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FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

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NO, EVOLUTION DID NOT MAKE US INTO SELFISH CAPITALISTS

Cooperation is imprinted in our genes just as unmistakably as competition

by Douglas Ruskoff

> *"By viewing evolution through a strictly competitive lens, we miss the bigger story of our own social development.*

Nature is a collaborative act. If humans are the most evolved species, it is only because we have developed the most advanced ways of working and playing together.

We've been conditioned to believe in the myth that evolution is about competition: the survival of the fittest. In this view, each creature struggles against all the others for scarce resources. Only the strongest ones survive to pass on their superior genes, while the weak deserve to lose and die out.

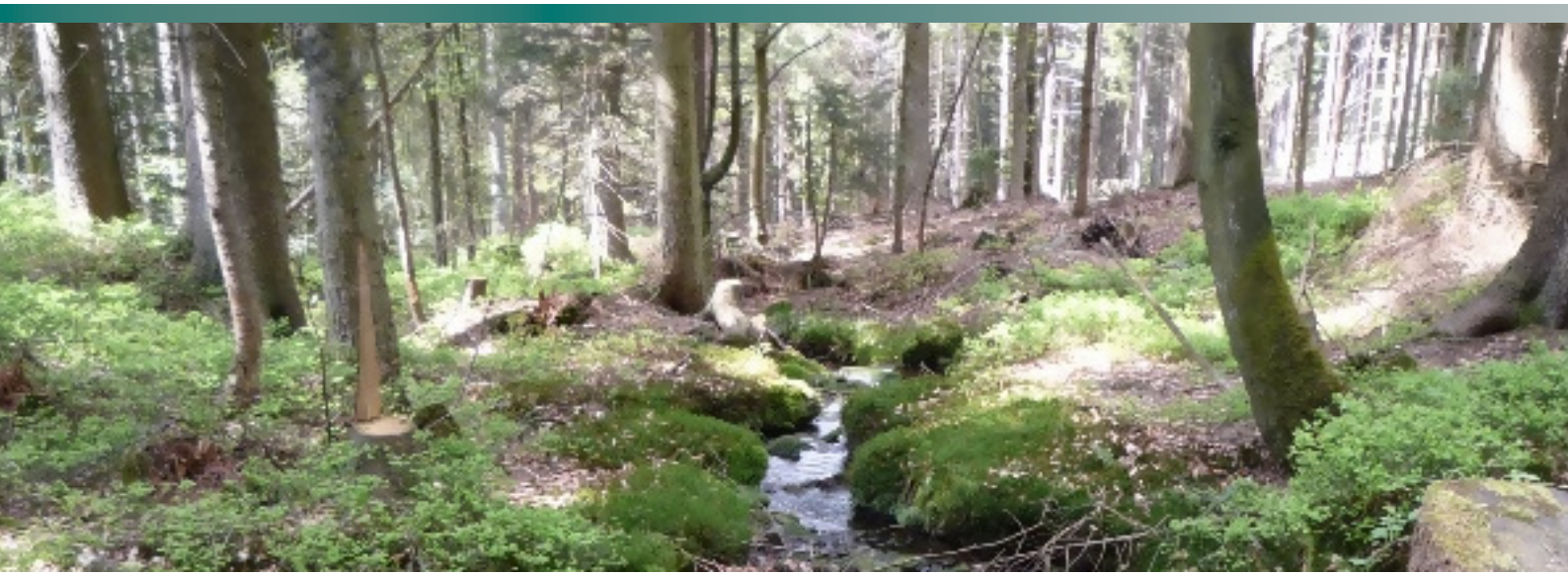
But evolution is every bit as much about cooperation as competition. Our very cells are the result of an alliance billions of years ago between mitochondria and their hosts. Individuals and species flourish by evolving ways of supporting mutual survival. A bird develops a beak which lets it feed on some part of a plant that other birds can't reach. This introduces diversity into the population's diet, reducing the strain on a particular food supply, and leading to more for all. What of the poor plant, you ask? The birds, much like bees, are helping the plant by spreading its seeds after eating its fruit.

Survival of the fittest is a convenient way to justify the cut-throat ethos of a competitive marketplace, political landscape, and culture. But this perspective misconstrues the theories of Darwin as well as his successors. By viewing evolution through a strictly competitive lens, we miss the bigger story of our own social development and have trouble understanding humanity as one big, interconnected team.

The most direct benefit of more neurons and connections in our brains is an increase in the size of the social networks we can form.

The most successful of biology's creatures coexist in mutually beneficial ecosystems. It's hard for us to recognize such widespread cooperation. We tend to look at life forms as isolated from one another: a tree is a tree and a cow is a cow. But a tree is not a singular tree at all; it is the tip of a forest. Pull back far enough to see the whole, and one tree's struggle for survival merges with the more relevant story of its role in sustaining the larger system.

We also tend to miss nature's interconnections because they happen subtly, beneath the surface. We can't readily see or hear the way trees communicate. For instance, there's an invisible landscape of mushrooms and other fungi connecting the root systems of trees in a healthy forest.



