

MAULDIN ECONOMICS  
SIC 2020

MATT RIDLEY

Moderator: Ed D'Agostino // John Mauldin

MATT: Shall I kick off with my slides, which I think you can see as well as my face? It's great to be with everybody in these extraordinary times, a quite unprecedented situation. I'm in the north of England. I think you're in many different places.

We face a truly terrible pandemic that is quite unprecedented in the impact it's having on the world. And if we can see the next slide, you will see that we are past the worst at least. The death toll is beginning to decline. But Europe and North America are where most of the deaths are happening. These are the worldwide pattern of deaths. So we can begin, at least, to think about how do we put the world back together economically as well as in medical terms after this pandemic. And what I want to talk about is the need for innovation in that period.

So if I look at the next slide. And if you click again, you'll see the issues that I think we're going to have to deal with, and I'm not going to deal with all of these in any depth. But there is the question of tackling zoonoses and wildlife markets. That is to say, diseases that jump out of wildlife and the way they get amplified in wet markets, particularly in East Asia. Clearly a big issue that faces the world.

Then we have to face whether or not we can keep global trade patterns going after the impact of this on the degree to which countries will want to reassure that trade and move away from dependence, particularly on China. And I, for one, hope that we don't throw the baby of global trade out with the bathwater of the problem of the pandemic.

We need to address pandemic preparedness. Why it was that the world was so much not ready for coping with the impact of a pandemic like this. And that will obviously redirect a lot of the world's resources into medical and health areas. I'm very interested in the degree to which we can improve health and medical innovation in response to this. I've been surprised by how slow we are to develop vaccines still, how little change there has been in the possibility of developing vaccines. I've also been struck by how long it takes to license a new medical device... in many, many months in many cases. And that, I think, has deterred a lot of innovation in that area.

Obviously, the world as a whole will have to move on to how to put the world economy back together and get the jobs and the prosperity back that we've all had. And it's there that I want to bring in a little rational optimism, which was, as Ed said, the subject of my book in 2010. And the main thesis of which I think still stands. John Mauldin particularly asked me to talk about *The Evolution of Everything*, which was the subject

of my last book, and I will, in the middle of the talk, touch on that, because I think it's very important to understand the degree to which our world is a bottom up world of spontaneous order rather than a top-down world directed from above.

Next slide, please. So just as we click through these, and if I won't say next slide, but if you could click slowly on each thing.

The first thing I'm going to point out is how gradual innovation is. It's not a case of disruptive big steps.

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It's serendipitous. That is to say, often the results of innovation come from unexpected directions. (Keep clicking, please.) It's recombinant. That is to say what the way we produce new ideas is by recombining different technologies.

Innovation is different from invention. That is to say, innovation is the turning of inventions into things that are of practical and affordable use and available to everybody. It runs on trial and error. Again and again, when you talk to innovators, they emphasize the importance of being able to do trial and error. It's a team sport. It's not an individual pursuit. You need to have your predecessors and your successors and indeed your collaborators involved in an innovation. There's an inexorable quality about it. Once it starts, it moves automatically to the next stage. There's what I call the hype cycle, that innovation tends to disappoint in the short term and then exceed our expectations in the long term. It likes fragmented governments. It doesn't like large empires. On the whole, innovation happens when you have different city states, or states in the case of America, competing with each other. It is, above all, an evolutionary phenomenon. It is driven by natural selection among ideas. It's a bottom up phenomenon that produces spontaneous order. It is both the seed of science and the fruit of science. But we tend to think of it as the fruit of science, whereas I think it's just as important to see it as the seed of science, that technology results in science. It doesn't destroy jobs. It creates them. It doesn't necessarily mean that we're running out of resources, because on the whole, a lot of innovation means doing more with less. And above all, it flourishes in freedom.

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So just to take those points in turn, if you think about the history of something like computing, you think in terms of great breakthroughs that led to great changes. So the change from the vacuum tube to the transistor and from the transistor to the integrated circuit. But if you plot what is effectively Moore's Law back through previous

technologies, calculations per second, per thousand dollars, this is Ray Kurzweil's graph, you don't see step changes at all. You just see a gradual, incremental improvement. Innovation requires us to move from one stage to another. Each technology enables you to develop the next one. And so it's a much more gradual phenomenon than we generally give it credit for.

