bar fight and end up hospitalized facing criminal charges.	Example: you give your life savings to charity, miss your rent payment, go hungry, get evicted, and become homeless.
	Yes	Example: you steal thousands of dollars from your employer and get away with it.	Example: through hard work, skill, and luck, you successfully invent a lucrative new lifesaving medicine.

Figure 1. Chart showing combinations of self-interest and altruism, with examples.

The examples I use are extreme, yet this grid is a useful way to look at civilization. Where do we put the invention of writing? Of agriculture? Smartphones? Your favorite joke? Where does your job go? How about your personal goals and caring for your family?

Let us move almost all human activity into the bottom right quadrant. Some of this is simply attitude-shift. There's satisfaction in knowing your efforts are leading us to a better future. Preparing for your own party is more fun than employment as a cafeteria worker, although many of the actions are identical.

In my plan for the future, I take the notion of urban density to its logical conclusion. Urban density is good for a number of reasons. Everything is closer and easier to reach. People in cities use less energy and fewer raw materials. A large nearby population supports services that would not be practical if fewer people could conveniently reach your location. The logical conclusion for density is a single giant city for the whole human population now and in the future. Is this practical? Would people want to live this way? Once most of humanity is conveniently close to almost everything, would you want to live in the second largest city? That would be like having access to the world's second largest computer network but not the internet. We can have many new services and conveniences of course, but what about the outdoors and nature? Can we all live in one city and each have a better experience of nature than we currently enjoy? What about the refreshing experience of wide-open spaces?

I'd like to think we can have the best of both cities and nature, so I imagined a plan that makes it so. I based the plan on calculations and numbers, but my assumptions could be off. We may need only half as much electrical energy, or twice as much. If so, the plan will need to flex. If we need twice as much energy, that means we will need a larger ring of solar panels around our city's

core. But the plan still works. Likewise, with other assumptions. I provide my assumptions and numbers in Appendix 1 so interested readers can experiment with different assumptions. I left most of the numbers and calculations out of the text to make this book easier to read.

Victor Hugo is thought to have said, “Nothing is as powerful as an idea whose time has come.” Although this is probably mis-attributed to him, it’s a good saying and hopefully true. Is fixing the whole world now, with the tools we have, an idea whose time has come? Is it even possible? If so, the specifics are less important than the perception. This book describes one such use of the tools we have to create one example of a better world.

I describe a worldwide civilization centered in one physical place, one giant city. This city is easy to visualize, and building it is a good idea in reality. I hope this city would be high on your vacation list even if you’re not ready to move there. Because it addresses the global problems of today, building this city is a compelling choice for us to make collectively. Because the city is a place you’d want to live, it is a compelling choice individually, too. Because the overall plan is both general and flexible, changes can be incorporated along the way. Changes can be incorporated forever, actually, just like the world we live in now, except the changes would be evaluated on the basis of making genuine improvements in your life versus today’s world where the money system drives what happens in most people’s lives.

How strange do you expect the future to be? The future will be different from today; that’s a certainty. To a degree, we all create

O V E R V I E W

what we expect. If you generally expect the future to be different in positive ways and make your choices accordingly, you are a force for good. You are a more powerful force for good if your expectations are detailed and practical. Get used to the idea of a world that works (with specifics). This book contains one such set of specifics.

Einstein said, “We can’t solve problems by using the same thinking we used when we created them.” This is a book about solving problems with new thinking. But what are those problems?

CHAPTER 2

PROBLEMS

WE'RE GENERALLY FAMILIAR WITH THE interrelated nature of global problems and how they reinforce each other. Climate change causes flooding and crop failures, which further impoverish and make refugees of the farmers. The refugee farmers flee to a place they are unwelcome, causing political discord, which spills into violence and turns to war. Or pick another combination of events and another combination of problems. They are linked. That's the bad news.

The good news is that the solutions are even more interrelated. Education leads to productivity, which leads to wealth, which leads to better health, which leads to more innovation, better public services, and so on. Change in either direction has a compounding effect. The compounding effect, in a sense, is inherent and just happens. But it happens better if we understand the potential

synergy and arrange our actions to take advantage of both the synergy and our understanding of it. It benefits countries to study their actions, collect accurate data, and share the data transparently. Our challenge is to collect and distribute data in a way that is useful to all and invasive to none. Chapter 5: “Relationships” discusses data and privacy in more detail. We will see how it is possible and desirable to thoroughly know what’s going on.