> *"The story we are taught in school about how trees of the forest compete to reach the sunlight isn't really true.*

The underground network allows the trees to interact with one another and even exchange resources. In the summer, shorter evergreens are shaded by the canopies of taller trees. Incapable of reaching the light and photosynthesizing, they call through the fungus for the sun-drenched nutrients they need. The taller trees have plenty to spare, and send it to their shaded peers. The taller trees lose their leaves in the winter and themselves become incapable of photosynthesizing. At that point, the evergreens, now exposed to the sun, send their extra nutrients to their leafless community members. For their part, the underground fungi charge a small service fee, taking the nutrients they need in return for facilitating the exchange.

So the story we are taught in school about how trees of the forest compete to reach the sunlight isn't really true. They collaborate to reach the sunlight, by varying their strategies and sharing the fruits of their labor.

Trees protect one another as well. When the leaves of acacia trees come in contact with the saliva of a giraffe, they release a warning chemical into the air, triggering nearby acacias to release repellents specific to giraffes. Evolution has raised them to behave as if they were part of the same, self-preserving being.

Animals cooperate as well. Their mutually beneficial behaviors are not an exception to natural selection, but the rule.

Darwin observed how wild cattle could tolerate only a brief separation from their herd, and slavishly followed their leaders. "Individualists" who challenged the leader's authority or wandered away from the group were picked off by hungry lions. Darwin generalized that social bonding was a "product of selection." In other words, teamwork was a better strategy for everyone's survival than competition.

Darwin saw what he believed were the origins of human moral capabilities in the cooperative behavior of animals. He marveled at how species from pelicans to wolves have learned to hunt in groups and share the bounty, and how baboons expose insect nests by cooperating to lift heavy rocks.

Even when they are competing, many animals employ social strategies to avoid life-threatening conflicts over food or territory. Like breakdancers challenging one another in a ritualized battle, the combatants assume

threatening poses or inflate their chests. They calculate their relative probability of winning an all-out conflict and then choose a winner without actually fighting.

> *"Developing bigger brains allowed human beings to maintain a whopping 150 stable relationships at a time.*

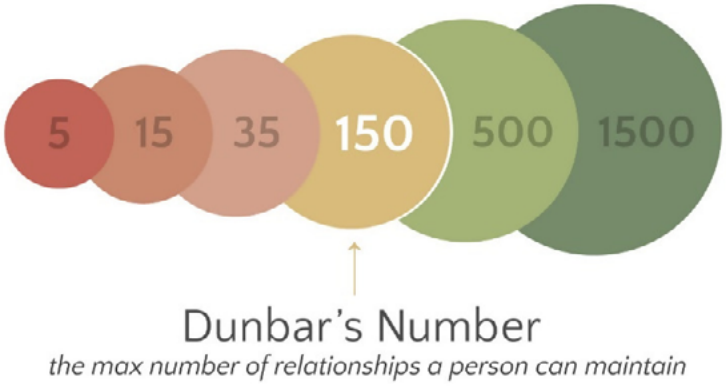
The virtual combat benefits not just the one who would be killed, but also the victor, who could still be injured. The loser is free to go look for something else to eat, rather than wasting time or losing limbs in a futile fight.

Evolution may have less to do with rising above one's peers than learning to get along with more of them.

We used to believe that human beings developed larger brains than chimpanzees in order to do better spatial mapping of our environment or to make more advanced tools and weapons. From a simplistic survival-of-the-fittest perspective, this makes sense. Primates with better tools and mental maps would hunt and fight better, too. But it turns out there are only slight genetic variations between hominids and chimpanzees, and they relate almost exclusively to the number of neurons that our brains are allowed to make. It's not a qualitative difference but a quantitative one. The most direct benefit of more neurons and connections in our brains is an increase in the size of the social networks we can form. Complicated brains make for more complex societies.

Threats to our relationships are processed by the same part of the brain that processes physical pain.

Think of it this way: a quarterback, point guard, or midfielder, no matter their skills, is only as valuable as their ability to coordinate with the other players; a great athlete is one who can predict the movements of the most players at the same time. Similarly, developing primates were held back less by their size or skills than by their social intelligence. Bigger groups of primates survived better, but required an increase in their ability to remember everyone, manage relationships, and coordinate activities. Developing bigger brains allowed human beings to maintain a whopping 150 stable relationships at a time.



The more advanced the primate, the bigger its social groups. That's the easiest and most accurate way to understand evolution's trajectory, and the relationship of humans to it. Even if we don't agree that social organization is evolution's master plan, we must accept that it is—at the very least—a large part of what makes humans human.

Human social cohesion is supported by subtle biological processes and feedback mechanisms. Like trees that communicate through their root systems, human beings have developed elaborate mechanisms to connect and share with one another.

Our nervous systems learned to treat our social connections as existentially important—life or death. Threats to our relationships are processed by the same part of the brain that processes physical pain. Social losses, such as the death of a loved one, divorce, or expulsion from a social group, are experienced as acutely as a broken leg.

Managing social relationships also required humans to develop what anthropologists call a "theory of mind"—the ability to understand and identify with the thinking and motivations of other people. From an evolutionary perspective, the concept of self came after our ability to evaluate and remember the intentions and tactics of others. Unlike the relatively recent cultural changes that encouraged ideas of personal identity or achievement, our social adaptations occurred over hundreds of thousands of years of biological evolution. Enduring social bonds increase a group's ability to work together, as well as its chances for procreation. Our eyes, brains, skin, and breathing are all optimized to enhance our connection to other people.

