It wasn't part of the equation I needed to work with.

But when I went from eating 3,000 calories a day to 2,000 calories a day, I lost weight. I lost about 1 pound per week for about 40 weeks.

But along the way, I started researching my city, its culture, its infrastructure, trying to figure out why this city seemed to have an obesity problem.

And I came to the conclusion that if you were a car, we would have built an incredible quality of life.

(Laughter.) But if you were a human, you would appear to be wrestling with cars at every turn.

Our city is very extensive.

Oklahoma City has great freeway crossings and literally no traffic.

And people live far away.

Our city is huge at 620 square miles, but 15 miles is less than 15 minutes.

You can literally get a speeding ticket during rush hour in Oklahoma City.

As a result, people tend to disperse.

Land is cheap.

Also, we haven't asked developers to build sidewalks on new developments for a long time.

We fixed that, but it was relatively recent, with literally over 100,000 homes in the neighborhood with virtually no walkable levels in stock.

And with all these factors in mind, I decided that the first thing we needed to do in trying to figure out how we could deal with obesity was have a conversation.

You know, we weren't talking about obesity in Oklahoma City.

So, on New Year's Eve 2007, I went to the zoo and stood in front of an elephant and said: "This town is going on a diet, so we're going to lose a million pounds."

Well, then all hell broke loose.

(Laughter) The national media was immediately drawn to the story and could actually go one of two ways.

They could have said, "The mayor had to go on a diet because this city is overweight."

But fortunately, the consensus is "Look, this is a problem in many places.

This city wants to do something about it. ”

And they started working with us to increase traffic to our website.

Well, the web address was thiscityisgoonadiet.com.

And I was on The Ellen DeGeneres Show one week morning to talk about this initiative. Our website had 150,000 visits that day.

People started signing up, money started coming in, conversations started happening that I thought were so important.

It was happening in the house and mothers and fathers were talking about it with their children.

It was held in church.

The church was starting its own running group and its own support group for people dealing with obesity.

Suddenly it became a topic worth discussing at school and at work.

And while large companies usually have great wellness programs, midsize companies, who are usually caught in the middle by issues like this, have taken a proactive stance, using our program as a model for their own employees and holding competitions to see who can address their obesity situation in a way that positively benefits others.

And then the next stage of the equation began.

It's time to push forward what I call MAPS 3.

Well, MAPS 3, like the other two programs, had an economic development motivation behind it, but added health-related infrastructure to the process in addition to traditional economic development tasks such as building a new convention center.

We've added a new 70-acre Central Park in downtown Oklahoma City.

We are building downtown streetcars to support the walkability formula for those who choose to live in inner-city areas and to help create density there.

We are building senior health and wellness centers throughout our community.

We have invested in the river that was originally invested in the original MAPS and are now in the final stages of developing the world's premier venue for the sport of canoeing, kayaking and rowing.

We hosted the Olympic trials last spring.

Oklahoma City hosts Olympic-class events, attracts athletes from all over the world, and has inner-city programs that get kids more involved in these slightly non-traditional recreational activities.

We are also building hundreds of miles of new sidewalks across the metropolitan area through another initiative that was passed.

We're even getting back to inner-city situations where we've built neighborhoods, built schools, but haven't connected the two.

We built libraries, we built neighborhoods, but we never really connected the two in any kind of walkability.

Through yet another source of funding, we are redesigning all of the city's streets to be more pedestrian-friendly.

Our road was so wide that we could walk across it at the push of a button, but we had to run to get there in time.

But now we are narrowing our streets, making them highly landscaped, making them more pedestrian-friendly, actually redesigning them, rethinking how we build infrastructure, and designing cities around people, not cars.

We are finalizing the master plan for the bike path.

The mileage will exceed 100 miles when completed.

And you can see this culture starting to change in Oklahoma City.

And surprisingly, the demographic shift that comes with it is very moving.

Well-educated twenty-somethings are moving to Oklahoma City from all over the region and even from as far away as California.

In January 2012, when I hit 1 million pounds, I flew to New York with participants who lost over 100 pounds and changed their lives, appeared on the Rachel Ray show, and went around the New York media that afternoon promoting the same message you're all familiar with about obesity and its dangers.

And I went to the lobby of Men's Fitness, the same magazine that put us on that list five years ago.

And as I sat in the lobby waiting to speak to a reporter, I noticed this issue of the magazine on the table, picked it up, looked at the headline above, and it read, "America's Fattest City: Do You Live in a City?"

Well, I knew about it, so I picked up a magazine and started looking for it, but it wasn't in it.

(Applause.) Then I looked up a list of the most suitable cities, and we were on that list.

We were listed as the 22nd best city in the US.

State health statistics are improving.

Sure, it's a long way to go.

Health is still not something to be proud of in Oklahoma City, but there seems to be a cultural change taking place that makes health a higher priority.

And we love the idea of ​​the well-educated twenty-something demographic—people with options—choose Oklahoma City.

We have the lowest unemployment rate in the United States and perhaps the best performing economy in the United States.

And if you're like me, at some point in your teaching career, you've probably been asked to read the book The Grapes of Wrath.

Oklahomans flock to California in search of a better future.

Looking at the demographics of people coming from the West, it looks like what we're seeing now is the rage of the grapes.

(Laughter.) (Applause.) My grandchildren are coming home.

You were a great listener and very attentive.

Thank you very much for coming here.

(applause)

Today I will teach you how to play my favorite game, multiplayer thumb wrestling.

This is the only game I know of that gives you, the player, the opportunity to experience 10 positive emotions within 60 seconds.

This is so true that if you play this game with me for just one minute today, you will feel joy, relief, love, surprise, pride, curiosity, excitement, awe, satisfaction and creativity all in one minute.

Pretty good, don't you think? Now you're ready to play.

We need some volunteers on stage soon to teach the game, so we're going to do a little hands-on demo.

As we'll let you know soon, this game was invented ten years ago by a collective of Austrian artists called Monochrom.

Thank you, Mr. Monochrome.

Now, most people are familiar with traditional two-person thumb wrestling.

Sunnis, let them remember.

1, 2, 3, 4, I declare a thumb war, we wrestle, and of course the Sunni beats me, because she is the best.

Well, the first thing we want to know about massively multiplayer thumb wrestling is we are a generation of gamers.

There are currently 1 billion gamers on the planet. So we need more challenges.

So the first thing you need is more thumbs.

So Eric, come over here.

So, with three thumbs up, Peter could join in too.

You can also align your four thumbs. The way to win is to be the first to pin someone else's thumb.

This is really important. Waiting for them to keep fighting and not being able to pounce at the last moment.

That's no way to win.

oh who did that? You did it, Eric.

Then Eric would have won. He was the first person to pin my thumb.

This is the first rule. You'll find that three or four thumbs in a node is common, but if you're feeling ambitious, don't be afraid.

I will do my best.

So you can see up from here.

Now, another rule to remember, fellow gamers, we love challenges.

Did you all notice that you have an unused thumb?

So I think we need to get a little more involved.

If there were only four people, try to wrestle both thumbs at the same time in this way.

completely.

Now, if there were more people in the room, they might reach out and try to catch others instead of wrestling in closed nodes.

And really, that's what we're trying to do now.

We try to connect all 1,500 thumbs in this room to one node.

And you have to connect both levels, so if you're on top, you're reaching down and reaching up.

Now — (laughter) — before we begin — this is great. I'm looking forward to playing it. — Before we start, can I easily undo the slides? Because once you get good at this game, we want you to know that there are advanced levels.

I mean, this is an easy level, right?

However, there is also an advanced configuration.

This is called a Death Star configuration.

Are you a Star Wars fan?

And this is called Moebius strip.

Any science geek understands that.

This is the hardest level. This is extreme.

So for now I'll just use the normal one. Press all thumbs into the nodes for 30 seconds, connecting the upper and lower levels. You go there.

30 seconds. to the network. create a node.

stand up! It's easier to stand.

Everyone, up up up up!

Get up, my friend.

have understood.

Don't start wrestling yet.

If your thumb is free, shake it to make sure it's connected.

have understood. You need to do a sum check just before.

If your thumb is free, shake your thumb to check.

Grab that thumb!

Please reach out behind your back. Here you go.

Do you have another thumb?

Okay, count to three and we're off.

Try tracking. Grab it, grab it, grab it.

have understood? One, two, three, go!

(laughs) Did you win? I got it? I got it? wonderful!

(Applause.) Well done. thank you. thank you very much.

have understood.

While you're basking in the joy of winning your first massively multiplayer thumb wrestling game, let's take a quick look at the positive emotions.

Very curious.

I said "multiplayer thumb wrestling".

I thought, "What the hell is she talking about?"

That sparked a little curiosity for me.

Creativity: Creativity was required to solve the problem of putting all thumbs into nodes.

I'm reaching around, and I'm reaching up.

You showed your creativity. That was great.

What about surprises? The actual feeling of trying to wrestle two thumbs at once is pretty amazing.

I heard the sound echo through the room.

we were excited. When I start wrestling, I get excited when I start winning, or when this person becomes obsessed with wrestling.

I feel safe. You have to stand up.

After sitting for a while, my body became more comfortable and my fatigue disappeared.

we were delighted. You were laughing and smiling. Look at everyone's faces. This room is full of joy.

There was some satisfaction.

No one was texting or checking email while we were playing, so you were playing with complete satisfaction.

Three of the most important emotions, awe and amazement, we were all physically connected for a minute.

When was the last time you went to TED and physically connected with everyone in the room?

And it's really nice and great.

And when it comes to physical connection, you all know I love the hormone oxytocin, you release oxytocin and feel connected to everyone in the room.

We all know that the best way to release oxytocin quickly is to hold someone's hand for at least six seconds.

You guys have been holding hands for over 6 seconds and we are now biochemically ready to love each other. wonderful.

And the feeling of pride at the end.

How many people are like me? just admit it.

you lost both thumbs.

It didn't work for you.

It's okay, I learned a new skill today.

I learned a game from scratch that I never knew before.

Now you know how to play. You can also teach others.

congratulations.

How many people have won with just their thumbs?

have understood. I have very good news.

According to the official rules of Massively Multiplayer Sam Wrestling, this allows you to become the grandmaster of the game.

Not many people know how to play, so the program needs to be accelerated more than games like chess.

Congratulations, Grandmasters!

Get one thumb and you become Grandmaster.

Has anyone won two thumbs?

yes. wonderful. have understood.

Be prepared to update your Twitter or Facebook status.

According to the rules, you are a legendary grandmaster, congratulations.

I'm just leaving this tip in case you want to play again.

The best way to become a legendary grandmaster is to have two nodes running.

Choose something that seems easy.

they are not paying attention. It looks kind of weak.

Let's focus on that and do something crazy with this arm.

Stop immediately if you win.

Everyone gets thrown. you go kill

This is how you can become the legendary grandmaster of multiplayer thumb wrestling.

Thank you for telling me about my favorite game.

Wow! (Applause.) Thank you. (applause)

(Applause) I want to talk a little bit about user-generated content.

I'll tell you three stories leading up to one argument that sheds some light on how to unlock user-generated content for your business.

So, that's it for the first episode.

1906. This man, John Philip Sousa, has come to this place, the United States Capitol, to talk about this technology, what he calls "talking machines."

Sousa was never a fan of talking machines.

Here's what he had to say.

"These talking machines will ruin the artistic development of music in this country.

When I was a boy, on summer evenings, young people would gather in front of every house and sing the songs of the day and old songs.

Today you hear these machines of hell running day and night.

We won't have vocal cords," Souza said.

"The vocal cords will be removed during evolution, much like the tails when humans were born from apes."

Now, I want you to pay attention to this photo.

This is a cultural photo.

This can be described as a kind of reading and writing culture using modern computer terminology.

It is a culture in which people participate in the creation and re-creation of culture. In that sense it is readable and writable.