I’ve sorted the world’s problems into eight categories. Each category has multiple parts. Some familiar problems are not on this list because I consider them only as parts of bigger problems. For example, climate change falls under Problem #1: Damage to the Natural World. Population growth isn’t on the list. That’s because we will look at the harmful effects of overpopulation, not population itself; especially now that the rate of population growth has been cut in half (since 1966), creating cultures with many old people and few children. Refer to Figure 2.

Problem #1: Damage to the Natural World

Damage to the natural world includes hundreds of items, such as pollution, climate change, desertification, soil erosion, ocean acidification, deforestation, the Great Pacific Garbage Patch, tropospheric ozone, and hundreds of other specific items. Importantly, this category doesn’t include the collapse of bee colonies, murder hornets in North America, or elephant poaching. Those are included under Problem #5: Relations between Humans and Other Species.

PROBLEMS

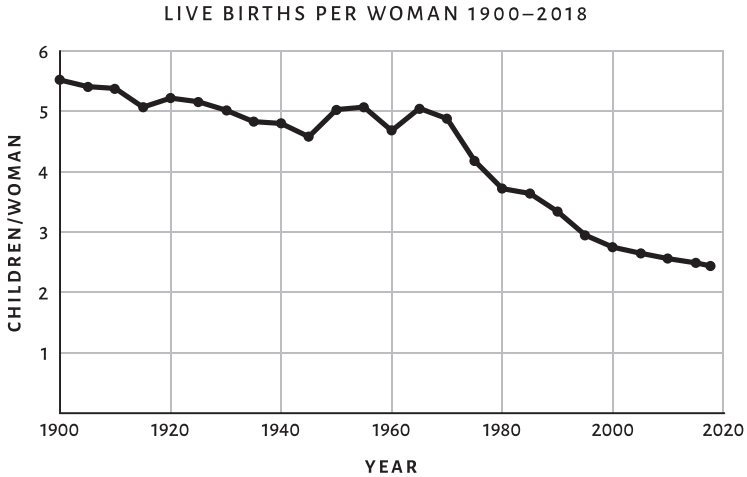


Figure 2. Live births per woman worldwide, 1900–2018. Source: *Our World in Data*, a project of the Global Change Data Lab UK. The curve indicates five-year averages. 2018 is the most recent year for which data was available at print time.

Problem #2: Injustice and Inequity

The category of injustice and inequity includes poverty (both relative and absolute), war, racism (and every other ism) in all its forms, crime, and the range of human nastiness from mass genocide to microaggressions.

Problem #3: Surveillance Capitalism, Loss of Privacy, Online Trolls

The problem of online trolls may not seem like it belongs on a list of global problems, but it does. Here's why: part of building a better world has to do with the ways we regard each other. To

treat each other with well-deserved respect and admiration (when admiration is deserved), we need to be able to see each other's admirable traits, unfiltered. In the current online atmosphere, extremes are emphasized because the currency is outrage and continued engagement. If what pays was instead based on a more positive set of values, our online environments would be different. Online interactions would bring out a better and more exciting public self for those who want to express themselves online and a greater alliance between us all. How do we build a world where being a better person pays? Stay tuned.

Problem #4: Weak Personal Connections, Loneliness

Loneliness speaks to what, for many, is the dividing line between current reality and a richer, more satisfying life. If our efforts could pay us in satisfying and meaningful connections, many of us would opt for that kind of reward rather than more money. We can get much more efficient at aligning our desires, our efforts, and our results in this area. I'll describe a new way to measure value and compare it to today's economic system. Many of us are fortunate enough to have our physical needs for sustenance securely met. But our desire for positive interpersonal relations is not nearly so well met. We can fix that.

Problem #5: Relations between Humans and Other Species

Relations between species include animal cruelty, pathogens, mass extinction, and many other items. I propose that we change the way

we interact with the natural world in a fundamental way, allowing much of the planet to return to the wild. But the choices about what constitutes “wild” will continue to be humanity’s choice. At this stage, it would be negligent to simply abandon the parts of nature we’ve already changed. Some choices will be obvious, such as prioritizing wild elephants over more mosquitoes. Many decisions will be more contentious. What will our lasting impact on nature be? What is nature? What will nature become in the future?