"Human beings connect so easily, it's as if we share the same brains.

Prosocial behaviors such as simple imitation—what's known as mimesis—make people feel more accepted and included, which sustains a group's cohesion over time. In one experiment, people who were subtly imitated by a group produced less stress hormone than those who were not imitated. Our bodies are adapted to seek and enjoy being mimicked. When human beings are engaged in mimesis, they learn from one another and advance their community's skill set.

The physical cues we use to establish rapport are preverbal. We used them to bond before we ever learned to speak—both as babies and as early humans many millennia ago. We flash our eyebrows when we want someone to pay attention to us. We pace someone else's breathing when we want them to know we empathize. The pupils of our eyes dilate when we feel open to what another person is offering. In turn, when we see someone breathing with us, their eyes opening to accept us, their head subtly nodding, we feel we are being understood and accepted. Our mirror neurons activate, releasing oxytocin—the bonding hormone—into our bloodstream.

Human beings connect so easily, it's as if we share the same brains. Limbic consonance, as it's called, is our ability to attune to one another's emotional states. The brain states of mothers and their babies mirror each other; you can see this in an MRI scan. Limbic consonance is the little-known process through which the mood of a room changes when a happy or nervous person walks in, or the way a person listening to a story acquires the same brain state as the storyteller. Multiple nervous systems sync and respond together, as if they were one thing. We long for such consonance, as well as the happy hormones and neural regulation that come with it. It's why our kids want to sleep with us—their nervous systems learn how to sleep and wake by mirroring ours. It's why television comedies have laugh tracks—so that we are coaxed to imitate the laughter of an audience of peers watching along. We naturally try to resonate with the brain state of the crowd.

These painstakingly evolved, real-world physical and chemical processes are what enable and reinforce our social connection and coherence, and form the foundations for the societies that we eventually built.

Thanks to organic social mechanisms, humans became capable of pair bonding, food sharing, and even collective childcare. Our survivability increased as we learned how to orchestrate simple divisions of labor, and trusted one another enough to carry them out.

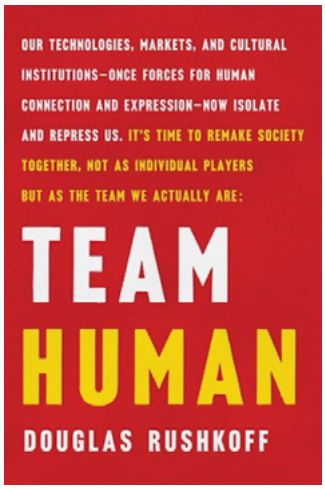
The more spectacular achievement was not the division of labor but the development of group sharing. This distinguished true humans from other hominids: we waited to eat until we got the bounty back home. Humans are defined not by our superior hunting ability so much as by our capacity to communicate, trust, and share.

Biologists and economists alike have long rejected social or moral justifications for this sort of behavior. They chalk it up instead to what they call “reciprocal altruism.” One person does a nice thing for another person in the hope of getting something back in the future. You take a risk to rescue someone else’s child from a dangerous predator because you trust the other parent to do the same for your kid. In this view, people aren’t so nice at all; they’re just acting on their own behalf in a more complicated way.

But contemporary research strongly supports more generous motives in altruism, which have nothing to do with self-interest. Early humans had a strong disposition to cooperate with one another, at great personal cost, even when there could be no expectation of payback in the future. Members of a group who violated the norms of cooperation were punished. Solidarity and community were prized in their own right.

Evolution’s crowning achievement, in this respect, was the emergence of spoken language. It was a dangerous adaptation that involved crossing the airway with the foodway, making us vulnerable to choking. But it also gave us the ability to modify the sounds that came from our vocal folds and make the variety of mouth noises required for language.

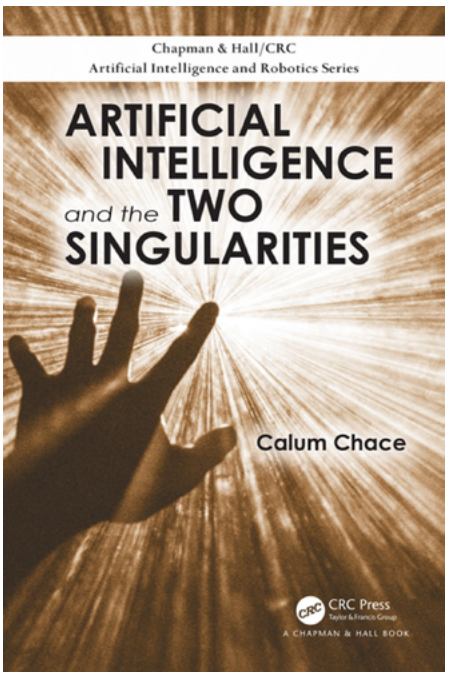
While language may have been driven by the need for larger, more complicated social structures, think of the immense collaborative act that developing a language required from its speakers. That multigenerational exercise alone would change the fabric of society and its faith in a cooperative enterprise.



