

Revolutionary Future Ahead

By John Mauldin | August 24, 2018



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Back in 1936, in *Esquire* magazine of all places, F. Scott Fitzgerald [wrote something profound](#).
“The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.”

As someone privileged to have met some of the world’s greatest thinkers, I know what first-rate intelligence looks like. I am not in their league, but I think I’m pretty good at holding opposing ideas. It’s why I’m often called the “muddle-through guy.” When I consider contradictory scenarios, I figure reality will be somewhere in between. That’s right more often than you might suspect.

So, let's consider two seemingly conflicting ideas.

1. Major economic pain is coming.
2. We have a bright, prosperous economic future.

Can both of those be right? I think so.

I explained last week in [The Good News Economy](#) how the current recovery should continue for a couple more years. Beyond that lies the Great Reset, featuring the “major economic pain” part. But beyond *that* is something much better... a time unprecedented in human history, when life will improve in ways we can barely imagine right now.

We'll have a better chance to get through the Great Reset with assets and sanity intact if we remember the good things waiting for us on the other side and take advantage of them as soon as possible. Today we'll talk about some of the technology and biotechnology developments that I believe will drive economic growth in the next decade or two. Full disclosure: This is a very short version of my forthcoming book, *The Age of Transformation*.

Change Happens Fast

Our various gadgets become so integral to daily life that we can forget what life was like without them. I've said this before, but it bears repeating: No one on Earth had a smartphone until 2007. That first iPhone, revolutionary at the time, was primitive compared to even today's low-end models.

Now, can you imagine living without your iPhone or Galaxy or whatever you have? The answer for most of us is probably not. Some Luddites don't like being online, and to each his own. I like my tech. But that just illustrates how fast the world can change. One invention, in one decade, radically altered both daily life and the global economy. Not without some downside, but I think mostly for the better.

Think about it from the other direction. In 2007, could you have imagined those little devices would have the staggering impact we now see as perfectly normal? Again, probably not. Many imagined the opposite: “Why do I want the internet in my pocket?” Guess what: Almost everyone who said that now has the internet in their pocket and would not dream of living without it. Certainly not if you are a Millennial.

In the next decade, we'll see *multiple* inventions bring similar and, I believe, even greater changes. The details won't be immediately obvious, but the changes will come. By 2030, they will be as ho-hum to us as smartphones are today.

It may not even take that long. The pace of technological change is accelerating, as is the speed at which new inventions propagate around the world. Intangible software and information can spread at lightspeed, while 3-D printing will let manufacturing capacity grow faster and more widely than we've ever seen before.

In sum, the *kind* of change, *magnitude* of change, and *rate* of change will all likely speed up considerably in the coming years. It will be a roller-coaster ride. Now let's look at some of the twists and turns it will bring us.

The Mathematical Reason for Accelerated Change

Back in the late 1700s, *maybe* a dozen people understood the steam engine, mostly dilettantes doing it for fun. James Watt understood the business implications and eventually built a steam engine that could do the work of four horses pumping water out of a coal mine.

John Wilkinson—who developed a machine to make a true bore so cannons could shoot longer and further—decided to use steam engines to power his fires. He took the engine apart, saw that the “bore” of the engine was not true and redid it. Voilà, a 16-horsepower engine. Then dozens and eventually hundreds of engineers and tinkerers improved performance further.

Fast forward to today. Today we routinely throw hundreds of scientists and engineers at much simpler problems. But it is going to accelerate even more.

Google and Facebook are in a race to make wireless internet available to every part of the earth. Google will use what is known as high balloons and Facebook is working on solar drones. Google is already supposedly circumnavigated the globe at one meridian in the southern hemisphere. Both technologies are viable, it will simply be a matter of which is the less expensive and more workable.

In the not-too-distant future, and certainly by 2025, wireless voice and data networks will be available to every human on the earth.

By the middle of the next decade, Wi-Fi will be essentially free or at negligible cost. Seriously. That means three billion more people will be connected to the internet. If 0.0001 percent of those three billion people (or merely 30,000) create a major new technology or business idea, that will accelerate the pace of change and make life better for all of us. Give them access to the internet and artificial intelligence expert systems, and stand back and watch what happens as individual humans try to improve their own lives.

Turning Back the Clock

Demographic challenges lie behind many of our economic problems, and the #1 demographic challenge is aging. Specifically, too many of us aging at the same time and not doing it very well. The resulting health problems both cost money to treat and may remove us from the workforce when we could otherwise stay happily productive.

This is going to change for the better. I don't mean simply longer lifespans, though I think that will happen, too. Adding more years is not necessarily a blessing if they simply extend your pain and make you a burden to others. Much better to have a long, healthy life, and then decline quickly when it naturally ends.