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It is serendipitous. And as I say, that means it comes with surprises from surprising directions. Both the Post-it Note at 3M and Kevlar at Dupont were invented by people looking for something completely different. And those are good examples of what happens. So we need to be open to the possibility of innovation producing ideas from different directions.

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Nearly all our technologies consist of other technologies combined. And this is a nice example. It's a pill camera. It takes a picture of your insides. It came about after a conversation over a garden fence between a gastroenterologist and a guided missile designer. That's the kind of thing I mean by ideas having sex.

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And the result of this is a rather fascinating phenomenon. This is an object that sits on my desk at home. It's an Acheulean hand-axe of the kind made by Homo erectus. And right next to it, there's another object of exactly the same size and shape. And, of course, this has an uncanny echo of the fact that our hands are the same as they were half a million years ago. These are both objects designed to fit the human hand. But the one on the left is made from a single substance, whereas the one on the right is made of silicon and metal and plastic, and it came about as a result of the combination of ideas, the idea of plastic. The idea of computing. The idea of the mouse. The idea of software. These were all ideas that occurred to different people in different times and different places and were combined within this one object. And I think it's very important that we understand... if we try to understand how the world works, that this is the process by which we produce the technologies on which we depend. And indeed, the ideas on which we depend.

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The result is, as Leonard Reid pointed out rather beautifully in an essay called *I Pencil* many years ago, that a simple object like a pencil is the product of many, many different

people working in many, many different places because there's someone cutting down a tree whose wood is going to be used in making the pencil. There's someone else mining, graphite. There are people growing coffee for the people who are cutting down the trees. There are people working in pencil factories. They're all collaborating to make a pencil. And there's hundreds of thousands, perhaps even millions of them. And the amazing thing is that not one of them knows how to make a pencil. The knowledge is not held inside individual heads, it's held between heads, it's held in the cloud, and it has been for thousands of years. The computer cloud is only the latest version of this.

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And this comes about because of a peculiar human habit—the habit of exchange. As Adam Smith famously said, “No man ever saw a dog make fair and deliberate exchange of a bone with another dog.” We just love swapping things. And that enables us to combine the expertise that we have with that of other people and produce things that are beyond the capability of individual minds to understand, such as how to feed a city. You know, the problem of how to make sure that everybody gets lunch in a big city like London is almost unimaginably difficult. And if somebody was in charge of it, they would make a mess of it. But by combining our minds, we can produce an outcome that works.

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It's quite important, I think, to understand that innovation is different from invention. And the nicest way of explaining this is the story that Charles Townes, the inventor of the laser, used to say... used to tell, which is that there's a beaver and a rabbit looking at the Hoover Dam and the beaver says, no, I didn't build it, but it's based on an idea of mine. So inventors sometimes feel short-changed that they don't get enough credit for something when it goes into production and reaches the market. But that's because innovation requires the extraordinary hard work of making something producible, affordable, and workable. And that's the complex process of innovation.

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So the results of this is that we can... the purpose of innovation is to bring things affordably within the reach of ordinary people. As Joseph Schumpeter put it, “The capitalist achievement does not typically consist in providing more silk stockings for queens, but in bringing them within the reach of factory girls.”

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And there's Thomas Edison, who was famously good at innovation because what he essentially did was understand the importance of trial and error. He said, "I have not failed. I've just found 10,000 ways that won't work." This is a central part of how innovation happens, and Edison was also the one who said that it is one percent inspiration and 99 percent perspiration.

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It's quite important, I think, to understand how people collaborate. So Norman Borlaug, gets the credit for the short strawed wheat that launched the Green Revolution in India and Pakistan, basically banishing famine from the world in the 1960s. But Borlaug got the idea from a man named Burton Bayles, who he met at a conference in Buenos Aires who told him about dwarf wheats. Bayles had got the idea from Orville Vogel in Oregon. Vogel had got the idea from Cecil Salmon, who was on Douglas MacArthur's staff in Tokyo at the end of the Second World War, and he got the idea from Gonjiro Inuzuka who had at a experimental station in Japan, bred these short wheats that grew much more vigorously and produced much higher yields. And then Borlaug passed the idea on to M.S. Swaminathan in India, who championed the development of these varieties. So it's very important, I think, to understand that innovation is a team sport, not an individual process.