Artificial Intelligence and the Two Singularities
by Calum Chace

Book Review

by Charles Brass – Chair, futures foundation



Callum Chace has been writing about artificial intelligence for a long time, both in fiction and in non-fiction form. This book was commissioned as part of a series from publisher Chapman and Hall and focuses on the implications for human beings when artificial intelligence matches and then exceeds human intelligence.

The two singularities in the title refer first to technology and second to economics. "Singularity" in this context means a situation in which the pre-existing rules no longer apply, although it is originally a maths/physics term referring to a situation when a function takes an infinite value, such as when gravity becomes infinite at the boundary of a black hole.

The technological singularity will occur when (if?) artificial intelligence generally becomes more intelligent than humans. The term generally is important. In many specific areas – such as doing maths calculations, playing chess and analyzing huge quantities of data – artificial intelligence (AI) is already more powerful than human intelligence. However, if AI ever becomes generally more intelligent than people are, then no-one knows what will happen.

The economic singularity will occur when (if?) machines become capable of replacing significant numbers of human beings at doing work.

Both of these possibilities have been the subject of many recent books, and Chace does a very good job of acknowledging other authors who have contributed to thinking about these issues. He also does a very good job of canvassing the various issues that thinking about these singularities raises, and in that sense this is a very good introductory book for readers who have not previously read scholarly thinking on these issues.

At the heart of current concern about the consequences of these singularities is the exponential rate at which technology has been advancing for many years. Chace points out that if a space the size of a sports stadium has a single drop of water added at time zero, and then doubles the number of drops every second it will take 49 minutes to fill the stadium. However, at the 45-minute mark the stadium will only be 7% full. This is the power of exponential growth. While no-one really knows how close we really are to either of these singularities, the fact that growth towards them might well be exponential should give us all grounds to pause and think carefully.

In thinking about the technological singularity Chace begins by looking at the historical and current state of AI. He notes that even those most intimately involved in its development differ markedly in their predictions about its future.

There is no doubt that what is called 'narrow' AI is becoming ever more sophisticated as the range of tasks that computers can do better than human expands virtually every day. Even in areas such as driverless cars, Chace notes that becoming better than humans merely means AI kills fewer than the hundreds of thousands currently killed annually on roads by human drivers. But, when, or if, these narrow achievements will ever broaden into a generally superior AI is not at all clear. Like many other authors, however, Chace counsels against using this uncertainty as an excuse for not thinking through the consequences of

generally superior AI, since it is not at all clear that such a development would have benign consequences for the human race.

Chace points out that the existence of human brains proves that "ordinary matter arranged in the right way can generate intelligence and consciousness" (p175). He also points out this intelligence was "created by evolution, which is slow, messy and inefficient" (p175). So, what many groups of humans are trying to now do has been done before. Whether this means it can be done again, is an open question, but "there are good reasons to believe that we cannot stop the progress of AI towards Artificial General Intelligence" (p177). He concludes his analysis of the technological singularity by writing: "If AI begets superintelligence, it will present humanity with an extraordinary challenge – and we must succeed. The prize for success is a wondrous future, and the penalty for failure (which could be the result of a single false step) may be a catastrophe. Optimism, like pessimism, is a bias, and to be avoided. But summoning the determination to rise to a challenge and succeed is a virtue" (p180).

In many ways, Chace seems more concerned about the possibility of an economic singularity. This is because it already seems to be happening. Machines have been taking over human work in ever expanding ways since the industrial revolution, but computer technology developed since the middle of last century has sped things up enormously. Chace does acknowledge that there are many commentators who don't believe this should cause us any worry, precisely because the history of the past two hundred years has shown that as fast as jobs have been replaced by machines, new types of job have been created. However, he calls this the "turkeys at Christmas" fallacy, the belief that past behavior is a reliable indicator of what will happen in the future (turkeys get regularly fed every day, until Christmas day).

Chace points out that in the US in 1915 there were 21.5 million working horses. Thirty-five years later the entire horse population was fewer than 2 million and few of them were what would once have been called working horses. He says, therefore, peak horse occurred in 2015, and he wonders when whether "we are approaching 'peak human' in the workplace?" (p189). By the end of his 80 or so pages exploring the potential for an impending economic singularity, he seems pretty much convinced it is going to happen, and by and large he seems to think it will be a good thing, if we apply our intelligence to creating a future world in which humans can thrive.

Which is why he finishes this section of the book by exploring how to respond to the challenges a jobless world creates. He joins many other authors in concluding that it is possible to imagine a viable future world in which most people don't work for a living, while at the same time acknowledging that achieving such a world will cause all of us (particularly our political leaders) to think and behave very differently. Prominent among our new thinking will need to be how money is distributed in such a future world. Chace joins many others in pointing out that the Star Trek universe explicitly operated without money, and yet seemed to function pretty effectively.

In a conscious acknowledgement to the uncertainty surrounding much of what he has written about, Chace concludes the book with four possible future scenarios, including one inspired by Kevin Kelly from *Wired* magazine called a 'protopia' (to distinguish it from 'utopia' and 'dystopia'). Kelly describes his protopia this way: "I am a protopian, not a utopian. I believe in progress in an incremental way where every year is better than the year before but not by very much – just a micro amount" (p309). Chace calls his fourth scenario a "protopian un-forecast" (Chapter 16). He acknowledges that none of his scenarios are going to play out exactly has he has envisaged them, but exhorts us to use them as the basis of developing a plan – "The matter is urgent. If the panic is coming, it is likely to arrive within the next decade. The time to act is now" (p339).