Sousa's concern was that we would be deprived of the ability to use these words as the "Hell Machine". they will take it away.

And in its place will be the opposite of the read-write culture, the so-called read-only culture.

A culture where creativity is consumed, but the consumer is not the creator.

Millions of vocal cords are lost in top-down owned cultures.

Now, looking back at the 20th century, we cannot help but conclude that Sousa was right, at least in what we consider "developed" countries.

Never before in the history of human culture has it been so specialized and concentrated.

Never before have millions of creativity been so effectively robbed and banished because of these "hell machines".

The 20th century, at least where we know it best, was the century when culture transitioned from being literate to being read-only.

So, second. Land is a kind of property, property. it is protected by law.

As Lord Blackstone explained, for most of the history of trespass laws, land was protected by trespass laws, and it is believed that lands were protected by trespass laws all the way from the bottom up.

Now, until this technology came along, this was a very good system for most of the history of land regulation, but people began to wonder if it was trespassing for these devices to fly over land without clearing their farm rights below as they moved across the country.

Well, in 1945 the Supreme Court had an opportunity to address the issue.

Two farmers who raised chickens, Thomas Lee and Tiny Corsby, had serious complaints about these techniques.

Complaints were that when the plane flew over land, the chickens followed the plane's pattern and flew themselves to the barn walls.

So they complained to Lord Blackstone that these planes were trespassing.

Since time immemorial, the law has decreed that no one can fly over the land without permission from the landlord, so this flight must stop.

Now, the Supreme Court considered this 100-year tradition and said in an opinion written by Justice Douglas that the Corseby family should lose.

The Supreme Court said the principle of protecting land all the way to the air does not exist in the modern world, otherwise every transcontinental flight would expose operators to countless trespass lawsuits.

Common sense, but an unusual idea in law, but here it was. Common sense -- (laughter) -- defies the idea. common sense.

finally. Before the Internet, the last great fear that fell upon the content industry was the fear created by this technology. Broadcast: A new way to spread your content. Thus begins a new battle for control of the business that disseminates content.

Well, at that time, the organization or legal cartel that controlled most of the music broadcast using these technologies was ASCAP.

They have exclusive licenses to the most popular content, and they used it in an attempt to prove to the broadcaster who was really in charge.

So, between 1931 and 1939, they raised prices by about 448 percent, until the stations finally got together and said, "Enough, okay."

And in 1939, lawyer Sidney Kay founded what was called Broadcast Music Inc. known as BMI.

And BMI was much more democratic in the arts it included in its repertoire, including including African-American music in its repertoire for the first time.

But most importantly, BMI acquired and arranged public domain works and distributed them free of charge to their subscribers. So when ASCAP threatened to double their rates in 1940, the majority of stations switched to BMI.

Now, ASCAP said it doesn't care.

They predicted that people would revolt because the best music was no longer available as it moved to the second best public domain offered by BMI.

Well, they didn't revolt, and in 1941 ASCAP collapsed.

And the important point to recognize is that even though these stations were broadcasting what they called the second best, there was enough competition at the time to break this legal cartel over access to music.

have understood. three stories. Here is the discussion.

In my view, the most important thing to recognize about what this Internet is doing is the opportunity to revive the literacy culture that Sousa glorified.

Digital technology is an opportunity to revive the vocal cords he spoke so passionately about in Congress.

User-generated content spreads to your business in such a highly valuable way and celebrates amateur culture.

This doesn't mean an amateurish culture, I mean a culture where people create for love of what they do, not for money.

I mean the culture that our children are constantly creating.

Because when you consider that Sousa romanticized young people and sang songs of the time and old songs together, you need to be aware of what your own children are doing now.

Remix the song of the day and the old song into something different.

That's how they understand access to this culture.

So let me give you some very few examples to understand what I'm talking about here.

This is what we call an anime music video. The first example is an anime captured from television re-edited into a music track.

(music) What you should have is confidence. Jesus survives. do not worry.

(music) (laughs) And this is the best.

(music) my love...

I have only you in my life...

The only bright...

my first love...

you're every breath i take...

you are my every step...

and I ....

i want to share all my love with you...

No one else will...

and your eyes...

They tell you how much they care...

(music) So this is a remix, right?

(Applause.) And it's important to emphasize that this is not what we call "piracy."

I'm not talking about or justifying the mass acquisition and distribution of other people's content without permission from the copyright owner.

I'm talking about people taking other people's content and recreating it to use digital technology to say things differently.

The point here is not the technique described here.

Because, of course, all the techniques you've seen here have been done by TV and film producers for the last 50 years.

Importantly, the technique is democratized.

Now anyone with access to a $1,500 computer can take sounds and images from the cultures around us and use them to describe things differently.

These tools of creativity have become tools of speech.

That is the literacy of this generation. My children talk like this.

That's how our children think. It means your child will increasingly understand digital technology and their relationship to it.

Now, in response to the new use of culture with digital technology, the law very common sense does not welcome this revival of Sousa.

Rather, the structure of copyright law and the structure of digital technology interact to create the presumption that these activities are illegal.

Because if copyright law fundamentally regulates what we call copying, then in the digital world there is an inescapable fact that every use of culture produces a copy.

Therefore, permission is required for any use. Without permission, you are a trespasser.

You are as sensible trespassers as these people were trespassers.

But common sense here has not yet rebelled in response to this response that the law has provided for these forms of creativity.

Rather, what we have seen is much worse than rebellion.

There is growing extremism on both sides of the debate in response to conflicts between the law and the use of these technologies.

On the one hand, we are building new technologies, such as the recently announced technology that allows content containing copyrighted material to be automatically removed from sites like YouTube, regardless of whether there is a fair use ruling that may apply to the use of that content.

And on the other hand, among our children, abolitionism is on the rise, a generation that rejects the very notion of what copyright should do, rejects copyright, and believes that the law is nothing more than something to be ignored and contested at every opportunity possible.

Extremism in one begets extremism in the other, a fact we should have learned time and time again, and both extremes of this argument are utterly wrong.

Now, the balance I'm trying to fight is, as a good liberal, by looking first at government. Completely wrong, right?

(Laughter) We looked to the courts and Congress first to try and get them to do something to make this system more meaningful.

The bill failed partly because the courts were too reluctant and partly because the legislature was corrupt. This does not mean that bribes are working to block real change, but it does mean that the economy of influence that governs the functioning of Congress prevents policymakers here from understanding the problem until it is too late to fix it.

So you need something different, you need a different kind of solution.

And the solution here, in my view, is a private solution, a solution aimed at legalizing what it means to be young and realizing its economic potential, and that's where the BMI story comes into play.

Because, as BMI has proven, the competition here can achieve a kind of balance. The same thing can still happen.

There is no public domain available at this time, so instead two changes are required.

First, artists and creators embrace this idea and choose to make their work more freely available.

So, for example, they can say that their work is freely available for non-commercial, amateur-type use, but not for any commercial use.

And second, the companies building this literacy culture need to clearly embrace this opportunity and make it possible. Doing so would allow an ecosystem of free content, or more free content, to thrive on a neutral platform where both exist at the same time, where more free content could compete with less free content, and the opportunity to develop creativity in that competition could teach one the lessons of the other.

Now, I'd like to talk about one such plan that I know of, but I don't want to violate TED's first commandment on sales, so I won't talk about it at all.

Instead, I want you to remember what BMI teaches us.

Artist choice is the key to new technology opportunities for business, and for these new technologies to have that opportunity, we need to build artist choice here.

But let me finish with what I think is more important—much more important than the business.

How this connects to our children is important.

We must recognize that they are different from us. This is us, right?

(laughs) We made a mixtape. They remix music.

we watched tv They make TV.

It was technology that differentiated them, and when we understand what this technology can do, we must realize that we cannot kill the instincts that technology creates. We can only criminalize it.

You can't stop children from using it.

We can only drive it underground.

You cannot make your children passive again.

All we can make is, in a word, "pirates". is that all right?

We live in these strange times. It's a kind of Prohibition era, and we live against the law all the time in many areas of our lives.

Ordinary people live against the law and that is what they are doing to me, our children.

They live knowing that they are living against the law.

Its perception is extraordinarily corrosive and extraordinarily corrupt.

And in democracy, we can do better.

At least do better for them, if not to start a business.

thank you very much.

(applause)

When we think of Nepal, we tend to think of the snow-capped Himalayas, the crystal clear still waters of alpine lakes, or the vast grasslands.

What some of us may not realize is that in the foothills of the Himalayas, the climate is much warmer, the landscape much greener, and a wide variety of wildlife, including one-horned rhinos, Asian elephants and Bengal tigers.

Unfortunately, these animals are under constant threat from poachers who hunt and kill for body parts.

Battalions of soldiers and rangers have been sent to guard Nepal's national parks to stop the killing of these animals, but it is no easy task as soldiers must patrol thousands of hectares of forest on foot or on elephant backs.

And poachers and firefights are dangerous for soldiers, so Nepal is constantly looking for new ways to help protect its forests and wildlife.

Nepal recently acquired a new tool to combat wildlife crime. It's a drone, more specifically a protection drone.

Over the past year or so, my colleagues and I have been developing drones for Nepal and training park conservation workers to use these drones.

Drones allow us not only to get a bird's eye view of the landscape, but also to capture detailed high-resolution images of objects on the ground.

For example, this is a pair of rhinos taking a cool bath on a hot summer day in the lowlands of Nepal.

We now believe that drones have great potential not only in combating wildlife crime, but also in monitoring the health of these wildlife.

So what is a drone?

Well, the kind of drone I'm talking about is just a model airplane with an autopilot system. This autopilot unit contains a small computer, GPS, compass, barometric altimeter and several other sensors.

Well, such drones are intended to carry useful payloads such as video cameras and photo cameras.

We also need software that allows users to program missions that tell the drone where to go.

People I talk to today are often surprised when they hear that these are the only four components that make up a conservation drone, but they are even more surprised when I tell them how affordable these components are.

In fact, a security drone costs less than a high-end laptop computer and decent binoculars.

Once you've built your own conservation drone, you'll probably want to fly it. But how do you fly a drone?

Not really, as the drone flies automatically.

All you have to do is program a mission to tell the drone where to fly.

However, using open source software, you can do just that by clicking a few waypoints on the Google Maps interface.

These missions can be as simple as passing through a few waypoints, or they can be slightly longer and more complex, such as flying along a river system.

In some cases, a drone can be flown in a lawn mower-like pattern to take pictures of the area and process those pictures to create a map of the forest.

Other researchers may want to fly drones along forest boundaries to monitor poachers and people trying to trespass the forest.

Whatever your mission is, once programmed, simply upload it to the autopilot system, bring the drone to the scene, and launch it by tossing it into the air.

And in many cases, we will tackle this mission while taking photos and videos along the way. Usually at that point I go get a coffee, sit down and relax for the next few minutes. However, some of us sit and panic for a few minutes, worried that the drone won't come back.

Usually it does, but sometimes it automatically lands when it does.

So what can you do with security drones?

When we built our first prototype drone, our main goal was to fly over the remote rainforests of North Sumatra, Indonesia, searching for nests of great apes known as orangutans.

We wanted to do it because we needed to know how many individuals of this species were still in the forest.

Today, the traditional orangutan survey method is to walk through the forest with heavy equipment and use binoculars to look up at treetops where orangutans and their nests are likely to be found.

As you can imagine, this is a very time-consuming, labor-intensive and expensive process. Therefore, we expected that the use of drones could significantly reduce the cost of surveying orangutan populations in Indonesia and other parts of Southeast Asia.

That's why we were so excited when we captured an orangutan nest for the first time.

That's all. This is the first photo of an orangutan nest taken with a drone.

Since then, we have taken dozens of photos of these nests in different parts of Southeast Asia and are currently working with computer scientists to develop an algorithm that can automatically count the number of nests from the thousands of photos we have collected so far.