Problem #6: Death

As you can guess from the title of this book, I’m against death. I’m against death for you and me. Technology is emerging to significantly extend your lifespan, and it is likely to emerge in time for many readers of this book. Not everyone will live forever; death will continue to be a possibility, just not inevitable. The future feels different when we no longer expect to inevitably age and die a grisly death.

Much of our motivation to ignore the current problems plaguing society can be categorized in one of two ways. The solutions either seem to require too much effort, or we see the effects of the problem as tolerable for now. We pass the real trouble on for the next generation to worry about. That approach changes when we expect to live to see the longer-term consequences of our actions. Until recently, we could all expect to die, but humanity would almost certainly go on. Soon the opposite will be true. The death of all humanity will be a bigger threat to our individual lives than

aging. This creates a different mindset with new and better problems—problems that are both more challenging and more fun.

Problem #7: Disease

Curing death without addressing disease would be a cruel joke. Diseases are caused by any combination of these four things: infection, what we ingest, heredity, and physiological disease. Physiological disease includes deterioration over time. The four types of disease each require separate responses.

We avoid infectious disease by not getting infected. I don't mean to sound flippant, but to date, our greatest advance in public health is sanitation, especially keeping waste out of drinking water. Yet there is much more we can do to avoid contact with infectious agents.

What we ingest can nourish us, poison us, or leave us with a deficiency. Of course, the solution is to get enough of what keeps us healthy and nothing that makes us sick.

Diseases of heredity include genetic and nongenetic diseases such as psychiatric disorders. I don't have any particular insight into diseases of heredity except to note that DNA repair is beginning to emerge, and science is moving rapidly in this area.

Regarding physiological disease: wear and tear is different from aging, but ending aging will partially address physiological disease by effectively keeping our bodies at an age before symptoms begin. If you have a propensity for age-onset dementia but your body never ages beyond thirty-five, then dementia is mostly not a problem for you.

Problem #8: Limited Outlook, Despair, Withdrawal

This is partly a symptom of short lifetimes in a world of seemingly intractable problems. But like other moments in history, the previously impossible has become possible in a way that makes it compelling. A democratically-governed country, universal literacy, worldwide communications, worldwide transportation—each of these went through stages. First, they were impossible, then aspirational, then maybe-possible-with-hard-work, then each one happened, then not doing any one of them would seem insane.

But each advance took time until its moment occurred, and even then, the moment was only local. Democracy existed alongside aristocracy and still shares the planet with authoritarian rule. Literacy is still not the norm in some countries, especially for girls. Now the need is urgent and global. Can we really do this?

Until now, progress was a trend heading toward the unknown. Progress was seen as a journey, not a destination. Now we are close enough to see the destination, a point where everyone alive can live in cooperation with nature while enjoying conditions as good as today's first-world standards. At that stage, humanity gains a new sort of interrelatedness. Society's focus switches away from a scramble to survive and becomes something else.

I've categorized today's problems into eight items. My intention is to make it easy to keep track of what I'm addressing when I describe possible solutions. What have I left out? I'm not including matters that would be considered spiritual. I consider spirituality a personal area that is internal to the self, not a problem

to be solved. But the focus of spirituality is not entirely separate. According to most belief systems, making a better world is a good thing and worthy of your attention.

One way to look at history is to look at what has disappeared. Slavery is the obvious example, but the vestiges of slavery live on, and work remains to correct the lingering effects of that injustice. But whatever happened to predation or duels? There was a time when being eaten by predators was a very real fear. And when was the last time you worried about being challenged to a duel to the death?

The future of the world is partially a self-fulfilling prophecy; we create our future based on what we think is possible. Making the future we want is no different. The difference now is that so much more is within our reach and simultaneously so much is at stake. This is why I think now is the time to consider the future from a viewpoint of what is physically possible, not based on outdated ideas of what is socially or politically acceptable.

CHAPTER 3

TOOLS

WHAT MANY DON'T CONSIDER WHEN THINKING about the current state of our human experience is that the future we want and deserve can be built with the tools and techniques we have. Or tools and techniques that we can reasonably expect to be available by the time we need them. Or technology that doesn't yet exist but is straightforward to create and doesn't require new science. Some of the things I imagine for our future are readily understood. For example, I'll describe new forms of currency and refer to Abraham Maslow's hierarchy of needs. Some of the things I will describe are no less real but not necessarily common knowledge. For example, I'll describe reactive laminar airflow designs that make it possible to share indoor space without sharing airborne pathogens.