Chace ends his book with a chapter title new to this reviewer – "Outroduction" in which he briefly summarizes his arguments. He ends with this paragraph: "A wonderful world can be ours if we rise to the challenges posed by the exponential growth of our most powerful technology and navigate the two singularities successfully. Let's grasp that wonderful future!" (p346).

FUTURISTS IN ACTION

FIVE PRINCIPLES FOR THINKING LIKE A FUTURIST

by Marina Gorbis

Credit: The Heads of State, © 2019

Thinking about the future allows us to imagine what kind of future we want to live in and how we can get there.

In 2018 we celebrated the fifty-year anniversary of the founding of the Institute for the Future (IFTF). No other futures organization has survived for this long; we've actually survived our own forecasts! In these five decades we learned a lot, and we still believe—even more strongly than before—that systematic thinking about the future is absolutely essential for helping people make better choices today, whether you are an individual or a member of an educational institution or government organization. We view short-termism as the greatest threat not only to organizations but to society as a whole.

In my twenty years at the Institute, I've developed five core principles for futures thinking:

1. Forget about predictions.
2. Focus on signals.
3. Look back to see forward.
4. Uncover patterns.
5. Create a community.

#1: Forget about Predictions.

If somebody tells you they can predict the future, don't believe them. Nobody can predict large socio-technical transformations and what exactly these are going to look like. We are getting better at making point predictions. There are prediction markets and all kinds of data-rich tools with which we're trying to predict elections, market share prices, and the success of product introductions. All of these focus on one particular event, a particular point. But a lot of our work at the Institute for the Future is focused on comprehending big, complex transformations—rather than just one thing, one event. We're looking at the interconnection between technologies and society and economics and organizations.

One way to think about this is to look at the difference between waves and tides. Waves are what we see on the surface. They are fleeting events, they come and go, appear and disappear. But there is something bigger underneath that is causing these waves. Underneath the waves is the tide, causing all kinds of disturbances of which waves are just one sign. Our work involves trying to understand those tides, the deeper forces underneath the waves.

Futures thinking is about readiness

So, if no one can predict the future, why think about it? Because doing so helps you to inoculate yourself. In the medical field, inoculating yourself prevents you from falling ill. In futures thinking, if you've considered a whole range of possibilities, you're kind of inoculating yourself. If one of these possibilities comes about, you're better prepared.

Futures thinking is about seeing new possibilities

Thinking about the future is also about imagining. It's about transforming how we think. It's about creating a map to the future and looking for the big areas of opportunity. We like to think about transformations, for example, in learning and work, and how they get connected and intertwined in various ways. And then we start thinking about zones of opportunity. How can we shape the future to make it more equitable? How can we amplify learning outcomes? What do we need to do to achieve these outcomes?

The future doesn't just happen to us. We have agency in imagining and creating the kind of future we want to live in, and we can take actions to get us there.

When we think about the future at the Institute, a ten-year horizon is our "sweet spot." This is for multiple reasons. Ten years is a safe place. People don't bring a lot of turf issues when thinking that far out, and they can agree on a desirable future to consider and to prepare for.

We use a cycle that we call the F-I-A process: foresight to insight to action (see figure 1). We believe that any successful strategy is based on a good insight about the future. So, as you think about the future and consider the tides—that is, as you develop *foresight*—ask yourself a question: What does it mean for us? What's the *insight?* The same foresight, the same possibility, or the same tide may offer very different insights depending on your type of industry or organization. For example,

if we're moving to a new way of accreditation or credentialing, one very different from traditional degrees, the insights will likely vary depending on your institution. Ultimately the goal is to use this foresight and the resulting insight as a way to determine the *action* to take. Although the foresight is usually five to ten years out, the action may be needed today or six months from now. What do we need to do today or tomorrow to either prepare for that future or to shape it in a more desirable direction?

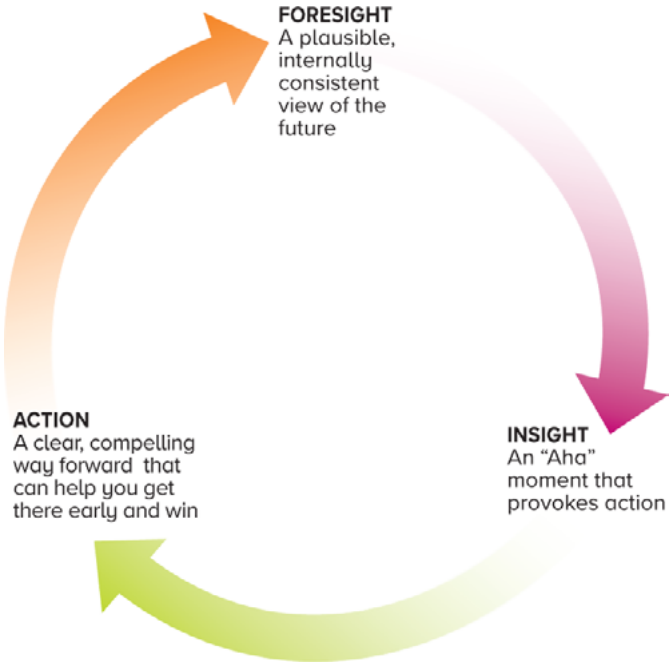


Figure 1. Foresight to Insight to Action Framework
Source: Institute for the Future, 2007

#2: Focus on Signals.