But nests aren't the only objects these drones can detect.

This is a wild orangutan, happily feeding on a palm tree, seemingly oblivious to the drones flying overhead more than once.

I also photographed other animals such as Gabon forest buffaloes, elephants and even nesting turtles.

But we don't just take pictures of the animals themselves, we also take pictures of the habitats in which these animals live. Because we want to track the health of these habitats.

From time to time I zoom out a bit and look at other things that might be happening in the landscape.

This is an oil palm plantation in Sumatra.

Since oil palms are now a major contributor to deforestation in that part of the world, we wanted to use this new drone technology to track the spread of these plantations in Southeast Asia.

But drones could also be used to track illegal logging activities.

This is a recently cleared forest, also in Sumatra.

We could also see the processed wooden planks still left on the ground.

But perhaps the most interesting thing about taking photos from the air is that you can later use specialized software to stitch these photos together to create a map of the entire landscape. This map provides important information for monitoring land-use change, letting you know where and when plantations may expand, where forests may shrink, or where fires may occur.

Aerial photographs can also be processed to create three-dimensional computer models of forests.

These models are not only visually appealing, they are also geometrically accurate. This means researchers can now measure distances between trees and calculate surface area, vegetation volume, and more. All of this information is important information for monitoring the health of these forests.

Recently, we have also started experimenting with a thermal imaging camera.

These cameras can now detect heat-emitting objects from the ground, making them very useful for detecting poachers and campfires at night.

So far, we've talked quite a bit about what conservation drones are, how to operate these drones, and what they can do for you.

Now let's talk about where conservation drones are being used around the world.

We built our first prototype drone in Switzerland.

We brought some of these to Indonesia for our first few test flights.

Since then, we have developed drones for our collaborators around the world. This includes fellow biologists and partners of major conservation organizations.

Perhaps the nicest and most rewarding part of working with these collaborators is that they give us feedback on how we can improve our drones.

Building drones for us is an ongoing process.

We are constantly striving to improve our range, sturdiness and payload capacity.

We will also work with our collaborators to discover new uses for these drones.

For example, camera traps are a common tool used by biologists to take pictures of shy animals hiding in forests, but because these are motion-activated cameras, they take pictures every time the animal crosses a path.

But the problem with camera traps is that researchers sometimes have to go back to the forest to get those images, and that takes a lot of time, especially when the forest has dozens or hundreds of cameras installed.

Drones may now be designed to perform that task more efficiently.

Equipped with special sensors, the drone can fly over forests and download these images remotely from a Wi-Fi enabled camera.

Wireless collars are another tool often used by biologists.

These collars are now worn on animals.

They transmit radio signals, allowing researchers to track the movements of these animals across the landscape.

But traditional methods of tracking animals are pretty silly. That's because researchers have to walk on the ground with huge, cumbersome radio antennas. Just like the old TV antenna that used to be on the roof. Some of us still do.

Drones can do the same job more efficiently.

By equipping a drone with a scanning radio receiver and flying it over the forest canopy in a specific pattern, why not allow the user or operator to remotely triangulate the location of these radio-collared animals without even setting foot in the forest?

The third, and perhaps most exciting, way to use these drones is to fly them into a truly remote, previously unexplored rainforest hidden somewhere in the tropics and parachute down with a tiny spy mic. This will allow you to eavesdrop on the calls of mammals, birds, amphibians, yetis, sasquatch, bigfoot, and more.

That would give us biologists a pretty good idea of ​​what kind of animals live in those forests.

And finally, we would like to show you the latest version of our conservation drone.

The MAJA drone has a wingspan of about 2 meters.

It weighs only about 2 kilograms, but can carry half that weight.

It is a fully autonomous system.

During missions, live video feedback can also be sent to the ground station laptop, so users can see what the drone is seeing in real time.

It has a variety of sensors, some of which have photographic quality as high as 1-2 centimeters per pixel.

The drone can stay airborne for 40 to 60 minutes and have a range of up to 50 kilometers.

This is sufficient for most maintenance applications.

Well, conservation drones started as a wild idea by two biologists with a deep passion for the technology.

And we strongly believe that drones can and will be a game changer in conservation research and applications.

There were more than a few skeptics and critics who thought we were just playing around with toy planes.

And in a way they are right.

Let's be honest, drones are the ultimate toy for boys.

But at the same time, we have met many great colleagues and collaborators who share our vision and understand the potential of conservation drones.

It is clear to us that conservation biologists and practitioners should make the most of every available tool, including drones, to save our planet's last remaining forests and wildlife.

thank you.

(applause)

Five years ago, I took a sabbatical to return to the medical school where I was studying.

I saw real patients, and I put on a white coat for the first time in 17 years since I became a management consultant.

Two things have surprised me in the past month.

The first is that the common theme of the discussion we had was the hospital's budget and cost reduction, and the second thing I was really worried about was some of my colleagues I met, the former friends of the medical school, and I knew that I was the smartest, most ambitious, positive and passionate people I've ever met. However, many of them were smiling, out of involvement, and staying away from hospital management.

So, in our focus on cost savings, we asked ourselves if we were forgetting about our patients.

Many of the countries you represent, and the country I'm from, are struggling with healthcare costs.

It occupies a large part of the national budget.

And there are various reforms aimed at curbing this growth.

In some countries, patients have longer waiting times for surgery.

In other countries, new drugs are not reimbursed and do not reach patients.

In some countries, doctors and nurses are targeted by governments to some degree.

Ultimately, costly decisions in healthcare are made by doctors and nurses.

You choose expensive lab tests, you choose surgery on elderly and frail patients.

In other words, it reduces costs by limiting the degree of freedom for doctors.

And finally, some doctors today would say that they don't have complete freedom to make choices they think are right for their patients.

So it's no wonder some of my old colleagues are dissatisfied.

At BCG, we looked at this and asked ourselves, how could this be the right way to manage health care?

So we took a step back and thought, "What are we trying to achieve?"

Ultimately, healthcare systems aim to improve patient health and must do so at limited or affordable costs.

We call this value-based healthcare.

The screen behind me shows the meaning of the word value. That is, significant results for patients compared to the amount of money we spent.

This is beautifully explained in a book published in 2006 by Michael Porter and Elizabeth Tydesberg.

In this photo, the father-in-law is surrounded by his three beautiful daughters.

When we started our research at BCG, we decided to focus on quality rather than cost. One of the things that fascinated us in our research was the variations.

When you compare hospitals in a country, you find some that are very good, but many that are much worse.

The difference was dramatic.

My stepfather, Eric, has prostate cancer and will probably need surgery.

Currently living in Europe, he could choose to go to Germany, which has a reputable healthcare system.

If you go there, you will have to put on diapers again, because there is about a 50% risk of incontinence if you go to a regular hospital.

toss a coin. The risk is 50 percent. That's quite a lot.

If he went to Hamburg instead and went to a clinic called the Martini Clinic, the risk is only 1 in 20.

Either flip a coin or take a 1 in 20 risk.

That's a big difference, a seven-fold difference.

You can see these big differences when you look at the many hospitals that treat different diseases.

But neither you nor I know. there is no data.

And often the data doesn't really exist.

nobody knows

In other words, going to the hospital is a lottery ticket.

It doesn't have to be. there is hope

In the late 1970s, a group of Swedish orthopedic surgeons met at an annual meeting to discuss the various procedures they would use to perform hip surgery.

On the left side of this slide you can see various pieces of metal used for people who need new hips, artificial hips.

They all realized they had their own way of doing things.

Everyone claimed that "my technique is the best", but in reality no one knew and admitted it.

So they said, "We're going to need to measure quality so we can know what's best and learn from it."

So they actually spent two years debating, "What is the quality of hip surgery?"

"Oh, I have to measure this." "No, I have to measure it."

And they finally agreed.

And once we agreed, we started measuring and sharing data.

They soon discovered that injecting cement into the patient's bone before inserting the metal shaft actually lasted much longer, and most patients never needed repeat surgery for the rest of their lives.

They published data and actually transformed clinical practice in the country.

Everyone sees this and it makes a lot of sense.

Since then, it has been published every year.

Once a year they publish the standings. Who is the highest and who is the lowest?

And as they visit and try to learn from each other, a cycle of continuous improvement is created.

For many years, Swedish hip surgeons had some of the best results in the world, at least for those who actually did the measurements, but many others didn't.

I found this principle really interesting.

So doctors get together, agree on what quality is, start measuring, share data, find out who is the best and learn from it.

Continuous improvement.

That's not the only interesting thing.

It's exciting in itself.

But if you go back to the cost side of the equation, you'll find that companies that focus on quality actually cost the lowest, even though they weren't meant to do so in the first place.

Looking back at the story of hip surgery, a study was done a few years ago comparing the US and Sweden.

They looked at the number of patients who needed repeat surgery seven years after the first surgery.

In the United States, the number was three times that of Sweden.

A great many unnecessary surgeries were performed in those seven years, causing unnecessary suffering to all who underwent them.

Now you can imagine how much it will save society.

We conducted a study that looked at OECD data.

The OECD may conduct health care quality surveys where data are available across member countries.

In fact, the quality of many diseases in the US is below the OECD average.

Now, if America's health care system could put more emphasis on quality measurement and raise it to average OECD levels, Americans would save $500 billion annually.

This corresponds to the budget, 20 percent of the national health care budget.

These numbers are great and you might say they're all logical, but is it possible?

I would argue that this is a paradigm shift in medicine and that it is not only possible, it must be done.

The agents of change are the doctors and nurses in the healthcare system.

I work as a consultant and probably see over 100 doctors, nurses and other hospital and medical staff each year.

What they have in common is a strong focus on what they achieve in terms of quality for their patients.

Doctors, like most of you in the audience, are very competitive.

They were always the best in their class.

We were always the best in our class.

And if someone can show them that what they do for their patients is no different than what others have done, they will do whatever it takes to improve.

But most of them don't know.

But doctors have another feature.

In fact, they grow by being recognized by their peers.

If a cardiologist calls another cardiologist at a competing hospital and discusses why they are getting much better results at that hospital, they will share.

Share information on how to improve.

So measuring and creating transparency gives you a cycle of continuous improvement and that's what this slide shows.

This might sound like a great idea, but it's more than just an idea.

This is real.

We are building a global community, and a large global community, where we can measure and compare our achievements.

BCG, in partnership with two academic institutions, Michael Porter of Harvard Business School and the Karolinska Institutet in Sweden, has created what it calls ICHOM.

You might think it's a sneeze, but it's not a sneeze, it's an acronym.

It stands for International Consortium for Health Outcome Measurement.

We bring together leading physicians and patients to discuss, disease by disease, what quality really is, what it should measure, and how to make those standards global.

they worked. Over the past year, four working groups have worked on cataracts, back pain, coronary artery disease including heart attacks, and prostate cancer.

The four organizations plan to release their data in November this year.

This is the first time we have compared apples to apples not only within a country, but also between countries.

Next year, 8 diseases are planned, and 16 diseases are planned for the year after next.

In three years, it will cover 40% of the disease burden.

Compare apples to apples. who is better?

why is that?

Five months ago I led a workshop at the largest Nordic university hospital.

A new CEO is born. she has a vision I would like to manage my large facility more with a focus on quality and outcomes that matter to my patients.

On this day, we attended a workshop with doctors, nurses and other staff to discuss childhood leukemia.

The group discussed how to measure quality today.

Can you measure more accurately than we can?

We discussed how these children should be treated and what the key improvements would be.

We then discussed how much these patients would cost and whether we could treat them more efficiently.

The room was filled with tremendous energy.

I had a lot of ideas and was very enthusiastic.

At the end of the meeting, the chairman stood up.

He looked over the group and said - he raised his hand first, I forgot - raised his hand and made a fist, and then said to the group:

thank you. Today we finally got to discuss the right way to do this hospital. ”

By measuring value in healthcare, outcomes that matter to patients and not just costs, staff in hospitals and elsewhere in the healthcare system can become an integral part of the solution, not the problem.