But one tool, while eminently possible and real, is frustratingly confusing. I'm referring to cryptography, cryptology, and cryptanalysis. Don't worry about the individual words. For simplicity, I'll refer to all of this as "crypto." I'm referring to the technology that (hopefully) keeps your online banking information private. But also, I'm referring to a wide range of techniques that can help balance competing interests in powerful new ways.

Crypto can be frustratingly counterintuitive. It can do seemingly impossible things easily, but often can't do things that seem simple and obvious. Sometimes, this has the effect of making intelligent people feel stupid. Hopefully, I will describe crypto in a way that leaves you with a feel for what is and what is not possible. Think of this as cryptographic literacy. Most of us have a good feel for what electricity can and cannot do. We don't need to be electrical engineers to have a good feel for what is possible with electricity. Likewise with getting a good feel for what crypto can and cannot do. As you become familiar with some examples, you will get a feel for what you can expect from crypto.

I acknowledge that tools alone will not make a better world or make us better people. Work is required in addition to the tools. Hopefully this work can be mostly satisfying discovery, not meaningless toil. Context is key. What otherwise seems like toil becomes gratifying when the result is building a world that works. Routine tasks take on an element of joy. But in addition to the gratification of doing meaningful work, much of what the world needs can be just plain fun. This fun element is especially true for

the ways that adapting to a better world both requires and enables us to be better people and more satisfied.

With that said, however, tools are critical for building our way toward a future that provides longevity, cooperation, and justice. The sixteen critical tools we will need in order to make this future possible are as follows.

Tool #1: Social Buy-In

The first tool I will discuss is social buy-in. This is especially important regarding the damage humans have inflicted, and continue to inflict, on the natural world. Social buy-in occurs not because the path looks easy; buy-in occurs when the goal is worthy and the actions look like they can succeed. So far, our efforts have been piecemeal and not robust enough. For example, if you care about climate change, you are told to drive a hybrid or electric car. Bothered by global poverty? Buy fair-trade coffee! Good choices, but not matched to the scale of the problems and therefore not by themselves inspiring.

What inspires people is a robust-enough plan, a plan that fits the scale of the problem. At some level, most of us know that we, as a society, are capable of acting at the required scale. And we understand that suitable specifics are both possible and known (by somebody). Many of us hold a sense of dread about the seeming sacrifices required. There is a temptation to not think about it and leave the work to future generations. Any level of work that leads to avoiding extinction can hardly be described as a sacrifice,

but the point here is that creativity and imagination can directly replace sacrifice. We are not short on creativity or imagination.

Tool #2: Maslow's Hierarchy of Needs

According to Abraham Maslow, we have a hierarchy of needs.¹ At the most basic level, we have physical needs such as food, clothing, and shelter. Until those needs are met, other things don't much matter. But once we get enough at any one level, more of the same doesn't really make much difference.

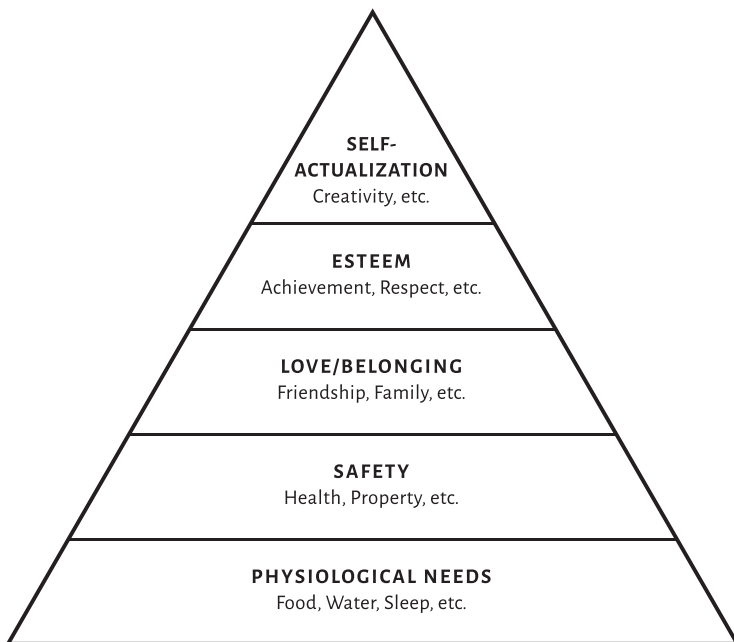


Figure 3. Maslow's hierarchy of needs, Maslow (1943).