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Kevin Kelly in his book explores the fact that almost every technology you look at has rival inventors saying, hang on, I invented this independently. There are huge disputes between people almost always. The best example of this is the light bulb, which is the sort of emblematic instance of innovation. But in fact, Thomas Edison had lots of rivals who said, no, I invented the light bulb. In fact, there are 21 different people who have a good claim to having invented the light bulb around the same time as Edison. There was Swan in England. There was Lodygin in Russia and so on. And all of them were working independently. How is it that innovation can be so inevitable that this can happen? And the answer is that that technology was ripe. The combination of glass and vacuums and filaments for lighting and electricity had come together in a way that made it possible to combine them to make a light bulb at that time, and it was just inevitable that that would happen.

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The same is true of search engines today—or rather, in the 1990s. Once the internet had reached a certain stage, it was sort of inevitable that search engines would become tremendously dominant and very important in an enabling us to navigate the web. If

Sergey Brin had never met Larry Page, we would still have search engines. In fact, there were lots about before Google already. And yet, here's the strange thing. Nobody saw the light bulb coming, and nobody saw the search engine coming. If you read early accounts of how we're going to use the internet, almost nobody talks about search engines. And even the Google founders themselves didn't realize that this was the way that they were going to make money—was from search. They didn't actually set out to create a search engine. They set out to catalog the internet.

So I think it's very... there's this strange asymmetry of innovation, that it looks fantastically predictable in retrospect, but not predictable at all if you're looking forward, is a curious feature of it.

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And of course, this means that it is extremely difficult to predict what is going to happen next. Here are some very, very clever people saying some very, very stupid things about the future. Ernest Rutherford says, "Anyone who expects a source of power from the transmission of the atom is talking moonshine." Ken Olsen, the chairman of the most successful computer company of the 1970s with the mini-computer, says, "There is no reason anyone would want a computer in their home." Paul Krugman, the Nobel Prize winning economist, says in 1998 that "by 2005 or so it'll become clear that the Internet's impact on the economy will have been no greater than the fax machine's." And Steve Ballmer, the chief executive of Microsoft, said, "There's no chance that the iPhone is going to get significant market share. No chance." So we seem to be really, really bad at seeing the future, despite the fact that technology has an inexorable inevitability about it.

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Here's a favorite example of this, this is a cartoon from the year I was born about what the future was going to look like in the 21st century, and notice that a mailman is delivering mail with a rocket strapped to his back. So it's old-fashioned letters. They haven't thought of e-mail, but transport is spectacular. You can jump from house to house using a personalized rocket. In fact, when you think about it, by the 1950s, there had been 50 years of extraordinary changes in transport and very little change in communication. Whereas in the 50 years since it's the opposite, we've had almost no change in transport. We still have 747s which were entered in service in 1969, whereas we've had enormous changes in computing, communication and computing. And that implies that the next 50 years are not going to be about either transport or computing, but might be about something completely different, like biotechnology or something like

that. We're probably overestimating the importance of computing and communication in the developments of the next 50 years.

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Not that everybody got everything wrong. I love this picture from a 1930s German magazine showing how telephones would look in the future.

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The Amara Hype Cycle is what I call this. Roy Amara was the man who said back in the 1960s that "we underestimate the impact of new technologies in the long run, but we overestimate them in the short run." And this is true when you think about it, of most of the technologies, and it's the reason why those forecasts I gave a few moments ago were so wrong. I think it's fair to say that the internet is no longer a disappointing technology. It is over-delivering now. Genomics was disappointing for most of the last 15 years, I would say, but is now beginning to show real promise. AI is probably still not quite fulfilling its potential. And as for blockchain, it has hardly begun to disappoint us yet, but one day, it might surprise us and do something spectacular.

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Empires are bad at innovation. I think it's important to understand that fragmented polities are where innovation happens best. Song China was extremely innovative, and it was a time when it was not very unified; whereas the Ottoman Empire, the Roman Empire, the British Empire, the Ming Empire in China, these are times when innovation stagnates and stops happening.

And I think this is the reason why the European Union has really struggled to be good at innovation in the last few decades. It hasn't been able to produce digital giants to rival Amazon and Google and things like that, And it's not been able to advance biotechnology because basically it is trying to be an empire with a centralized decision-making political process.