That is exactly where biotechnology is taking us. My friend Patrick Cox [writes about this](#) extensively. He believes, as do many top scientists we both know, that we are only a few years away from treatments that can not only slow the aging process to a crawl, but in some quite profound ways, actually reverse it. We already see it in animal studies. Elderly mice exposed to these new treatments regrow their hair, gain muscle mass, see and hear better, and even regain their sexual vigor. Maybe not the mythical fountain of youth, but at least a fountain of middle-age. And let me tell you from where I stand, about one month shy of 69, middle-age sounds really good right now.

Obviously, humans are not mice and the research is ongoing. In fact, it is accelerating because the Japanese government (which not coincidentally faces major demographic headaches) is removing many of the bureaucratic hurdles that slow down progress. Some treatments could be available there as soon as two or three years from now.

If it works in Japan, other countries will follow quickly because it will be in their own financial self-interest. Taking care of an aging, unhealthy population is expensive. Think of all the time, money, and attention that goes to health care. In the US, it's about 18% of GDP—the majority of which is spent on elderly people. If we can not only get them healthier but actually *make them younger*, some of that money can find better uses.

Then there is the astonishing progress being made against our most challenging medical foes: cancer, heart disease, diabetes, and assorted other killers. Big data and AI systems are quickly decoding the genetics behind some of them, leading to better detection and treatment. I truly believe we will have eliminated most cancers by 2030, or at least turned them into minor, easily treated conditions. Imagine the productivity boost from having all those patients stay alive and working. (Again, full disclosure: I'm invested in a company that is in phase 2 of a "silver bullet" cancer cure. If we are successful, and it is still *if*, the treatment will not require hospitalization and seems to have minimal side effects. I now think the biggest risk to my investment is not that our drug does not work, but that other drugs will be cheaper, better, and faster.) You can't believe how much progress there is being made in this area.

As with HIV, cancer may soon become a chronic condition treated with a cocktail of drugs rather than just one therapy. There are so many possible scenarios, it's almost impossible to describe what the path will look like over the next 10 to 15 years. But barring stupid governments, by 2030, cancer will be a nuisance and not a death sentence, and certainly not something that will take massive national expenditures.

New Space Race

At [the end of last week's letter](#), I mentioned the billionaires' space race. Paul Allen, Jeff Bezos, Richard Branson, and Elon Musk all want to send satellites and/or people into orbit and eventually beyond. Unlike the 1960's US-Soviet space race, this one has unashamedly commercial motives.

These men are so wealthy, in part because they can recognize opportunities and what it takes to seize them. Reaching space at a reasonable cost is the first step, so that's the first order of business. They have different ideas on how to do it. Time will tell what works best... and competition between them will probably work better and faster than waiting for the government to do it.

The first goal is to put more satellites in orbit. We forget that our smartphone location features depend on the satellite-based Global Positioning System. And of course, satellites take the pictures you see on your phone's mapping app. All that works well, but more satellites will make it even better.

My friend Peter Diamandis wrote an interesting blog post on this last month.

As of August 2017, there were nearly 1,800 operational satellites in orbit. Of these, 742 are communications satellites, 596 are used for Earth observation, and 108 are used for navigation.

We're seeing a massive increase in the number of operational satellites as satellites become smaller and launch costs plummet.

Private companies all over the world are building out satellite technology. For example, China plans to place 60 commercial (i.e. private) high-resolution Jilin 1 imaging satellites in orbit by 2020.

Planet Labs is a disruptive company using milk-carton sized imaging satellites to help entire industries obtain game-changing data. Planet Labs showcases 175+ satellites in orbit, enabling them to image anywhere on the globe with up to 3.72-meter resolution.

Alternatively, Planet Labs offers a specialized, targeted satellite option called SkySats. Thirteen of these satellites can achieve up to 72-centimeter resolution. SkySats can also capture video, which can be used to extrapolate 3D models. These satellites are built on the same technology that Google deployed to capture crisp 3D image views for Google Maps.

Imagine Google Maps satellite imagery that is *live*, not months or years old. What could you do with that capability? Farmers, mapping software, construction, maintaining operational control of your logistics supply line, and a thousand other things we haven't even thought about today. We're going to find out, on top of many other benefits from easy, low-cost access to space.

Beyond that, a wealth of minerals are just waiting to be collected out there, both in asteroids and on the Moon. Bringing them to Earth in greater quantities than we have now could enable untold miracles.