What tools do we have to help us systematically think about the future and develop foresight? There is no data about the future; all the data we have is about the past. Historical data is useful when things continue as they are. You can just continue planning for the same trajectory. That's fairly easy.

The situation is different when things are changing and there are inflection points. I think we are in this space right now: notions of what learning is, how and where people learn, and the value of degrees and who grants degrees are all changing. What tools do we have to help us think about the future in this landscape? At the Institute for the Future, we use what we call *signals of the future* to help us develop foresight.

The science fiction writer William Gibson famously said, "The future is already here, it's just not very evenly distributed." Indeed, signals of the future are all around us today. Often these are things or developments that are on the margins. They may look weird or strange. They are the kind of things that grab your attention and make you ask: "Why is this happening? What is going on here?" A signal can be anything. It could be a technology, an application, a product/service/experience, an anecdote or personal observation, a research project or prototype, a news story, or even simply a piece of data that shows something different. Recently I read that 62 percent of jobs today do not afford people with middle-

class livelihoods. For me, that was a signal. Unemployment is low, and the economy is booming. What is going on here? A signal is anything that makes you want to dig in and say: "Why? What is causing this situation?"

Let's take as examples an old signal and a new signal. In 1995, eBay first appeared on the horizon and created a lot of excitement. Strangers began to trade with each other. You trusted somebody you'd never met to sell you something, and you agreed to pay them! The significant signal here, the critical innovation of eBay, was the creation of a reputation system, for both the seller and the buyer. The creation of this online reputation system enabled strangers to conduct economic transactions easily. This idea could be carried into many different arenas, and it was. Today, all online transactions rely on some sort of a reputation system. Online reputation has become a new kind of currency. When I was a child, we were told: "Don't get into cars with strangers." Now most of us don't think twice about getting into Uber or Lyft cars with complete strangers. So, this signal, this notion of online reputation markets, changed the whole industry, allowing new kinds of transactions in which strangers come together. Just a few examples are Uber/Lyft, Upwork, LinkedIn, and the whole ecology of badges certifying that someone has certain skills or abilities.

That's the old signal. An example of a new signal is a video billboard in Sweden. It's placed at a bus stop. If somebody at the bus stop starts smoking, the billboard plays a video of a person choking. What this signal shows is that what used to be on our laptops and desktops—all of this information, all of this content—is moving into the real world. It will become available not just on billboards but all around us. We've talked about how the whole world can become infused with media, and that has happened. We can access content almost anywhere and interact with it.

If you are a futurist, you will get into the practice of looking for signals all the time. When you wake up in the morning and read the news, you will look at everything through the lens of these signals. You will naturally ask about events: "Is this a signal of something? Why?" This kind of curiosity and the ability to continually sense while also sharing with others is very important.

Ideally, people in organizations will think about signals and get together to share their observations. I call this *sensing.* To be a sensing organization, staff need to create some means, formal or informal, of aggregating these signals and working to interpret them. This will allow feedback and direction on what to do next.

#3: Look Back to See Forward.

I said earlier that there is no data about the future; the only data we have is about the past. While we cannot fully rely on past data to help us see the future, there are larger patterns in history that we tend to repeat over and over again. Thus, we need to look back to see forward. I've started to think of myself as a historian as much as a futurist. I'm trying to understand the larger story and to place what is happening today and what we see on the horizon into a larger context. We don't repeat our history completely, but we do repeat patterns. If we look at the invention of the printing press and the debates and worries that people had at that time, we see that those concerns are very similar to our current debates

and worries about fake news, computational propaganda, bots and how they skew our public opinion.[1] It's almost eerie. People were talking about fake information and propaganda and lies all those years ago!
What is the larger pattern? Changing our fundamental information, communications, and infrastructure changes our society in very dramatic ways. Why? Because of power dynamics. New media tools alter who has the voice, who has the platform, and who has the ability to shape opinion. In Gutenberg's days, the authority was with the church, which held the ultimate truth. But with the printing press, people could distribute leaflets. Luther nailed his thesis on the church doors. At that time, the transformation in the media led to social transformations, to scientific revolution, and even to wars. Eventually people created new rules, new regulations, new principles around how to value and assess this information and how to decide who has the authority to say what is true or not true. We are in the process of trying to figure this out again. This is our Gutenberg moment.

#4: Uncover Patterns.

Ultimately, the goal of aggregating signals and connecting these to the larger historical context helps us understand patterns of change—the deeper tides I mentioned earlier. It helps us understand how we got to key developments shaping our future. What is the larger story? What are the tides of change? At the Institute for the Future, we've been working with a pattern that we call the Two-Curve Framework. It comes from Ian Morrison, former president of the Institute for the Future, who wrote the book *The Second Curve*. In the book Morrison argues that in any period of large transformation—which I think we're going through now—we are simultaneously living along two curves (see figure 2).