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And of course, the same is true of big companies. Big, imperial companies are taken by surprise by technologies coming from their smaller rivals. Kodak did know about digital photography, did indeed arguably invent it. It had an early prototype, but it was so invested in film that it didn't want to disrupt its own business and it looked the other way. Nokia was by far the biggest mobile phone company in the world, spending more

on research and development than all the others put together at a certain point, but it was so invested in voice that it didn't realize the importance of data.

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Now, this is the idea that I think is really crucial, to understand that innovation is an evolutionary process. And to illustrate that, it's worth quoting this French philosopher who went by the name of Alain: "Every boat is copied from another boat. Let's reason as follows in the manner of Darwin. It is clear that a very badly made boat will end up at the bottom after one or two voyages and thus never be copied. One could then say with complete rigor that it is the sea herself who fashions the boats, choosing those which function and destroying the others."

When you get on a jet airliner, you think of it as something that's been designed by people, and of course, it's in a sense that's true. But in another sense, they didn't start from scratch. They started from previous designs, and they kept things that worked in previous designs and discarded things that weren't so successful and so on—all the way back to the Wright brothers. In that sense, our technology really does evolve.

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And you can see that in the way we find dissent with modification in all of our technologies. We really can see the parenthood, the pedigree of the technologies we use, and this isn't just true of physical technologies. It's true of ideas. It's true of institutions that they combine and recombine, and they produce offspring and the offspring varies slightly, and as I say, it's a gradual process.

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One of the consequences of this is that there are things in the world that are extremely ordered and organized but are not designed, and yet they are manmade. Adam Ferguson, a Scottish philosopher, said there are things that are the result of human action, but not the execution of any human design. What did he mean by that?

Well, he meant something like the English language, which is obviously a manmade phenomenon, but nobody invented it. Nobody is in charge of it. There is no committee to organize it. It doesn't require any central direction. The same is true of the internet. The internet came about because of the interaction among lots of different people. It's absurd to try and talk about somebody inventing the internet or indeed somebody directing the internet today.



So my argument here is that there are all sorts of aspects of human society that are the results of human action but not the execution of any human design, that are, in a sense, much more bottom-up, much more a case of spontaneous order than we recognize. And we tend to make the mistake of thinking that we have to put somebody in charge of them to make them work.

In other words, we tend to be much too creationist about it. We got used to the idea, most of us, that when you see complex and sophisticated order in the natural world, you don't have to imply that there was a designer.

I think we're making the same creationist mistake, though, about human society. We're thinking that you have to put government in charge of things in order to produce order, and I'm not sure that's the case.

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I think it's crucial to understand that whereas politicians and journalists think that technology is something that comes out of the bottom of a pipe and science is something that goes in the top of the pipe, that there's a linear relationship between the input of science and the output of technology. But actually, those who study the economics of this have abandoned that idea a long time ago. They do not see it as a linear one-way relationship. There are all sorts of examples where technology is the seed of science rather than the fruit. The science of thermodynamics came out of the steam engine rather than vice versa. And this is still happening today. A good example is the CRISPR/Cas9 genome editing technology that is being used to do precise edits to human genomes and the genomes of plants and animals. This looks like a purely scientific, academic, university-based invention that has come into the real world of industry.

But actually, when you look at where the universities that have been developing it got the idea from, they got it from the yogurt industry. Why? Because in the yogurt industry, it's important to keep bacteria alive and healthy, and occasionally they get sick. And when they get sick, they catch viruses, so yogurt companies employ bacteriologists to study the immune systems of bacteria. And they picked up on a hint from work by an academic working with the salt industry in Spain. There was a strange structure in the genomes of bacteria, which was very repetitive and had very long palindromes in it, that is to say things repeated backwards, and that there was a hint that it might be part of the immune system of bacteria. And it sure enough, it turned out to be the way in which bacteria stored libraries of their enemies so as to know when to go on the attack against a virus that had infected them.

And it was possible to repurpose this genomic sequence as a tool for the use in biotechnology. So a very nice example of how science and technology have been reciprocal rather than one leading to the other.