I believe that measuring the value of healthcare will revolutionize it. I am sure Hippocrates of Greece, the founder of modern medicine that always puts the patient at the center, would smile in his grave.

thank you.

(applause)

Technology can change our understanding of nature.

Consider the case of lions, for example.

For centuries, it was said that the female lions did all the hunting in the open savannah, while the male lions did nothing until it was time for dinner.

You've heard this too.

Recently, I led an aerial mapping campaign in Kruger National Park, South Africa.

Our colleagues fitted GPS tracking collars to male and female lions and mapped their hunting behavior from the air.

The bottom left shows a lion sizing to kill a herd of impalas, and the right shows what I call the lion's viewshed.

This is the distance a lion can see in all directions before being obscured by vegetation.

And what we discovered is that male lions aren't the lazy hunters we thought they were.

They're just using a different strategy.

Female lions hunt long distances in open savannah, usually during the day, while male lions employ ambush strategies in dense vegetation and often at night.

This video shows actual hunting viewsheds for a male lion on the left and a lioness on the right.

Red and dark colors indicate denser vegetation and white indicates wide open spaces.

And this is quite literally a visible hut at eye level that hunts male and female lions.

Suddenly you can see very clearly the very eerie circumstances in which a male lion hunts.

I brought up this example first because it emphasizes how little we know about nature.

A huge amount of work has been done to slow the loss of tropical forests, and as shown in red on the slide, we are losing forests at a rapid rate.

I think it's ironic that despite all the things we do, these areas are so little known to science.

So how can we save the incomprehensible?

Now, I am a world-class ecologist and earth explorer, with a background in physics, chemistry, biology, and many other boring subjects, but most of all I am preoccupied with what we don't know about our planet.

So I founded the Carnegie Airborne Observatory (CAO).

It may look like a fancy painted plane, but it's packed with over 1,000 kilograms of high-tech sensors, computers and a highly motivated staff of earth scientists and pilots.

Two of our instruments are very unique. One, called an imaging spectrometer, can actually measure the chemical composition of plants while flying over them.

The other is a set of extremely powerful lasers that shoot out from the bottom of the plane and wipe out entire ecosystems, making high-resolution 3D measurements nearly half a million times per second.

Here's an image of the Golden Gate Bridge in San Francisco, not far from where I live.

We flew straight over this bridge, imaging it in 3D and capturing its color in just a few seconds.

But the real power of CAO is its ability to capture the actual components of ecosystems.

This is a small town in the Amazon, CAO is imagined.

You can slice the data to see the 3D structure of vegetation and buildings, for example, or use chemical information to really get a sense of how fast plants are growing when you're flying over them.

The hottest pinks are the fastest growing plants.

And we can see biodiversity in ways you never imagined.

Flying over a rainforest in a hot air balloon might look like this.

We thus see the rainforest in kaleidoscopic colors. It tells us that many species live in symbiosis with each other.

But you have to remember that these trees are literally bigger than whales. And that means it's impossible to understand it just by walking on the ground beneath it.

So our images are 3D, chemical, biological, and they give us a lot of information not only about canopy-dwelling species, but also about the rest of the rainforest.

We created CAO to answer questions that have now proved to be very difficult to answer from other vantage points, such as ground and satellite sensors.

I would like to share three of those questions with you today.

The first question is how to manage tropical forest carbon reserves.

Tropical forests contain large amounts of carbon in their trees, and that carbon must be retained in order to avoid further global warming.

Unfortunately, the global carbon footprint from deforestation currently rivals the global transportation sector.

This is a combination of ships, planes, trains and automobiles.

So while it's understandable that policy negotiators are working hard to reduce deforestation, they're doing it for landscapes that are largely unknown to science.

If you don't know exactly where the carbon is, how do you know what you're missing?

Basically, you need a high-tech accounting system.

Our system allows a detailed look at the carbon stocks of tropical forests.

Red clearly shows tropical forest with a closed canopy, then cookie cutting, or yellow and green for forest clearing.

It's like cutting a cake, but this cake is as deep as a whale.

You can still zoom in and see the forest and trees at the same time.

And amazingly, even though we flew so high over this forest, subsequent analysis allows us to actually go inside and experience the tree leaf by leaf, branch by branch, just as other species living in this forest experience it with the trees themselves.

We have used this technology to explore and actually publish the first high-resolution carbon geographies in remote locations such as the Amazon basin and not-so-distant locations such as the United States and Central America.

What I'm about to do is take you on a first-of-its-kind high-definition tour of the carbon landscape of Peru and Panama.

The color will change from red to blue.

Red is the largest cathedral forest imaginable with very high carbon stocks, blue is very low carbon stocks.

And let me tell you, Peru is the only place that is completely unknown to this day when it comes to carbon geography.

Fly into this region of northern Peru and you'll see a reddish, ultra-high-carbon resource with the Amazon River and floodplain piercing through it.

Blue takes you to areas of complete devastation caused by deforestation, and orange to areas where the virus of deforestation is rampant.

You can also fly into the southern Andes to check the forest line and see exactly how the carbon landscape ends as you ascend into the mountain system.

And you can also go to the western Amazon's largest swamp.

It's a watery dream world, similar to Jim Cameron's Avatar.

If you go to Panama, one of the smallest tropical countries, you can see a wide range of carbon variations, from more red to less blue.

Unfortunately, most of the carbon is lost in the lowlands, but what remains in terms of high carbon stocks of greens and reds is in the mountains.

One interesting exception to this is in the middle of the screen.

A buffer zone is visible around the Panama Canal.

it's red and yellow.

Canal authorities are using force to protect the watershed and global trade.

This kind of carbon mapping has revolutionized conservation and resource policy development.

It really advances our ability to protect forests and curb climate change.

Second question: How can we prepare for climate change in places like the Amazon rainforest?

Mind you, I spend a lot of time in these places and I can already see the climate changing.

Temperatures are rising and what is really happening is massive, recurring droughts.

The 2010 mega drought is shown here, with red indicating an area the size of Western Europe.

The Amazon river in 2010 was very dry, and the Amazon river itself was partially dried up, as seen in the photo at the bottom of the slide.

What we have found is that in very remote areas, these droughts are having a huge negative impact on tropical forests.

For example, these are all red dead trees that died after the 2010 drought.

This region, which happens to be on the border of Peru and Brazil, is completely unexplored and little known to science.

So, as geoscientists, we think that species will need to migrate with climate change from the east of Brazil all the way west to the Andes and mountains to minimize exposure to climate change.

One of the problems with this is that humans are dismantling the Western Amazon as we speak.

See this 100-square-kilometer chasm created in the forest by gold miners.

The forest appears in 3D and in green, showing the impact of gold mining below the soil surface.

Clearly, species have nowhere to move in a system like this.

If you have never been to Amazon, please do so.

Wherever you go, you will always have a great experience.

You will probably see it on the river like this.

But in many cases, the river masks what is really going on in the forest.

We flew over this same river and visualized the system in 3D.

The forest is on the left.

Then you can digitally remove the forest and see what's happening under the canopy.

And in this case, it turned out to be all illegal gold mining activity, far from the edge of the river, as evidenced by the strange pockmarks on the screen to the right.

please do not worry. We are working with authorities to address this and many other issues in the region.

Therefore, geographically clear planning must begin now to put together conservation plans for these unique and important corridors, such as the Western Amazon Corridor and the Andean Amazon Corridor.

How do you do that if you don't know the geography of biodiversity in the area, or it's too little known to science?

So what we've been doing is using CAO's laser-induced spectroscopy to map the biodiversity of the Amazon rainforest for the first time.

Here you'll see real data showing different species in different colors.

Red is one species, blue is another, and green is yet another.

And when integrated and scaled up to the regional level, we get a whole new geography of biodiversity that was unknown before this study.

This tells us where the major biodiversity changes are occurring for each habitat. This is very important because it tells us a lot about where species may migrate and from where they may migrate in response to climate change.

And this is vital information for decision-makers developing protected areas in the context of regional development plans.

And the third and final question is how do we manage biodiversity on a planet where ecosystems are protected?

The example I started with lion hunting was a study we did inside the fence of a reserve in South Africa.

And the truth is that much of Africa's nature will continue into the future in protected areas like the ones I show in blue on the screen.

This puts an incredible amount of pressure and responsibility on park management.

They must take actions and decisions that benefit all the species they protect.

Some of their decisions have a really big impact.

For example, where and how much fire is used as a management tool.

Or how to deal with large species like elephants. If its population increases too much, it can adversely affect ecosystems and other species.

And, let me tell you, this kind of dynamic really affects the landscape.

In the foreground is an area with many fires and many elephants. It is a savanna that spreads blue and only a few trees.

Beyond the perimeter of this fence, you enter a fire-protected, elephant-free area. That is, dense vegetation, a radically different ecosystem.

And in places like Kruger, the surge in elephant density is a big problem.

I know this is a sensitive issue for many people, but there is no easy answer to this.

But the good thing is, for example, the technology we've developed and we're working on in South Africa allows us to map all the trees in the savannah, and by flying repeatedly we can see which trees are being pushed down by elephants, and they're red as you see them on screen, and to what extent that's happening in different types of landscapes in the savannah.

This gives park managers the first opportunity to use the more subtle, less extreme tactical management strategies introduced earlier.

In fact, how we view protected areas today is as managing fires, managing elephants, their impact on the structure of ecosystems, and cycles of life that affect everything from insects to apex predators like lions.

In the future, we plan to significantly expand the airborne observatory.

I really want to get this technology into orbit so that technology like this can manage the entire planet.

Until then, you'll find me flying in remote areas you've never heard of.

Finally, I would like to say that while technology is absolutely essential in managing our planet, the understanding and wisdom to apply it is even more important.

thank you.

(applause)

Serj Salman: Henry Evans from Los Altos Hills, California.

(Applause) Henry Evans: Hello.

My name is Henry Evans. By August 29, 2002, I was living my version of the American Dream.

I grew up in a typical American town near St. Louis.

my father was a lawyer.

my mother was a housewife.

My six siblings and I were good kids, but we caused quite a few problems.

After high school, I left home to study and learn more about the world.

I attended the University of Notre Dame and graduated with a degree in Accounting and German, including a year of study abroad in Austria.

After that, I got my MBA from Stanford University.

I married my high school sweetheart, Jane.

I am lucky to have her.

Together we raised four wonderful children.

I worked and studied hard to move up the ladder and eventually became the Chief Financial Officer of Silicon Valley, and I really enjoyed this job.

My family and I purchased our first and only home on December 13, 2001. It's a fixer upper in a beautiful location in Los Altos Hills, California. I'm talking from there now.

I was looking forward to rebuilding it, but eight months after moving in, I had a stroke-like seizure due to a birth defect.

At the ripe age of 40, I became a quadriplegic mute overnight.

It took me a few years, but with the help of my incredibly supportive family, I finally decided that life was still worth living.

I became interested in using technology to help people with severe disabilities.

A head-tracking device sold by Madentec translates my small head movements into cursor movements that enable normal computer use.

I can surf the web, exchange emails with people, and routinely beat my friend Steve Cousins ​​in an online word game.

This technology keeps me focused, mentally active, and makes me feel a part of the world.

One day, while lying in bed watching CNN, I was surprised to see Professor Charlie Kemp of the Georgia Tech Healthcare Robotics Lab demonstrating the PR2 robot.

I emailed Charlie Cousins ​​and Steve Cousins ​​of Willow Garage to form The Robots for Humanity Project.

For about two years, Robots for Humanity has developed a way to use PR2 as a body replacement.

I shaved my beard for the first time in 10 years.

I shaved Charlie in Atlanta from my home in California. (laughs) I handed out Halloween candy.