Figure 2. The Two-Curve Framework
Source: Ian Morrison, Institute for the Future, 1996

The first curve is the descending curve. This is the curve we've lived on for a long time. We have rules, we have regulations, we have usage patterns, we know how to live this way. But that way of doing things is slowly declining, and we don't know the exact angle of the decline. At the same time, a new way of doing things is emerging: a nascent curve.

We're in the early stages—we're just now seeing signals of it—but this curve tells us something about a new way of doing things.

What we see, and what I write about in my book *The Nature of the Future,* is that the declining curve, the curve on which we've existed for a long time, is the curve of *institutional production*. It is a system in which most resources—money and people—are concentrated in large formal organizations, whether corporations, news organizations, or colleges/universities. But this way of doing things is on the decline. We're moving from institutional production to what I call *socialstructed creation.* In this way of doing things, a platform engages large numbers of people to create something that no formal organization could, with no or very little formal structure. The best example is Wikipedia. Today, the Wikipedia Foundation has about 300 staff and contractors, but the online encyclopedia has millions of contributors and billions of users from all around the world. Together they created what no one organization could create. We're seeing this new way of doing things in open-source software, in the news media, and in other parts of our lives.

Moving from the old to the new curve requires one to behave like an immigrant. I am an immigrant to this country, and I strongly believe that we are all immigrants to the future. We are all moving somewhere new, so it is good to have the mindset of an immigrant. When you're an immigrant, you must learn a new language, a new culture, a new way of doing things. These are exactly the attitudes and skills we need to bring to thinking about and shaping our future. We must be open to learning a new language, a new culture, a new way of doing things.

#5: Create a Community.

Being a futurist or thinking about the future is not a solitary affair. I have a lot of distrust for people who say: "I'm a futurist. I went to a mountaintop, and I saw this vision, and this is your future." That's not real futurism. Thinking about the future is a collaborative and highly communal affair. It requires a diversity of views. We need to involve experts from many different domains. When we think about anything, from higher education to work, we need to include people who bring different perspectives on the topic—demographics, economics, technology, artificial intelligence, organizations. We need young people in the room. A robust forecast is a collective endeavor; it's very much a product of collective intelligence. So, if you're going to create a sensing and signaling mechanism in your organization, make sure you're not bringing in people who all think the same way. Be sure to create a diverse group of people who can contribute their varied experiences and their differing knowledge to give you much more robust views of the future.

A few years ago, the Institute for the Future brought together a group of experts and contributors to develop a forecast that ties together innovations in blockchain technologies, new patterns of working and learning, and new forms of assessment. The product of this research was a provocative video scenario titled *Learning Is Earning 2026.*[2] What if we could bring blockchain and new reputation systems together in education? What would that scenario look like? What would it mean for students? For educators? What challenges would be created? We produced the video to raise these questions and to provoke conversations.

Conclusion

Fifty years ago, Alvin Toffler warned us of the impending "future shock," a condition not unlike the culture shock experienced by travelers to foreign countries, involving disorientation, irrationality, and malaise. "Imagine not merely an individual but an entire society, an entire generation—including its weakest, least intelligent, and most irrational members—suddenly transported into this new world. The result is mass disorientation, future shock on a grand scale."[3]

We seem to be living Toffler's future today. Between climate change, media disruption, and the rise of automation and machine intelligence, many people are feeling like they are victims rather than makers of the future: they are victims of the future shock. To overcome this malaise, we must answer Toffler's call to make futures thinking a way of life not just for a few innovators in Silicon Valley but for everyone—including students, educators, and average citizens.

At its best, futures thinking is not about predicting the future; rather, it is about engaging people in thinking deeply about complex issues, imagining new possibilities, connecting signals into larger patterns, connecting the past with the present and the future, and making better choices today. Futures thinking skills are essential for everyone to learn in order to better navigate their own lives and to make better decisions in the face of so many transformations in our basic technologies and organizational structures. The more you practice futures thinking, the better you get. The five principles outlined above—not focusing on predictions, uncovering signals, understanding historical trajectories, weaving together larger patterns, and bringing diverse voices into the conversation—should help you on your journey of making futures thinking a way of life for you and your community.

Notes

1. Gorbis, "Our Gutenberg Moment," *Stanford Social Innovation Review,* March 15, 2017.
2. "Learning Is Earning 2026," March 6, 2016, is available on the **Institute for the Future YouTube channel**.
3. Alvin Toffler, *Future Shock* (New York: Random House, 1970), 12. The book grew out of an earlier article: Alvin Toffler, "The Future as a Way of Life," *Horizon* (Summer 1965) 7, no. 3.

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Signals in the Noise

TEN RECENT LOW-TECH INVENTIONS THAT HAVE CHANGED THE WORLD

Technologies don't have to be cutting edge to make a profound difference in people's lives.

Oral Rehydration Salts

By the early 1990s, diarrheal diseases were killing some 5 million children under the age of five every year. That number is down to about 1.5 million, thanks to oral rehydration salts—a mixture of salt and sugar that can be dissolved in water and administered at home. Zinc is sometimes added to the mix to reduce the severity and duration of diarrhea. This simple innovation has perhaps saved more lives at lower cost than any other.