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I think we should get away from the idea that innovation destroys jobs. We've been worrying about this for 200 years and, in that time, we have automated agriculture and manufacturing almost entirely and we're left mostly working in the service sector. But we have not seen a reduction in employment, indeed, quite the reverse. More of the population is in employment than... or at least before the pandemic that was true... than for a long time. And why is this? Well, it's because innovation produces automation, which actually produces new jobs. Imagine trying to explain to somebody from the Victorian times what a software engineer is or a flight attendant. There are new opportunities that come out of this, and we have worried too much about the idea that automation is going to take away jobs, and our current worry is that it's going to take away middle class jobs like doctors and lawyers because of artificial intelligence. Well, I don't think that's anymore... yes, there will be individual job losses in individual sectors but overall, I think it's extremely unlikely.

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And you often hear that you cannot innovate or grow infinitely in a finite world. And I'm not sure that's true either, because your innovation can be something that uses less material to produce a similar product. So, for example, a modern drinks can has about 13 percent as much aluminum in it as a drinks can from when drinks cans were first invented. So less and less metal is used. Less metal is used in cars and in buildings than before. This is my favorite example, which is that we use 68 percent less land to produce a given amount of food, as we did 50 years ago.

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Innovation flourishes in freedom. On the left is a proclamation by King Charles the second of England, to try and ban coffee. All throughout Europe and indeed the Middle East in the 1500s and 1600s, rulers tried to illegalize coffee, to ban it. And the reason they did so was because, well, partly because they were being lobbied by the brewing industry or the wine industry who didn't want a competitor, but also partly because coffee led to fake news. That is to say, it led people to gather in coffee houses and discuss whether the king was a good king, which the king didn't like. So he tried to ban coffee.

So there's been huge resistance from innovation, and it is very easy for authorities to get rid of it. By contrast, look at what happened in the late 1990s under the Clinton administration in the United States. The Digital Millennium Copyright Act was an extremely permissive form of legislation. It essentially launched e-commerce and, if it had not happened, we would not be nearly as advanced in online commerce as we are today, because what it essentially did was make the distinction between a website as a platform rather than a publisher, and thereby kicked off the extraordinary explosion of online commerce that we've seen.

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Now, I want to end by cheering you up as Ed promised. I wrote a book called *The Rational Optimist* 10 years ago. I said the world has been getting extraordinarily better and is going to go on getting better despite the bad things that would happen, and I did say a pandemic might be one of them, actually. And in the 10 years since that book has been published, there's always been something happening in the world that has led people to say, well, you can't possibly still be an optimist because of the war in Syria, the war in Ukraine, the euro crisis, the whatever it might be.

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Imagine asking this question. (Don't click yet on the next one, stop there, that's fine.) If you ask the question, has the percentage of the world population that lives in extreme poverty doubled, halved, or stayed the same over the last 20 years? And Hans Rosling did, indeed, ask a thousand people this question in the US, and then he repeated it in the UK, and the answer he got was very similar in both countries that 65 percent of people think that the number of people living in poverty, the percentage of the world population living in poverty has doubled in the last 20 years, and only five percent think it has halved. The five percent are right, and the 65 percent are wrong, which is interesting in itself. But then Rosling said if he'd written those three answers on three bananas and thrown them to a monkey (next slide, sorry, next click) then the monkey would have picked up the right answer one third of the time, 33 percent of the time. It would have done six times as well as human beings at answering a question about human society. How is this? How can it be that we are so steeped in pessimism that we are unable... that we're actively wrong about a subject like this?

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"It's not what you don't know that gets you into trouble," said Josh Billings. "It's what you know for sure that ain't so."

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Here is the data on poverty. And next click, you will see what happened in my lifetime, although I take no credit for this, the most extraordinary and unprecedented plummet in poverty that has ever been in experience. That goes up to 2015. The latest data is that something like seven percent of the world lives in poverty, and people are leaving extreme poverty at the rate of about 160,000 people per day, which is truly a remarkable phenomenon.

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And throughout this time, throughout the last 50 years, we've been told that things can only get worse. "The outlook for man is painful, desperate, and the hope that can be held out for his future seems to be very slim indeed," said Robert Heilbroner, an economist, in a bestselling book in 1970. And I read this sort of stuff when I was 12 years old and it worried me. It genuinely worried me. I thought the future was very bleak. But if you look at the greatest measure of misery that there is, that is to say child mortality, then I think it's pretty spectacular what's happening.