For those of us fortunate enough to be secure in our physical needs, our interactions with others become more important than additional sustenance. I use Maslow's hierarchy as one of the tools because it is a useful way to list what matters to our emotional well-being. There is some controversy about the priority order of Maslow's four levels of nonphysical needs, but the order is not important to us. The point is to live a life where all these needs are fulfilled.

Tool #3: New Forms of Money and Measure

Part of human nature includes psychological defenses that worked exceptionally well at a pivotal moment in the past. Because of their success, those psychological defenses became a defining personality trait long after they served a useful purpose. Similarly, the price system was the best possible answer to the scarce resources that defined the world economy of the past. However, nonphysical goods and services are neither scarce nor actual resources. The price structure does not serve these needs.

Today, our economic system is focused on making and acquiring money. That may sound obvious or redundant, but economics can guide our choices in different directions. We must orient our economy toward the things that genuinely make life better for individuals, society, and the planet. We can create an economy that works not only by helping people receive what they most deeply want but also by enriching people who give to each other in imaginative ways. Why doesn't our economy value giving as much

as receiving now? Because it doesn't pay. It doesn't pay under our current money system, but that system can change into one where imaginative giving pays in solid ways.

Tool #4: Brain Communication

This is a technology under development today and working in a primitive form but mostly below the radar and out of the news. More than the other tools listed here, brain communication is still not completely proven. The technology includes implanted microsensors to detect the actions of individual brain cells. The sensors connect to a transmitter, which connects to a computer so that the computer can detect activity from individual brain cells.

The user undergoes training to learn to signal the computer in a detailed and deliberate way. As an infant, how do you learn to move your fingers? It happens naturally by trial and error. Later, you may train your fingers again when you take up the piano, and you call it practice. Training yourself to communicate with signals from your brain will be similar, except instead of fingers, nothing physical moves.

Today's version of brain communication requires minimally invasive brain surgery. Most people don't jump for joy at the thought of brain surgery, minimally invasive or not. Hopefully, future versions will use external sensors, but early versions will prove the concept. The concept is that while our bodies have rich sensors for taking in information, we don't have rich ways to transmit information. We don't have comparably rich ways to express ourselves. For example,

we have eyes that can see a whole picture in a flash. But we don't have projectors in our foreheads that can project video from our imaginations. The rapid output of rich information will vastly alter the human experience, especially how we treat each other.

Although it is still in early development stages, the signs are there. Empathy will be facilitated in a way almost indistinguishable from living the first-person experience of another person. Conversely, having an experience will no longer be just for yourself. Your inner experience will be shareable with others in vivid new ways.

Tool #5: Zone Pods

I coined the term “Zone Pod” to describe a small room that fools your brain into keeping you in the *flow* or in the *zone*. The zone is that state where your mind and body focus in a way that is relaxed yet energized. In the zone, you lose track of time, and hours later you look back and marvel at how productive you've been. Time spent in the zone is both productive and satisfying.

Maybe your zone is in the woods with birds chirping, or on a fast-moving train, or in a college library surrounded by students focused on their studies. The walls of a Zone Pod are large video screens; the sounds and air are adjustable to give you the feel of your desired location. A Zone Pod is not meant to be a convincing illusion. If you examine the walls, you will never mistake them for the trees of a forest. But with the air set to deliver the right mix of gases, ions, moisture, smells, temperature, pressure, and flow rate; with light that mimics the sun peeking through the leaves; and

with the sounds of nature, your brain will accept the illusion well enough to help you stay in the zone.

Zone Pods are not meant to replace reality. The experience is meant to flexibly adapt the room where you spend some portion of your time. Compare a Zone Pod to a work cubicle. The flexibility of a Zone Pod allows you to be in the woods one minute and in a conference room or auditorium with other people a moment later. Zone Pods will not replace the real experience of being together in-person or as part of a group. But the experience inside one compares favorably to conferencing on a computer screen.