I opened the refrigerator myself.

I started working around the house.

I have found new possibilities to live and contribute that were previously unthinkable, both for myself and others in the same situation.

We are all disabled in some way.

For example, if one of us wants to go 90mph, we both need an assistive device called a car.

Your disability does not make you any less human, nor does mine.

By the way, check out my lovely ride. (Laughter) From the time we were born, we have suffered from not being able to fly on our own.

Kaijen Hsiao from Willow Garage introduced me to Chad Jenkins last year.

Chad showed me how easy it is to buy and fly a drone.

That's when I realized that aerial drones could be used to extend the world of bedridden people through flight, giving them an incredible sense of movement and control.

These web interfaces allow you to see video from the robot using a head-controlled mouse cursor, and send control commands by pressing web browser buttons.

With a little practice, I was comfortable enough with the interface to be able to drive around my house on my own.

I could look around our garden and see the grapes we were growing.

I have checked the solar panels on the roof. (Laughter) One of my challenges as a pilot is landing a drone on a basketball hoop.

We also wanted to see if we could have an immersive experience controlling a drone using the Oculus Rift, a head-mounted display improved by Fighting Walrus.

With Chad's group at Brown University, I regularly fly drones around his lab from home, 3,000 miles away, several times a week.

A quadriplegic person will get bored if all the work and nothing to do is fun, so he sometimes finds time to play a robot soccer friendly. (Laughter) I never thought that I would be able to navigate a campus like Brown easily by myself.

I just wish I could pay my tuition. (Laughter) Chad Jenkins: Henry, kidding aside, I'm sure everyone here wants to see you fly this drone from your bed in California 3,000 miles away.

(Applause.) Now, Henry, have you been to Washington DC recently?

(Laughter) Are you excited to be at TEDxMidAtlantic?

(Laughter) (Applause) Can you show me how excited you are?

(Laughs) All right, it's a big hit.

Can you show me how good a pilot you are?

(Applause.) Okay, we still have a little way to go, but I think this shows promise.

What's great about Henry's story is that it's about understanding Henry's needs, understanding what people in Henry's situation need from technology, understanding what advanced technology can offer, and integrating the two to use them in a smart and responsible way.

What we are trying to do is democratize robotics and allow everyone to participate in robotics.

We offer off-the-shelf robotic platforms such as A.R. at affordable prices. We give you a drone, $300, a Suitable Technologies Beam for just $17,000, and open source robotics software so you can be a part of what we're doing.

And it is our hope that by providing these tools, you will be able to think of better ways to provide mobility for the disabled, care for an aging population, improve the education of our children, imagine what the new types of middle-class jobs of the future will look like, monitor and protect our environment, and explore the universe.

Back on topic, Henry.

Him: Thank you, Chad.

With this drone setup, we demonstrate the potential for bedridden people to explore the outside world again, robotics ultimately providing a level playing field limited only by mental acuity and imagination, where disabled people can perform the same, or perhaps more, activities than others, and technology can even provide an exit for many people who are now considered vegetables.

100 years ago I would have been treated like a vegetable.

Not really.

would have died

For better or worse, it's up to all of us to decide how robotics will be used to simply replace humans or make them better, to do more and have more fun.

Our goal for robotics is to make the world more physically accessible to me and people like me around the world, thereby liberating everyone's mental powers.

With the help of people like you, we can make this dream a reality.

thank you.

(applause)

Today, 1 billion people in the world have no access to roads in any season.

1 billion people.

One-seventh of the planet's population will be completely cut off at some time of the year.

We can't get them medicines reliably, we can't get them vital supplies, we can't market our goods to generate sustainable income.

For example, in sub-Saharan Africa, 85% of roads become unusable during the rainy season.

Investments are being made, but at current levels it is estimated that it will take 50 years to catch up.

In the United States alone, there are over 4 million miles of roads that are very expensive to build and maintain, have a high environmental impact, and are frequently congested.

So we saw this and wondered if there was a better way.

Using today's cutting-edge technology, could we create a system that could leapfrog this part of the world in the same way that mobile phones did in the last decade?

Many of these countries have excellent telecommunications today without running copper wires underground.

Could transportation do the same?

Imagine this scenario.

Imagine you are in a maternity ward in Mali with a newborn in urgent need of medication.

what are you doing today?

Send a request on your mobile phone and someone will pick it up instantly.

That's the part that works.

However, due to bad roads, it may take several days for the medicine to arrive.

That's the broken part.

We believe that with a motorized autonomous vehicle like this, we can deliver it within hours.

It can today transport a small load of about 2 kilograms over a short distance of about 10 kilometers, but it is part of a much wider network that could cover whole countries and even continents.

This is a highly flexible automated logistics network.

It is a network for transporting matter.

We call it Matternet.

We use 3 main technologies.

The first is an electric autonomous flying vehicle.

The second is an automated ground station where vehicles enter and exit to change batteries to fly farther, load or deliver packages.

And the third is the operating system that manages the entire network.

Let's look at each of these technologies in a little more detail.

The first is an unmanned aerial vehicle (UAV).

Ultimately, we will have all kinds of vehicles for different payloads and ranges.

I am using a small quad today.

They can carry 2 kilograms over 10 kilometers in just about 15 minutes.

Compare this to trying to hit a bad road in a developing country or getting stuck in traffic in a developed country.

They fly autonomously.

This is the key to technology.

As such, it uses on-board GPS and other sensors to navigate between ground stations.

All vehicles are equipped with automatic payload and battery exchange mechanisms, so these vehicles will travel to a ground station, dock, automatically replace their batteries, and set off again.

Ground stations are installed in safe places on the ground.

They secure the most vulnerable part of the mission: the landing.

Since they are at known locations on the ground, we also know the path between them. This is very important in terms of overall network reliability.

It will not only meet the energy requirements of vehicles, but will eventually become a commercial hub where people can retrieve packages and put packages into the network.

The final component is the operating system that manages the entire network.

It monitors weather data from all ground stations and optimizes vehicle routes through the system to avoid severe weather, avoid other risk factors and optimize resource usage across the network.

I would like to show you what one of those flights is like.

We flew in Haiti last summer and are doing our first field tests there.

Here, we model medical care delivery in a camp we set up after the 2010 earthquake.

People there love this.

And we want to show you what one of those vehicles looks like up close.

So this is a $3,000 vehicle.

Costs are coming down very quickly.

We use this in all kinds of weather conditions: very hot or very cold climates, very strong winds. They are very sturdy vehicles.

Imagine your life depended on this package after Sandy, somewhere in Africa or New York City.

The next big question is, what is the cost?

It turns out that it costs just 24 cents to move a 2-kilogram package 10 kilometers in this vehicle.

(Applause.) It may seem counterintuitive, but the cost of energy expended in flight is currently just two cents on a dollar, and we're just the beginning.

We saw this and felt that this could have a big impact on the world.

So we said, "How much does it cost to build a network anywhere in the world?"

And we considered establishing a network in Lesotho to transport HIV/AIDS samples.

The question is how to transport them from the clinic where they are collected to the hospital where the analysis is done.

And I thought, what if I want to cover an area that spans about 140 square kilometers?

This is about 1.5 times the size of Manhattan.

Well, it turns out it cost less than $1 million.

Compare this to a normal infrastructure investment.

We believe this is possible. This is the power of the new paradigm.

Therefore, I would like to introduce new ideas about transportation networks based on the ideas of the Internet.

It is decentralized, peer-to-peer, interactive, highly adaptable, and has a very low infrastructure investment and environmental impact.

But if it's a new paradigm, there should be other uses.

It can probably be used in other parts of the world as well.

Now let's look at the other end of the spectrum: cities and metropolises.

Currently, half of the earth's population lives in cities.

500 million of us live in megacities.

We live in a time of incredible urbanization.

In China alone, a megacity the size of New York City grows every two years.

These locations have road infrastructure, but it is very inefficient.

Congestion is a big problem.

So in these places, we think it makes sense to build a new layer, the transport network, that sits between the roads and the internet, initially for light and urgent things, and over time we want to develop this into a new mode of transportation that will be a truly modern solution to a very old problem.

The end result is highly scalable, has a very small ecological footprint, and works 24/7 in the background, just like the Internet.

So when we started doing this a few years ago, a lot of people came to us saying, 'This is a very interesting but crazy idea and not something we should be working on right away.

And, of course, we are talking about drones, yes, this technology is not only unpopular in the West, but it has become a very, very uncomfortable reality for many people living in poor countries, especially those in conflict.

So why do we do this?

Well, we decided to do this not because it's easy, but because it works wonders.

Imagine a billion people being connected to physical goods in the same way that mobile communications were connected to information.

Imagine if the next big network we built in the world would be a network for transporting matter.

In the developing world, we want to reach millions of people with better vaccines and better treatments.

It will give us an unfair advantage in the fight against HIV/AIDS, tuberculosis and other epidemics.

Over time, we hope it will become a new platform for economic transactions and lift millions out of poverty.

We hope it will be a new mode of transportation that will help make our cities more livable, both in developed and emerging countries.

So to those who still believe this is science fiction, I categorically say it's not.

However, you have to engage in social fiction to make it happen.

thank you.

(applause)

I would like to know how many of you here think that what I am about to say has practical value, so please raise your hand. If you're here and are over 65, or want to live past 65, or have parents or grandparents who were or were alive past 65, raise your hand. (Laughter) Okay. You are the people for whom my talk has practical value. (Laughter) The rest of you will find my story irrelevant to you personally, but you will still find the subject fascinating.

I talk about growing old in a traditional society.

This subject constitutes just one chapter of my latest book, which compares traditional small tribal societies to our larger modern societies on topics such as parenting, growing up, health, coping with danger, conflict resolution, religion, speaking multiple languages, and more.

These tribal societies, which made up all human societies for most of human history, are far more diverse than the modern large societies.

All large societies where there are governments and where most people are strangers to each other are necessarily similar to each other and differ from tribal societies.

Tribes constitute thousands of natural experiments for running human societies.

They constitute experiments from which we might be able to learn ourselves.

Tribal societies should not be despised as primitive and miserable, but neither should they be glorified as happy and peaceful.

Knowing about the customs of some tribes, some of them terrify us, while others make us admire, envy, and wonder if we can adopt them.

While most seniors in the United States will eventually live away from their children and most of their childhood friends, often in separate nursing homes, in traditional societies they spend their lives with their children, other relatives, and lifelong friends instead.

Nevertheless, the treatment of the elderly varies widely among traditional societies, ranging from much worse to much better than modern societies.

At the worst extreme, many traditional societies dispose of the elderly in one of four increasingly direct ways. These include ignoring the elderly, not eating or cleaning them until they die, abandoning them when the group moves, encouraging them to commit suicide, or killing them.

In which tribal society do children abandon or kill their parents?

It occurs mainly under two conditions.

One is nomadic hunter-gatherer societies that frequently move camps, making it physically impossible to carry the elderly who cannot walk when able-bodied young people already have to carry young children and all their possessions.

The other situation is in societies that live in marginal or variable environments such as the Arctic or the desert, where there are regular food shortages and sometimes not enough food to keep everyone alive.

Whatever food is available should be reserved for able-bodied adults and children.

For us Americans, the thought of abandoning or killing a sick wife or husband, an old mother or father sounds terrifying, but what is different in these traditional societies?

They face a cruel situation in which they have no choice.

Their old people had to do the same to their parents, and they know what will happen to them.

At the other end of the treatment of the elderly, the happy pole, are the agricultural societies of New Guinea, where I have fieldworked for the past fifty years, and most sedentary traditional societies around the world.

In those societies, the elderly are cared for.

they are fed. they are still valuable.

And they continue to live in the same hut or in nearby huts near their children, relatives and lifelong friends.

There are two main reasons why different societies treat older people differently.

Its variation depends especially on the usefulness of older people and the values ​​of society.