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All of the continents seeing incredible declines in child mortality. Notice Africa falling behind in the '80s and '90s as a result of the HIV epidemic, but now beginning to catch up.

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One of the things that was getting worse right up until the end of the 1990s was malaria. It was killing more and more people every year, particularly in Africa, and because of climate change, we were told it was going to get much worse in the future. But what happened? Well, after 2003 when that graph ends...

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...malaria mortality halved, largely because of innovation, because of the invention of the insecticide impregnated bed net, which was invented and developed in the 1980s, but really only became widespread after 2003, with the support of the Gates Foundation and has made by far the biggest difference to malaria mortality, much bigger than insecticides and malaria treatment, malaria pills put together.

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Again, a pessimistic quote of the kind that we were reading in the '60s and '70s. "In the 1970s, hundreds of millions of people will starve to death in spite of any crash programs embarked upon now," said Paul Ehrlich. And he and others suggested there wasn't even any point in trying to feed India, we would have to just leave it to its fate. And it's true that in the time up until then, there had been frequent famines and there was no general rate of improvement in that. But what happened next? What happened after that?

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What happened was that famine went extinct. Except in a few dictatorships like North Korea, it just became impossible to find a famine anywhere in the world, and that is the situation today, despite a doubling of the world population during that period. These are extraordinarily good times if you're worried about famine.

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And as I say, the population growth was very rapid during that period. But even the population explosion, which we thought was unstoppable in the 1960s, has now dramatically slowed. The percentage of people added to the world population has halved now from two percent a year to one percent. And the absolute number added to the world population each year is going down all the time and we're heading for a stable population sometime towards the end of this century.

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One of the remarkable features of the last few decades has been how peaceful it is. Almost any measure of violence shows a decline.

If you click on this, you'll see how deaths in war have largely gone out of fashion. We are living through a time of extraordinary peace, as Steven Pinker has documented in his book, *The Better Angels of Our Nature*.

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And everybody thinks that this is at the expense of the environment. But on the whole, that's not the case. In most measures, environmental quality are improving. When I was young, oil spills in the ocean were one of the most frequent and most distressing forms of pollution. Look what's happened to the data since then. It's declined very dramatically

over recent years. The tiny little blue bar that sticks up near the right that's the Deepwater Horizon disaster of 20... I can't remember what year it was, 2009, I think.

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And when I was young there were only 5000 humpback whales left in the world, and I never dreamed that I would see one. I sort of assumed they would be extinct long before I got to see one. In fact, I've seen them now all over the world. There are more and more. There are 80,000 now. That is 16 times as many as there were then. And you see aggregations of them now in groups of up to 200 are sometimes seen together, which nobody had experienced for centuries.

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But what about climate change? Are we not experiencing dreadful climate change? Well, we may face problems in the future because we undoubtedly are seeing climate change happening, and it may result in problematic issues in the future. But in the moment, contrary to what most people think, we are not yet seeing dramatic changes. If you look at drought, (next click) you will see that actually there's been a slight decline in the percentage of the world that is in any form of drought or severe drought.

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Likewise, if you look at tropical storms, there was a steady increase through the '80s, and it looked like it was going to go on, but what actually happened (next click) is that it meandered all over the place and it is no worse than it was. This is the accumulated energy, that is to say, the frequency times the strength of all the world's hurricanes, cyclones, and typhoons.

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The sea level is rising. Yes, and that's an issue, but it's rising no faster than it did in the 21st century [SIC].

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It's going at the rate of about three millimeters a year, as far as we can tell. It's very difficult to measure, but that's what the satellites are telling us. And that is about one foot per century, which is not very different from what we had in the 20th century

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And meanwhile, we've seen a 14 percent increase in green vegetation on the planet, most of which, about 70 percent of which, is caused by the extra carbon dioxide in the air, which causes plants to grow more vigorously for a given amount of water that they take in. This is equivalent to adding a continent's worth of green vegetation twice the size of the mainland United States over that period. This is called global greening, and it is, on the whole, good news. You don't want every area of the world to get greener, but particularly in the Sahel region south of the Sahara, this has been a great boon to people to have more green vegetation in those areas.