Financial Revolution

Recently I heard someone say banks are now essentially technology companies. So much lending now happens in the capital markets and “shadow banks” that the legacy banks are mostly service providers. They process payments, hold assets in custody, and provide the financial system’s necessary plumbing. Old-style “banking” is on the way out.

That may be a stretch, but it is true that the financial services business is changing fast, due largely to technology. Stock trading commissions are one obvious example. Remember when it used to cost \$50 to buy 100 shares of a stock? It wasn’t that long ago. Now the fee is pennies or even zero. That’s partly because brokers have found new ways to make revenue from order flow, and partly because their costs are mostly fixed. Once you have the systems in place, the incremental cost of processing one more trade is negligible. Competition does the rest and customers win.

More competition is coming. You know what Amazon has done to the retailing industry? Banks may be next. Here’s an amazing graphic from CB Insights.



Source: *CB Insights*

In short, Amazon has ways to deliver many of the services we presently get from banks. So where exactly is that line between technology and banking? It’s hard to say and getting harder.

Blockchain-based cryptocurrencies are slowly finding their place in the financial system, too. I've been a Bitcoin skeptic—and it may yet give way to some other currency—but this isn't fool's gold. The technology has real advantages that will change the industry.

When I see people like John Burbank and Mark Yusko essentially go “all-in” on blockchain investments, staking their careers and reputations and hundreds of millions of dollars on something so ephemeral to most of us, I sit up and take notice. Something is happening here.

Finally—and you wouldn't know this from all the tariff talk—capital is flowing around the world like never before. Investors who once thought they should stick “close to home” have branched out internationally. They do this in part because technology makes it possible to monitor assets you own, even on the other side of the world. This is good because it means capital will flow more easily to the entrepreneurs with the best ideas, wherever they may be geographically. Ultimately, that's good for everyone.

It Is Happening Everywhere

Cambridge and Oxford could have been Silicon Valley. They had the Turing machine, but the bureaucrats were so afraid Russia would steal it they literally tore it down. They drove the greatest mathematical mind of the time, Alan Turing, to suicide simply because he was homosexual.

Over in the United States, ENIAC was formally dedicated at the [University of Pennsylvania](#) on February 15, 1946, and was heralded as a “Giant Brain” by the press. It had a speed on the order of one thousand times faster than [electro-mechanical](#) machines; this computational power, coupled with general-purpose programmability, excited scientists and industrialists alike. (Wikipedia)

What did the US do? The University of Pennsylvania threw a conference and three dozen schools came. Shown every design detail, they all went back and created computer schools and courses at their universities. Truly open source development.

From a human perspective, it really doesn't make any difference where an invention comes from, as long as it improves our lives. 35% of artificial intelligence research funding will come from China in the next three years. PricewaterhouseCoopers recently projected AI's deployment will add \$15.7 trillion to global GDP by 2030, with China taking home \$7 trillion of that total, dwarfing North America's \$3.7 trillion share.

You think engineers and scientists in India are going to sit back? Or Thailand? No. Ricardo was right, different countries will specialize in their strengths. Yes, we would all like our home team to be the one that benefits the most, but the reality is the *world* is going to benefit, and we are all part of the world.

One day I will do a letter on China's rising companies. Yes, many are state-sponsored, and we can grouse about it all we want, but then a lot of US research has been state-funded, too. That's just what countries do. You think Airbus doesn't get a lot of subsidies? But they make good planes. I like them. Just like I like Boeing planes. It makes no difference to me which plane I get on if it gets me there safely.

In India, you can get all the music you want streamed to your phone or device for literally pennies a month, not the \$10 a month we pay to Spotify, which still seems incredibly low. I could go on with examples for pages, and probably will in my book.

But understand, all of these remarkable changes and improvements in our lives are going to happen even as we figure out how to deal with global debt. And those changes and improvements are going to be extraordinarily powerful investments if we get there at the right time and place.

Summer Winding Down

None of this means we are entering Nirvana next week. We're going to have another recession eventually. The Great Reset is still coming. I expect to be talking about recessions in the next century. But the Great Reset and recessions won't be the end of the world. Good things will keep happening, and we'll get to the other side.

In the Vietnam War, "light at the end of the tunnel" became kind of a joke because the war seemed endless. Finally it did end, and some bad years followed. But now Vietnam is at peace and its economy growing fast.

One of my favorite frontier market investors told me at Camp Kotok that Vietnam is his favorite opportunity right now. There really was light ahead in their long, dark tunnel. Getting to it just took time. We will get there, too.

I don't have any trips or personal news to report this week. We're in August, it's hot and summer is winding down. I'm looking forward to cooler weather and even cooler new technology.

Your really optimistic about the future analyst,



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