First, regarding usefulness, elderly people continue to provide useful services.

One of the uses of older people in traditional societies is that they are often still competent in food production.

Another traditional utility of the elderly is that they can nurse their grandchildren, thereby freeing their adult children, the grandchildren's parents, to go hunting and gathering food for their grandchildren.

Yet another traditional value of the elderly is in making tools, weapons, baskets, pots and textiles.

In fact, they're usually the ones who are the best at it.

Older people are usually the leaders of traditional societies and the most knowledgeable about politics, medicine, religion, song and dance.

Finally, older people in traditional societies have a greater importance than can be imagined in modern literate societies whose sources of information are books and the Internet.

In contrast, in traditional non-literate societies, the elderly are the goldmine of information.

In times of crisis caused by rare events experienced by only the oldest living, it is their knowledge that makes the difference between survival and death for an entire society.

So, these are ways older people can help in traditional societies.

Their usefulness varies and contributes to the changing treatment of older people in society.

Another reason for the uneven treatment of older people is the cultural values ​​of societies.

For example, in East Asia, there is a particular emphasis on respect for the elderly in relation to the Confucius doctrine of filial piety, which implies obedience, respect and support for aging parents.

Cultural values ​​that emphasize respect for older people contrast with the low status of older people in the United States.

Older Americans are at a great disadvantage in job search.

They are at a great disadvantage in hospitals.

Our hospital has a clear policy of allocating medical resources based on age.

What that ominous phrase means is that when hospital resources are limited, say, when only one donor heart is available for transplantation, or when surgeons have time to operate on only a certain number of patients, hospitals in the United States have a clear policy of prioritizing younger patients over older patients, on the grounds that they are considered more valuable to society because they have more life ahead of them, even though younger patients have fewer years of valuable life experience to follow.

There are several reasons for the low status of older people in the United States.

One is that the work-oriented Protestant work ethic means that older people who are no longer working are not respected.

Another reason is that Americans attach so much importance to the virtues of independence that we instinctively look down on older people who are no longer independent and independent.

A third reason is America's cult of youth, and it shows in advertising.

Advertisements for Coca-Cola and beer always depict smiling young people, even though not only young people but also older people are buying and drinking Coca-Cola and beer.

Think about it, when was the last time you saw a Coke or beer ad featuring smiling 85-year-old people? Never.

Instead, the only American ads that feature gray-haired old men are those for nursing homes and pension plans.

Now, what has changed in the status of the elderly today compared to their status in traditional societies?

There have been some good changes, but many more bad ones.

Major changes for the better include the fact that today we live much longer, have much better health in old age, and have much greater recreational opportunities.

Another positive change is the existence of specialized retirement facilities and programs to care for older people.

Change for the worse begins with the grim reality that today there are more old people and fewer young people than at any time in the past.

It means that all these old people are a burden to a few young people, and that each old person has low personal value.

Another major change that worsens the status of the elderly is the age-related disconnection of social ties. This is because older people, their children, and friends all move and disperse independently of each other many times during their lives.

We Americans move on average every five years.

Therefore, our seniors are likely to live far away from our children and childhood friends.

Another even worsening change in the status of older people is their formal retirement from the workforce, accompanied by a loss of friendships at work and a loss of work-related self-esteem.

Perhaps the biggest negative change is that our elderly have become objectively less useful than traditional societies.

Widespread literacy means that it is no longer useful as a repository of knowledge.

When we want information, we look it up in a book or google it instead of finding an older person and asking.

The slow pace of technological change in traditional societies means that what you learned there as a child will still be useful to you in old age, but the fast pace of technological change today means that what you learned as a child will be useless 60 years from now.

Conversely, we seniors are not familiar with the technology that is essential for survival in modern society.

For example, at 15, I was thought to be very good at multiplying numbers because I memorized multiplication tables, knew how to use logarithms, and was quick with a slide rule.

But today, any fool can use a pocket calculator to multiply 8-digit numbers accurately and instantly, so such skills are useless.

Conversely, at age 75, I am incompetent in the skills necessary for everyday life.

Our first TV, built in 1948, had only three knobs: an on/off switch, a volume knob, and a channel selector knob, but we quickly got used to it.

Now, just watching a program on my TV at home requires operating a TV remote control with 41 buttons, which is very cumbersome.

I need to call my 25 year old sons and have them listen while I press 41 miserable buttons.

How can we improve the lives of older Americans and better leverage their value?

That's a big problem.

In the remaining four minutes of the day, I'd like to make some suggestions.

One of the values ​​of older people is that, with more young women entering the workforce and fewer young parents of both sexes caring for their children full-time, they are increasingly useful as grandparents to provide quality childcare for their grandchildren if they wish.

Compared to the usual alternatives of paid babysitters and daycare centres, grandparents provide excellent, motivated and experienced childcare.

They already have experience raising their own children.

They usually love their grandchildren and are eager to spend time with them.

Unlike other caregivers, grandparents don't quit their jobs just because they find a higher paying job to care for their next baby.

The second value of older people is paradoxically related to their loss of value due to changes in world affairs and technology.

At the same time, the increased value of older people today is due to the unique experiences of living environments that are now rare due to rapid change, and may return.

For example, only Americans in their 70s and older now remember surviving the Great Depression, surviving a world war, and the agony of the fear that the atomic bombings would be more horrifying than the consequences of not dropping them.

Most voters and politicians today have no personal experience with these things, but millions of older Americans do.

Unfortunately, all of these horrifying situations can recur.

Even if they don't come back, you have to be able to make plans for them based on your experience of what they were like.

Older people have similar experiences.

Young people are not.

The remaining values ​​of older people that we will discuss include recognizing that while there are many things that older people cannot do anymore, there are also things they can do better than younger people.

The challenge for society is to take advantage of what older people are better at.

Of course, there are also abilities that decline with age.

These include strength and stamina, ambition, and the ability to do jobs that require novel reasoning in confined situations, such as figuring out the structure of DNA, and are best left to scientists under the age of 30.

Conversely, valuable traits that increase with age include experience, an understanding of people and relationships, the ability to help others unencumbered by one's own ego, and interdisciplinary thinking about large databases such as economics and comparative history, and are best left to scholars over the age of 60.

Older people are therefore far better than younger people at supervising, managing, advising, strategizing, teaching, synthesizing, and devising long-term plans.

I have seen these values ​​of older people with many of my friends in their 60s, 70s, 80s and 90s who are still active as investment managers, farmers, lawyers and doctors.

In other words, many traditional societies make better use of the elderly and provide them with a more satisfying life than modern large societies.

Paradoxically, with more seniors than ever before, living healthier lives than ever before, and access to better health care than ever before, old age is, in some ways, more miserable than ever before.

It is widely recognized that the lives of the elderly constitute a disaster zone in contemporary American society.

We can certainly improve by learning from the lives of older people in traditional societies.

But what is true of the lives of older people in traditional societies is also true of many other characteristics of traditional societies.

Of course, I'm not advocating that everyone quit farming and metal tools and go back to hunting and gathering.

There are many things that make it clear that our lives today are much happier than those of traditional small societies.

Our lives are longer than those of people in traditional societies, are much richer materially, and suffer less from violence, just to name a few.

But there is something to be admired about people in traditional societies, and perhaps something to learn from them.

Their lives are usually poor materially but socially much richer than ours.

Their children are more confident, more independent, and have better social skills than our children.

They are more realistic about danger than we are.

They almost never die from diabetes, heart disease, stroke, or other non-communicable diseases that kill nearly everyone in this room today.

Modern lifestyle features make us more susceptible to these diseases, and traditional lifestyle features protect us from them.

These are just a few examples of what we can learn from traditional societies.

I hope you find reading about traditional societies as interesting as I was interested in living in them.

thank you.

(applause)

Yesterday, I went out to the street in front of this building and was walking on the sidewalk. I was with several people and they all followed the rules of walking on the sidewalk.

we are not talking to each other we are facing forward

I am on the move.

When the person in front of you slows down.

So as I looked at him, he slowed down and finally stopped.

Well, it wasn't fast enough for me so I put out my turn signals and walked around him and as I walked I saw what he was doing and he was doing this.

He was texting, but he couldn't walk while texting at the same time.

You can now approach this from a working memory perspective or from a multitasking perspective.

I'm going to try working memory today.

Now, working memory is that part of our consciousness that we are aware of at all times of the day.

you are doing it now

It's not something we can turn off.

Turning it off is called a coma, right?

So for now you're doing just fine.

Now, working memory has four basic components.

This allows you to store first-hand experience and bits of knowledge.

This allows us to go back to our long-term memory, retrieve parts of it as needed, mix them up, and process them in the light of our current goals.

My goal right now is not to be president or to be the best surfer in the world.

It's more mundane. I want that cookie or I'll have to find a way to get into the hotel room.

Now, the capacity of working memory is the capacity to harness it, to take what we know and what we can hold on to and use it in ways that allow us to achieve our current goals.

Now, working memory capacity has a fairly long history and is associated with many positive effects.

People with high working memory tend to be good storytellers.

They tend to solve standardized tests and do well despite it being important.

They can acquire high level writing skills.

They can also reason at a high level.

What we're trying to do here is play around with some of it a little.

So let's have you do some tasks and use your working memory.

OK? have understood.

I'm going to say five words, and I want you to stick to them.

don't write them down. just wait.

5 words.

Have them answer three questions while you wait for them.

I'd like to see what that word would look like.

Here are the words: trees, highways, mirrors, Saturn, electrodes.

So far, so good?

have understood. All I want is for you to tell me what the answer to 23 x 8 is.

just shout

(mumbling) (laughter) Actually, it's -- (mumbling) -- it's accurate. (Laughter) Okay. I want you to stick out your left hand and do "1, 2, 3, 4, 5, 6, 7, 8, 9, 10."

Mind you, this is a neurological exam.

got it. Now recite the last five letters of the English alphabet backwards.

Should have started with Z.

(Laughter) Okay. How many people here are sure you understand all five words?

have understood. It usually ends up being about less than half, which is normal. there will be a range.

Some people can tolerate up to five.

Some people can put up with 10.

Some people go down to two or three.

What we do know is that this is very important to the way we work, right?

And it's going to be very important here at TED, because you're going to be exposed to so many different ideas.

Now, the problem we have is that life hits us, and it comes very quickly. And all we have to do is take that amorphous stream of experience and use our pea-sized working memory to extract some form of meaning from it.

Don't get me wrong. Working memory is a wonderful thing.

Working memory allows us to explore current experiences as we move forward.

It allows us to make sense of the world around us.

But it has certain limitations.

Well, working memory is great for enabling communication.

We can have a conversation and we can build a story around it so we know where we've been and where we've been and how we can contribute to this conversation.

It allows us to solve problems and think critically.

During a meeting, we can listen to someone's presentation, rate it, decide if we like it, and ask additional questions.

They all occur in working memory.

And even if what you're really looking for is Red Bull and bacon, you can still go to the store and get milk, eggs, and cheese. (Laughter) You have to make sure you get what you're looking for.

Now, the central problem with working memory is that working memory is limited.

Limited capacity, duration and focus.

We tend to remember about four things.

have understood? It used to be 7, but now seems to be 4 on functional MRI, which was overachieving.

Now, our recollection of these four things is about 10-20 seconds unless we do something about it, process it, apply it to something, or talk to someone about it.

When we think about working memory, we need to recognize that this limited capacity affects us in different ways.

Have you ever walked from one room to another and then forgot why you were there?

You know the solution, right?

Go back to your original room. (laughter) Have you ever forgotten your keys?

Forgot your car?

Have you ever forgotten your children?

Have you ever been in a conversation and noticed that the conversation on the left was actually more interesting? (Laughter) And you really hope the answer is no. Because that's what you're trying to say.

All of this talks about working memory, what we can and can't do.

We need to recognize that working memory capacity is finite and working memory capacity itself is a way of negotiating that.