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I think the optimistic graph that most surprises people is the idea that we are more equal. Back in the 1970s, there was a rich world and a poor world, a first world and a third world and a valley between them, a chasm between them. Whereas today, (next click) there's a mountain where there used to be a valley, largely because of most people in Asia moving from very low incomes to middle level incomes. People in poor countries have got rich much faster than people in rich countries over the last 20 or 30 years and that has led to a great improvement in global equality, which is good news. And people say, well, yes, but what if inequality is getting worse in China or in America? Surely there's no comfort in knowing that it's getting better in the world. I think there is comfort. Ethiopia has seen its average income double over the last 10 years. Italy has seen its average income go slightly backwards over the last 10 years.

So Ethiopians are catching up with the Italians and Ethiopians are much poorer than Italians. So I think that's, on the whole, good news.

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Surprisingly, we used to think that people got less happy as they got wealthier. But surprisingly, we're finding that's not the case. There is a correlation between wealth and happiness, both between countries, that's the distribution of points on this chart and within countries, that's the direction of the little arrows attached to each point. It's possible to be very rich and very unhappy. But that's alright. It cheers other people up when you achieve that.

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Even these measures that I've shown underestimate the impact, the improvements of our lives because they underestimate the impact of technology.

If you click, you'll see the rest of this chart and you will see what an extraordinary change there has been in the cost of light. Light was once a rare luxury. Now it is a common necessity. And that's measured in money. But if we measure it instead in labor, in time, in how long you have to work (next clicks, please) in order to achieve... in order to have a certain amount of light, enough light to read a book for an hour, then the change is even more dramatic. Today, you need a third of a second of work to earn an hour of light. Six hours of work on the average wage back in 1800 would have been necessary to earn that much light. That's how extraordinary the changes have been as a result of technology and as a result of innovation.

Next slide.

So all in all, we are an extraordinary generation. We have lived through an unprecedented change in human living standards such as no previous generation has experienced. And yet throughout that time, we have told ourselves that it's about to get worse. That it's been good for a while but it can't last.

Here's a quotation from Thomas Babington Macaulay, the historian, writing in 1830 when he was reviewing a pessimistic book about the future. And he said, "We cannot absolutely prove that those are in error who say society has reached a turning point... that we have seen our best days. But so said all who came before us and with just as much apparent reason... on what principle is it that with nothing but improvement behind us, we're to expect nothing but deterioration before us?"

Now, he was saying that in 1830, when the great improvement of human living standards had hardly begun and only in a few countries such as Britain and North West Europe. What an extraordinary thing it would have been to stop the improvements then, because we were worried about the future. I think that today there is every reason to think that we will get through this current pandemic, that we will defeat future pandemics and other threats, including climate change, and that we will, in our grandchildren's time, look back on this period as a period of poverty and misery compared with what they have achieved in the future. But it all depends on allowing and encouraging innovation.

Thank you very much for your attention. I hope I haven't gone on too long and I'd be delighted to take a few questions if possible.

ED: Oh, good. We have John Mauldin. He was having technical difficulties. We've got John.



JOHN: Well, it's not technical difficulties. We tried these new things called air pods, Matt, one of these clever innovations, and it turns out that you actually have to charge them after three or four hours, and so I am, you know, learning these... about these new innovations as they go along and so I've got my trusty iPad over here with the questions that the audience is sending you. One of the things that I want to talk to you about first, so I'm going to take the privilege of having my own question, is how do you see the impact of innovation on the COVID world going forward, not necessarily about COVID, but about all the other things that we're going to have to do, because clearly the post-COVID world, the post-vaccine world, is going to be remarkably changed. Everything changes. The world gets repriced. How does innovation do that?

MATT: Yeah, I think you're absolutely right. As I said, I think we now know that innovation in vaccines has been neglected, and it's been neglected because it's not very profitable. The problem with a vaccine for a pharmaceutical company is that it does itself out of business very quickly. It solves the problem, and it goes away. It's not a repeat prescription, as it were. So I think we need to... we are going to see, in fact, we've already seen a few years ago something called a Coalition for Epidemic Preparedness Innovation set up by the Gates Foundation and the Wellcome Trust, which said that we need to be better prepared with vaccines. But unfortunately, they've only just got going, and it hasn't been in time to make a difference in this case.