But there is a twist. In real life, interactions occur partially based on the physical characteristics of the bodies involved. Perhaps you don't offer your opinion because your colleagues seem too domineering. With a Zone Pod, you could discreetly adjust the illusion to show your domineering colleague as an eighteen-inch-tall version of themselves. Now, the bombast seems almost cute and not at all intimidating.

Tool #6: Accordion-Construction

Think about your house. How many rooms does it have? How many people are in each room right now? If some of the rooms are currently unoccupied, your house is a candidate for accordion construction. Using mechanical devices, the unoccupied rooms squish to a fraction of their size until a split second before you enter. Then as you enter, each room is restored to the way you left it, including returning each object to the place you left it.

There are expensive cities where the cost of space makes accordion construction economical today. You will need new furniture, construction materials, appliances, and many other things, but it is worth the cost and effort to effectively have more space. More importantly, it is past time to reimagine those things anyway.

For accordion construction to work, we will need standards, easily configured interchangeable pieces, and enough distributed knowledge to make it work. Not unlike the early years of railroads, automobiles, or personal computers.

Tool #7: “Plumbing”

I say “plumbing” in quotes because I mean plumbing in a broader and more general way than the term is usually used, and I don’t have a better name for this tool. Plumbing is what delivers the health benefits of sanitation as well as hot and cold running water. Sanitation safely removes dirty or contaminated water to a place where it is treated before returning the water to a natural system that further treats the water. Before plumbing, cities were terribly dangerous and unhealthy places to live. In nineteenth-century Manchester, England, over half of working-class children died before reaching their fifth birthday, mostly from infectious disease.² Then what happened? Sanitation! Plumbing separated the waste from the drinking water and reduced the spread of infectious disease, leading to the most effective public health advance in history.

But then we got vaccines and antibiotics. We stopped focusing on reducing the physical movements of bacteria, viruses, fungi,

protozoa, prions, parasites, and allergens. I'll refer to these collectively as "pathogens." Additionally, a feature of our current plumbing is that it depends on nature to do a fair amount of the treatment of harmful waste. In the future, we will want to manage the whole process—and not just for water. We will want to treat the air we breathe, the surfaces we touch, and everything that goes in or comes out of our bodies. Eventually we will want to account for every molecule we touch, plus all the chemistry and biology that occurs in connection with our bodies.

It will be a long time before we understand nature and our bodies at the level of every molecule, but that's no reason not to build the infrastructure. Before we reach that molecular-level understanding, we can combine the best knowledge we have with a thorough tracking system to help us learn more. With attention to "plumbing," we can make a world where person-to-person infection is so rare that any case of contagion will be investigated with the thoroughness we now apply to plane crashes.

Part of health is avoiding pathogens, but part of health is immunity and healthy exposure to dirt. Exposure to dirt trains our immune systems. But today, our exposure is haphazard, leading to disease from some dirt and lack of immunity from the absence of other dirt. As we learn more, this will become more like a database problem based on a library of dirt and records of the immunological differences between individuals.

To reduce contagion due to respiratory viruses, air will be delivered in calculated flow patterns, usually vertically, between

vents throughout the ceiling and vents in the floor. The air will be directed in a gently moving flow calculated to prevent turbulence and prevent airborne contagion. Today, some hospital operating rooms and laboratory hoods are designed to do this to a degree, but it is not practical for everyday construction. Or is it? If we build everything new, many things become possible. The air can be filtered of harmful pathogens and pollutants between each pass through an occupied space. With each pass, the air can be adjusted to the desired mix of gases, ions, moisture, smells, temperature, pressure, and flow rate.

Our bodies and brains evolved in air with a carbon dioxide level of about 280 parts per million. Today's air has about 410. Indoor air often has several times that level. Measurable cognitive impairment starts at about 1,000 parts per million. There's a lot we can do with air. We can start by better understanding just what constitutes the best air for us to breathe.

How about surfaces that scrub themselves between each touch? Or food that is grown with your individual body in mind and tracked from seed or egg to your plate? Your personal health and taste data can track the best ways to maximize your health, your pleasure, and your body's nutritional needs. The data will be kept private while helping further our general understanding of nutrition and health. I'm calling all of this plumbing: air, water, dirt, food, data, self-scrubbing surfaces—anything that has to do with the flow of substances, and also the behind-the-scenes mechanisms that do the mixing and separating.