We negotiate it through strategy.

So I would like to talk a little bit about some strategies here. These are very important as you will be in an environment rich in information targets over the next few days.

Now, the first part of this that we need to think about is our being, our life, iterating instantly.

We need to process what is happening in the moment, not 10 minutes or a week later.

So we have to think, well, can I agree with him?

What am I missing? What do you want to know?

Do you agree with this assumption?

How can I apply this to my life?

It's a way to handle what's going on so you can use it later.

Now we have to repeat it too. You have to practice.

So here we have to think about it.

In the meantime, we want to talk to people about it.

Write it down, and when you get home, you'll take it out and think about it and spend time practicing it.

For some reason, practice has become so negative.

It's very positive.

The next important thing is that you need to think rigorously and you need to be specific.

We often think that new knowledge must be related to previous knowledge.

What we want to do is rotate it.

We want to involve all of our being in new knowledge and make all these connections so that it becomes more meaningful.

I would also like to use images. We are made for images.

you have to take advantage of it.

Think of things in images and write them down as such.

If you're reading a book, pull things up.

Just finished reading The Great Gatsby and I have a perfect picture of who he is in my head, so my own version.

Last is organization and support.

We are machines that make meaning. that's what we do.

We try to make sense of everything that happens to us.

Organization helps, so we need to structure what we do in a meaningful way.

If you provide knowledge or experience, it should be structured.

And last is support.

We all started as beginners.

Everything we do is an approximation of refinement.

You should expect it to change over time. we have to support it.

Support may come by asking people questions or handing out papers with org charts and guiding images, but we need to support them.

Now, this last part, the takeaway message in terms of working memory capacity is: "What we process, what we learn."

If we are not processing life, we cannot say that we are living it.

live. thank you.

(applause)

What is so special about the human brain?

Why do we study other animals instead of animals studying us?

What functions does the human brain have, and what functions do other brains lack?

About ten years ago, when I became interested in these questions, scientists thought they knew what different brains were made of.

With little evidence, many scientists believed that all mammalian brains, including the human brain, were created similarly, with the number of neurons always proportional to brain size.

This means that two brains of the same size weighing 400 grams, like these two brains, should have a similar number of neurons.

Now, if neurons are the functional information processing unit of the brain, then these two brain owners should have similar cognitive abilities.

However, one is a chimpanzee and the other is a cow.

Now, perhaps cows have a very rich inner spiritual life, and are so clever that they keep us from noticing them, but we eat them.

Most people would agree that chimpanzees are much more complex, sophisticated and flexible than cows.

So this is the first indication that the "all brains are made the same" scenario is not entirely correct.

But let's play together.

If all brains are made the same and comparing animals with brains of different sizes, the larger brain should always have more neurons than the smaller brain, and the larger the brain, the higher the cognitive capacity of its owner.

Therefore, the largest brain around should also have the highest cognitive capacity.

And here comes the bad news. Our brain is not the largest brain in the world.

It seems pretty frustrating.

Our brains weigh 1.2 to 1.5 kilograms, elephant brains weigh 4 to 5 kilograms, and whale brains can weigh up to 9 kilograms. Scientists have therefore argued that the human brain must be special to explain our cognitive abilities.

It must really be the exception, the exception to the rule.

They may be bigger, but we may be better, for example, in that they appear larger than they actually are because they have a much larger cortex than we need for our body size.

That would give us extra cortex to do more interesting things than just manipulating our bodies.

That's because brain size usually follows body size.

So the main reason our brains are said to be larger than they really need comes from comparing us to great apes.

Gorillas are two to three times bigger than us, so their brains should be bigger than ours, but the opposite is true.

Our brain is three times larger than a gorilla's brain.

The human brain also seems to be special in the amount of energy it uses.

It's only 2% of your body weight, but it consumes 25% of the total energy your body needs to run for the day.

That's 500 of the 2,000 total calories you need to keep your brain working.

So, the human brain is special because it's bigger than it needs to be and it consumes more energy than it needs to.

And this is where this story started to haunt me.

In biology, we look for rules that apply to all animals and life in general. So why do the laws of evolution apply to everyone else and not us?

Perhaps the problem was the basic assumption that all brains are created the same.

Perhaps two similarly sized brains actually consist of very different numbers of neurons.

Perhaps very large brains don't necessarily have more neurons than more modestly sized brains.

Perhaps the human brain, regardless of its size, actually has more neurons than any other brain, especially in the cerebral cortex.

So this became an important question for me to answer. How many neurons are there in the human brain and how is it different from other animals?

Now, you may have heard or read somewhere that we have 100 billion neurons. So ten years ago I asked a colleague if he knew where this number came from.

But no one did.

I searched the literature looking for the original reference for that figure, but I couldn't find it.

No one seems to have actually counted the number of neurons in the human brain, or any other brain for that matter.

So I came up with my own method for counting brain cells. It's basically melting your brain into soup.

It works like this: Take a brain or part of it and dissolve it in detergent. This disrupts the cell membrane but leaves the cell nucleus intact, resulting in a clear soup-like suspension of free nuclei, like this one.

This soup contains all the nuclei that were once mouse brains.

Now, the advantage of soup is that because it is a soup, you can stir it and distribute those cores evenly throughout the liquid. So, by looking at just 4-5 samples of this homogenous solution under a microscope, you can count the nuclei and thus know how many cells are in that brain.

Simple, straightforward, and very fast.

So, we've used that method to count neurons in dozens of different species, and it turns out that not all brains are created equal.

Take rodents and primates for example. As rodent brains get larger, the average size of neurons increases, so the brain swells very quickly and increases in size much faster than neurons increase.

However, the primate brain acquires neurons without the average neuron getting any larger. This is a very economical way of adding neurons to the brain.

As a result, primate brains always have more neurons than rodent brains of the same size, and the larger the brain, the greater the difference.

So what happens to our brains?

It turns out that humans have an average of 86 billion neurons, 16 billion of which are in the cerebral cortex. Considering that the cerebral cortex is central to functions such as consciousness and logical and abstract reasoning, with 16 billion neurons being the most in any cortex, I think this is the simplest explanation for our amazing cognitive abilities.

But just as important, what does 86 billion neurons mean?

Now that we know that the relationship between brain size and number of neurons can be explained mathematically, we can now calculate what a human brain would look like if it were made like a rodent brain.

Therefore, a rodent brain with 86 billion neurons weighs 36 kg.

it is not possible.

Such a huge brain collapses under its own weight, and this impossible brain enters the body of 89 tons.

I don't think it's like us.

So this brings us to an already very important conclusion. That is, we are not rodents.

The human brain is not as big as a rat's brain.

Sure, we may look special when compared to rats, but it's not a fair comparison considering we know we're not rodents.

Since we are primates, it is fair to make comparisons with other primates.

So if you do the math, you'll find that a typical primate with 86 billion neurons has a body of about 66 kilograms and a brain of about 1.2 kilograms, which seems just right. This is exactly the case with me, which is not very surprising, but still leads to an incredibly important conclusion. So I'm a primate.

And you are primates.

And so was Darwin.

I'd like to think Darwin would have really appreciated this too.

His brain, like ours, was modeled after the brains of other primates.

So while the human brain may indeed be remarkable, the number of neurons is not extraordinary.

It's just a large primate brain.

I think this is a very humble and sober thought and should remind us of our place in nature.

So why does it take so much energy?

Well, other people have figured out how much energy the human brain and the brains of other species require, and now that we know how many neurons each brain is made up of, we can do the math.

And it turned out that the human brain costs about the same as any other brain, averaging 6 calories per billion neurons per day.

Thus, the total brain energy cost is a simple linear function of the number of neurons, and we find that the human brain consumes as much energy as expected.

The reason the human brain consumes so much energy is simply because the brain has a huge number of neurons, and since we are primates and have more neurons than any other animal for a given body size, the relative cost of the brain is greater, but only because we are primates, not because we are special.

Last question. So how did we get this staggering number of neurons? In particular, if great apes are bigger than us, why don't they have bigger brains than us, and more neurons?

When I saw how expensive it was to have a large number of neurons in the brain, I thought there might be a simple reason.

They cannot afford to supply energy to both their large bodies and their large number of neurons.

I calculated it there.

We calculated how much energy a primate could get in a day from eating raw food, on the other hand how much energy it would take for a brain with a specific body size and a specific number of neurons, and looked for the combination of body size and number of brain neurons that a primate could tolerate if it ate a specific number of hours per day.

And what we discovered is that neurons are so expensive that there is a trade-off between body size and number of neurons.

That means a primate that eats eight hours a day could have a maximum of 53 billion neurons, but its body could not exceed 25 kilograms.

To gain more weight, you have to abandon your neurons.

That is, either a large body or a large number of neurons.

If you eat like a primate, you can't afford both.

One way out of this metabolic limitation is to spend more time eating each day, but that is dangerous and beyond a certain point impossible.

Gorillas and orangutans, for example, can gain about 30 billion neurons in an eight-and-a-half-hour meal a day, which seems to be their limit.

Nine hours of feeding per day seems to be the practical limit for primates.

what about us?

With 86 billion neurons and a weight of 60-70 kilos, we have to spend more than 9 hours a day feeding ourselves, which is unrealistic.

If we were eating like primates, we shouldn't be here.

So how did you get here?

Well, if our brains don't consume as much energy as they need and we can't spend all our waking hours throughout the day feeding, really, the only alternative is to somehow get more energy from the same foods.

And surprisingly, it matches exactly what our ancestors are thought to have invented cooking 1.5 million years ago.

Cooking is the pre-digestion of food outside the body using fire.

Cooked foods are softer, easier to chew, completely mushy in the mouth, fully digested and absorbed in the intestines, producing more energy in less time.

So cooking frees up time for us to do much more interesting things in the day and with our neurons than just thinking about food, looking for food, and devouring food all day long.

So thanks to cooking, this big, dangerously expensive brain with many neurons, which was once a huge burden, is now a huge asset, giving us both energy for our many neurons and time to do interesting things with them.

This, I think, explains why the human brain, while still a primate brain, evolved so rapidly in size.

Cooking made this big brain affordable, and we rapidly moved from raw food to culture, agriculture, civilization, grocery stores, electricity, refrigerators, and anything else that today can give you all the energy you need for the day in just one sitting at your favorite fast food joint.

So what was once the solution is now the problem, and ironically, we look to raw food for the solution.

So what is the human advantage?

What do we have that other animals do not?

My answer is that humans have the most neurons in the cerebral cortex, and I think this is the simplest explanation for our superior cognitive abilities.

And what do other animals not do, and what I believe are the fundamentals that allow me to reach the highest number of neurons in the cortex?

In short, we cook.

Other animals do not cook food. Only humans do.

And that's how we become human.

Studying the human brain has changed the way we think about food.

I now look at the kitchen and bow my head, thanking our ancestors for perhaps coming up with the inventions that made us human.

thank you very much.

(applause)

(Applause) It's an honor to be here tonight. It really inspired me, so I'm really glad I stayed here and listened.

And tonight we're playing some songs that will literally be world premieres.

I'm working on a new record and have never played these songs for anyone other than Mike.

This is a song I wrote about the meaning of technology, and it's perfect for this gathering.

When I was in college, I started to think that writing a research paper was a big job, especially as a blind person.

I had to go to the library and see if I could find the book by looking at the footnotes and such.

You should now be able to access Google. Check it out.

I wish I had that when I was in college.

Anyway, this song is about "I have this much stuff, what am I going to do with it?"

It's called "All Answers".