Cheap, Low-Power Irrigation

Rainwater catchment and solar + gravity-fed drip irrigation system being installed for flower crops in a high tunnel at Greenhouse 17

Irrigation accounts for the bulk of fresh-water use in most countries—something like three quarters of the total. Drip irrigation uses half as much water as conventional irrigation and is half again as productive. But it's expensive and usually requires electrical power. The GEAR lab at MIT has developed low-pressure solar-powered drip irrigation systems that can deliver the benefits at much lower cost.

DC-Power Microgrid

Solar cells can provide cheap, decentralized electricity. But if you're plugging them into conventional devices on a normal household grid, there's a lot of overhead involved in converting the direct current they produce into alternating current and back again. A well-designed small DC network can save a substantial amount of energy by eliminating this need.

Signals in the Noise

TEN RECENT LOW-TECH INVENTIONS THAT HAVE CHANGED THE WORLD

Better Woodstoves

Deforestation is a major problem in much of the developing world, as is the harm to human health that comes from breathing in the particulate matter in smoke from woodstoves. Better-designed stoves like the Berkeley-Darfur stove use only half as much fuel to cook a comparable amount of food, and they cut the particulate emissions in half as well.

Simple, Effective Water Filters

Hundreds of millions of people around the world lack access to safe water. Simple, cheap water filters use ash combined with silver nanoparticles to filter out impurities and pathogens; they have improved the lives of hundreds of thousands.

Hippo Roller

Hundreds of millions of people, usually women, have to walk every day to get enough water for their basic needs and transport it home in buckets. The Hippo roller is a heavy-duty plastic barrel that can be flipped on its side and rolled home, via an attached handle, over rough terrain.

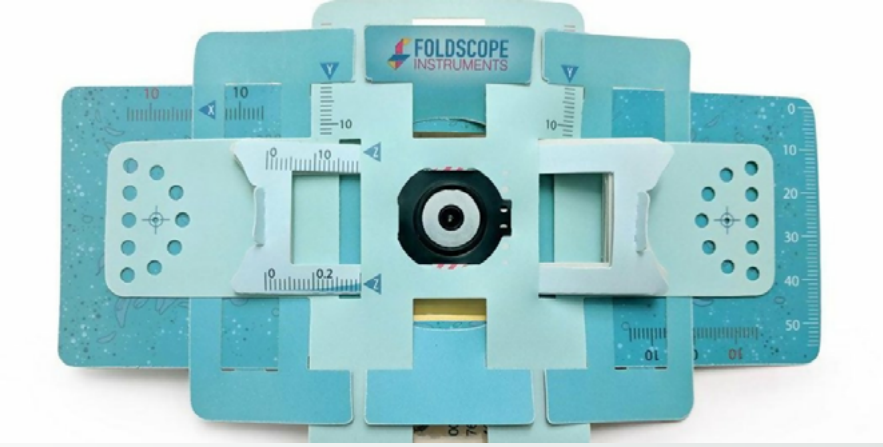
Jet Injections

Vaccines are crucial for public health. But in the developing world, distributing the vaccine to where it's needed is only part of the problem. How do you administer it in a place where sterile needles might be scarce? One fix is a jet injector, a decades-old invention that can send a high-pressure, directed stream of fluid through the skin.

Signals in the Noise

TEN RECENT LOW-TECH INVENTIONS THAT HAVE CHANGED THE WORLD

Paper Microscopes

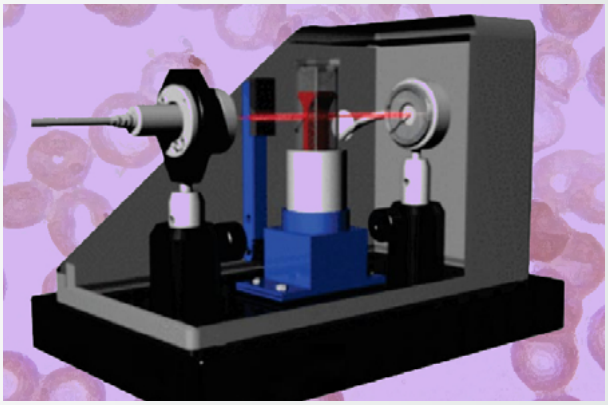


Microscopes are crucial for diagnosing infectious disease. But in some ways they're the worst possible device—heavy, expensive, and hard to maintain. Paper microscopes, also known as foldscopes, contain all the crucial parts within one foldable sheet of paper. They can be optimized for different diseases and cost less than a dollar.

Disaster Communications System

Cell phones are common even in poor countries, but when a natural disaster strikes, the communications networks these devices rely upon can fail. Developed in Chile, SiE is a system that encodes text into high-frequency audio tones that can be distributed over broadcast radio waves and received on any smartphone without requiring any internet infrastructure. An app on the phone listens for these tones and transforms them into a text message.

Portable Malaria Screener



Malaria kills 1,200 children a day. Quick diagnosis and treatment is crucial, but that typically requires a microscope and a reliable technician to analyze blood samples. A quicker, simpler system developed last year at the University of Southern California is portable and detects levels of hemozoin, a by-product created by the malaria parasite, which reveals how far the disease has progressed.

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