But as we react to this pandemic, we are going to change our regulations to try and accelerate technologies and innovations. And we are going to do so by stripping out some of the obstacles to innovation. We're going to speed up decision making. As I said, diagnostic tests take up to 17 months to get approval from licensing authorities in some countries. And that has been a real problem. So as we strip away these regulations, we need to think about how we could do that for all sorts of other technologies, too. What are the things we're doing at the moment that that hold back innovation in all sorts of areas?

And another thing I think we can do is to use prizes more than patents to encourage innovation. I think the evidence is that patents are a problem for innovators on the whole. When they expire, there tends to be a burst of innovation. 3D printing has just seen its patents expire, for example. Whereas if something like an advance market contract, a sort of prize for a company that develops a vaccine has been already pioneered by the Gates Foundation. So all sorts of ways of encouraging innovation, without necessarily predicting which technologies we want, are what I hope comes out of this.

JOHN: Okay, now I've got two questions here. The first one is, as I'm reading, three pandemics have been inflicted, over 200,000 global casualties, yet different countries

have reacted differently to the swine flu and Hong Kong flu. What are your thoughts about that?

MATT: Well, I think it's very clear that the experience with SARS that countries like Hong Kong and Singapore and to some degree China had and the experience with MERS that South Korea had have very much influenced their preparedness for this and particularly with respect to test, track, and trace. And by the way, just back to the sort of the previous question, one of the really interesting things is it's possible that this will be the first disease that we defeat with digital technology, that is to say, apps that allow us to isolate cases and things like that. And just reflecting on what we're doing here and now, the pandemic is clearly going to change the way we work because we've all discovered the wonderful ease with which we can use these technologies, albeit with one or two hiccups in your case and my case.

JOHN: Well, we look, we learn about these things. Now, another question, and my own personal *bête noire*, is people have asked what do you think about Robert Gordon's book on the death of innovation?

MATT: Yeah. Robert Gordon, and to some extent, Tyler Cowen have been making this point that we are... we're actually running out of innovation. That far from... and that the most recent innovations are frivolous ones compared with the things that were invented a hundred years ago or something, you know, and the sort of classic question is, would you rather give up your iPhone or your toilet? And, you know, on the whole, what we're developing now is, you know, we're sort of running out of things to develop.

I don't agree that this is a sort of inevitability, but I think they have half a point, these people, because I think we aren't living in a period of incessant accelerating innovation, as we often tell ourselves we are. I gave the example earlier of how transport has hardly changed in my lifetime, whereas communication and computing has. And Peter Thiel has made the point that an awful lot of our innovation these days is in digital technology, in bits, not atoms, and that's because we're very heavily regulating atoms, whereas we haven't been regulating bits.

So if you look at the turnover of entrepreneurial firms or the degree to which creative destruction happens in technologies, it's not as fast as it should be. Brink Lindsey makes this point very brilliantly in a book called *The Captured Economy*. And so, I think we do need to rediscover the secret sauce of innovation. To some extent, the Chinese have got it at the moment. They are leapfrogging us or have been leapfrogging us in terms of the use of digital technologies as consumers and things like that. And that seems paradoxical because they're not a free society. But, of course, to some extent they are a free society below a certain level. That is to say, as long as you don't annoy the

Communist Party or try to do try to express your freedom politically, then you are not subject to the same petty rules and licensing requirements as you are in Western countries. And so that's why China has been able to do so much innovation. But it's an unhappy picture if we are to rely on China as the innovation engine in the current century because it is not a free country at the political level.

JOHN: Well, we're gonna have to conclude there, but I want to do a couple of things. If I had been on, I would have said that you are my favorite libertarian philosopher in the entire world. And I think your book, *Evolution of Everything*, and *Innovation* as you sent me a copy which will become one of my favorites, but *Evolution of Everything* is one of my one, one out of five, most important books to be read. Matt, we are glad to have you back to our conference, and we look forward to having you there many times.

MATT: Thank you so much, John. Thank you, Ed.

JOHN: We will turn it back to you, Ed.

ED: Thank you, Matt. And we'll take a short 10-minute break at the most. So go refill your cup with your favorite beverage. When we come back, we'll be dipping our toe gingerly into politics with Bruce Bartlett and Bruce Mehlman.

See you in 10 minutes.

[END]

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