♫ ♫ What's the weather in Cincinnati? ♫ ♫ What time is it in Tokyo? ♫ ♫ Who is this little one's dad? ♫ ♫ And who needs to know? ♫ ♫ Why do memories of you linger when I'm trying to reach my goal ♫ ♫ ♫ ♫ And why should I ♫ ♫ move my fingers to the music of my soul? ♫ ♫ I don't know. ♫ ♫ You don't need to know. ♫ ♫ Because I'm here... ♫ ♫ And I've got all the answers ♫ ♫ In my hands. ♫ ♫ And I got all the answers ♫ ♫ And I don't have to understand ♫ ♫ 'Cause I got all the answers. ♫ ♫ I'm going to explore the century while listening to the sounds of the sea ♫ ♫ ♫ ♫ Ah, freedom is nice, ♫ ♫ Freedom. ♫ ♫ Who was the mayor of Chicago in 1964 ♫ ♫ ♫ ♫ And why did Shakespeare create Iago ♫ ♫ to tear apart such pure love? . ♫ ♫ You don't need to know. ♫ ♫ And here we go... ♫ ♫ Cause I've got all the answers ♫ ♫ In my hands. ♫ ♫ And I got all the answers. ♫ ♫ See, you don't have to understand ♫ ♫ 'Cause I've got all the answers. ♫ ♫ I'm going to browse ♫ ♫ tabloid news ♫ ♫ while drinking tea. ♫ ♫ Well, it's nice to be free. ♫ (trumpet sounds) ♫ I never have to be alone. ♫ ♫ I can do it all at my house. ♫ ♫ Yeah, uh uh, uh... ♫ ♫ Everything that's ever been known, ♫ ♫ I can punch it right here on my phone. ♫ ♫ Freedom Train Coming Soon ♫ ♫ Here in my living room ♫ ♫ From Baton Rouge to Saskatoon ♫ ♫ And everywhere in between. ♫ ♫ Because all the answers are right here on the screen ♫ ♫ ♫ ♫ And I got all the answers. ♫ ♫ I got all the books and magazines. ♫ ♫ Got it all, got it all, got it all... ♫ ♫ Got all the answers, ♫ ♫ Got all the answers, oh yeah. ♫ ♫ Well... ♫ ♫ But let me know what you're going to do: ♫ ♫ I'm going to find the capital of Peru ♫ ♫ Or find the latitude of Kathmandu. ♫ ♫ I'll look it up on Google ♫ ♫ Because everyone is doing it. ♫ ♫ Then I comb through the century. ♫ ♫ Got it all, got it all, got it all... ♫ ♫ Got all the answers. ♫ ♫ Yes, yes ♫ ♫ I know all the answers. ♫ (Applause) Thank you.

Phew! It's a miracle I didn't make a mistake on that song.

I played for the first time.

(Applause) It's like, "Even if you're scared, let's just do it."

The next song is a dream, a song that started with a childhood dream.

This was one of the titles I was considering on my record, except for a few issues.

One is that it is difficult to pronounce.

And it is a coined word.

It's called "Tembellana".

I think this song is based on my first attempt to think about invisible forces in my childhood.

In other words, I can only say that "Temberelana" was a dream in which I was running away from bad feelings.

So this is called "Temberelana".

It is based on an Argentinian rhythm called "Carnibalito".

♫ Dreams within dreams, ♫ ♫ Worlds within worlds, ♫ ♫ Primordial cries ♫ ♫ carry across the earth. ♫ ♫ Pictures flicker, ♫ ♫ The sounds of fighter planes, ♫ ♫ Limousine lines ♫ ♫ slowly move across the land. ♫ ♫ Another kid could use his hands. ♫ ♫ Reaching out from within ♫ ♫ Tenmberelana, hey, tenmberelana ... ♫ ♫ Annihilation movement. ♫ ♫ The earth is an open grave. ♫ ♫ The final boom, ♫ ♫, reverberates across the earth. ♫ ♫ Fear, you are the enemy. ♫ ♫ Erase everything but you. ♫ ♫ You can see what you want to see. ♫ ♫ Before I go blind, I raise a toast ♫ ♫ Shadow of the power I love most, ♫ ♫ The power of creation. Tembererana, Hey, Tembererana... ♫ ♫ Same name. ♫ ♫ Temberelana, hey, Temberelana ... ♫ ♫ Da, Da, Da, Da, Da, Da, Da ♫ ♫ Tembere, Tembere, Tembere, Temberelana ♫ ♫ Tembere, Tembere, Tembere, Temberelana, Hey

There's something you know about me, something very personal, and something I know about all of you, and it's very central to your concern.

There is something we know about every person we meet on the street, anywhere in the world. It is the very source of what they are doing and what they are putting up with.

And that is, we all want to be happy.

We are all together in this.

How we imagine ourselves to be happy is different for each of us, but we already have much in common in our desire to be happy.

Well, my theme is gratitude.

What is the relationship between happiness and gratitude?

Many people will say, "It's that easy."

Be grateful when you are happy.

But think again.

Are only truly happy people grateful?

We all have everything we need to be happy, but I know quite a few people who are not happy because they want something different or want more of the same.

And we all know people who have had a lot of misfortune, misfortune that we don't want to experience ourselves, and for whom they are genuinely happy.

They radiate happiness. you are surprised

why? because they are grateful.

Therefore, it is not happiness that we are grateful for.

Gratitude makes us happy.

If you think being grateful makes you happy, think again.

Gratitude makes you happy.

So what does gratitude actually mean?

And how does it work?

I appeal to your own experience.

We all know from experience how it happens.

We experience what is valuable to us.

We are given something of value.

And it is really given.

These two things have to happen at the same time.

It must be of value, it is a genuine gift.

you didn't buy it you haven't earned it

you didn't replace it. I never worked for it.

It's just given to you.

And when these two things come together, when I realize that it's really valuable to me, that it's a free gift, gratitude naturally springs up in my heart, and happiness naturally springs up.

That's how gratitude is born.

Now, the key to all this is that you only get to experience this once in a while.

We cannot only experience gratitude.

We can become grateful people.

It is important to live with gratitude.

And how can we live with gratitude?

As we say, by experiencing, by realizing that every moment is a given moment.

It's a gift. you haven't earned it

You never caused it.

There is no way to guarantee that the next moment will be given to us, but it is the most valuable thing this moment can give us, including any opportunity.

Without this present moment, we would not have had the opportunity to do or experience anything. And this moment is a gift.

As we say, it's a given moment.

Now, we say that this gift of gifts is really an opportunity.

What you really appreciate is the opportunity, not the gift. Because if the thing is out there somewhere and you don't have the chance to enjoy it or do something with it, you won't appreciate it.

Opportunity is the gift of all gifts, and there is a saying that opportunity comes only once.

Now think again.

Every moment is a new gift that is repeated over and over again, and even if we miss the opportunity of this moment, another moment will be given to us and another moment will be given to us.

We can either take advantage of this opportunity or let it pass. Taking advantage of opportunities is the key to happiness.

Behold, the master key to our happiness is in our own hands.

Every moment we can be grateful for this gift.

Is it possible to be grateful for everything?

Certainly not.

We cannot appreciate violence, war, oppression and exploitation.

On a personal level, we cannot be grateful for the death, infidelity, or bereavement of a friend.

But I didn't say I could appreciate everything.

We said that we can be grateful for the opportunity in every moment, and that even when we are faced with the most difficult circumstances, we can rise to the occasion and respond to the opportunities given to us.

It's not as bad as it looks.

Indeed, when we observe and experience it, we find that most of the time what we are given is an opportunity to enjoy, and we miss it because we are in a hurry in life and do not stop to find the opportunity.

But sometimes things are given to us that are very difficult. And when that hard thing happens to us, it's a challenge to rise to the occasion, and sometimes it can be overcome by learning something painful.

For example, learning patience.

We have been told that the road to peace is more like a marathon than a sprint.

It takes patience. That's difficult.

It may be to assert your opinion, to assert your beliefs.

It's a chance given to us.

Opportunities to learn, to suffer, to rise up, all these opportunities are given to us, but they are opportunities, and those who take advantage of them are the ones we respect.

They make something out of life.

And those who fail will be given another chance.

We are always given another chance.

That is the wonderful richness of life.

So how do we find a way to take advantage of this?

How can each of us find a way to live with gratitude in the moment, instead of just being grateful from time to time?

How can I do that? It's very easy.

It's so simple that it's actually what we were told when we were kids learning to cross the street.

stop.

that's all.

But how often do we stop?

we run through life. we don't stop

If you don't stop, you will miss your chance.

I have to stop.

And we need to incorporate stop signs into our lives.

When I went to Africa a few years ago and came back, I noticed water.

In Africa where I was, there was no drinking water.

Every time I turned on the faucet, I was impressed.

Every time I clicked on the light, I was so grateful.

I was very happy.

But after a while this disappears.

So I put a little sticker on the light switch and water faucet, and turned on the water every time the switch was turned on.

So I leave that to your imagination.

You can find what works best for you, but life needs stop signs.

And when you stop, the next thing is to look.

please look. you open your eyes

Please open your ears. You can open your nose.

You open all your senses to this wonderful abundance that has been given to us.

There is no end, life is about enjoying and enjoying what you have been given.

And we can open up too. Be open to opportunities. You can also be open to opportunities to help others and make others happy. Because nothing makes us happier than when we are all happy.

And when we open our hearts to opportunity, that opportunity invites us to do something. This is the third.

Stop, watch, and do something.

And all we can do is whatever life offers you in this moment.

Most of the time it's an opportunity to have fun, but sometimes it's more difficult.

But whatever it is, if we take this opportunity, we will work on it, we are creative and they are creative people.

And that little stop, look and go, is a very powerful seed that could revolutionize our world.

Because we are in the midst of a shift in consciousness right now. And you may be surprised, but it always amazes me when I hear the word "gratitude" or "gratitude" repeated over and over again.

No matter where you go, thanks to airlines, thanks to restaurants, thanks to cafes, thanks to wine.

Yes, I've also come across a brand of toilet paper called Thank You.

(Laughter) There is a wave of appreciation as people are realizing how important this is and how this can change the world.

It can change our world in very important ways. Because if you are grateful you are not afraid and if you are not afraid you are not violent.

If you are grateful, act out of a feeling of having enough, not lacking, and willing to share.

If we are grateful, we can enjoy the differences between people and show respect for everyone, which will change this power pyramid we live in.

It doesn't bring equality, but it does bring equal respect, and that's what matters.

The future of the world will be a network, not an overturned pyramid.

The revolution I am talking about is non-violent revolution, so revolutionary that it changes the very concept of revolution. Because a regular revolution is one in which the power pyramid has been turned upside down and the people who were at the bottom are now at the top and are doing exactly the same things as before.

What we need is networking of smaller, smaller and smaller groups who know each other and interact with each other, and that is a world of gratitude.

A grateful world is a world of joyful people.

A grateful person is a joyful person and a joyful person. The more fun people have, the more fun our world becomes.

We have a network to live with gratitude, and it's growing rapidly.

We didn't understand why it was growing so fast.

We have the opportunity to light candles when people appreciate something.

And 15 million candles were lit in 10 years.

People are starting to realize that a grateful world is a happy world, and we all have the opportunity to transform the world and make it a happier place by simply stopping, looking and going.

And if that's what you're expecting from us, and if this has contributed in any way to making you want to do the same, stop, look and go.

thank you.

(applause)

I am here today to talk about social change, not new treatments, new interventions, new ways of working with children, etc., but new business models for social change, new ways of tackling problems.

In Britain, 63% of men released from prison after serving short sentences reoffend within a year.

Now, on average, how many times do you think they have committed crimes in the past?

43。

How many times do you think they've been to prison?

Seven.

So we went to talk to the Ministry of Justice and said to the Ministry of Justice, what's the value to you if these people are less likely to reoffend?

It should be worth something, right?

I mean, you have to spend money in jail costs, police costs, court costs, all these things to deal with these people. What is it worth?

Of course, we attach great importance to social values.

The organization I helped found, Social Finance, is socially concerned.

But we wanted to show an economic basis. Because the value of doing this becomes completely convincing if you can show the economic justification.

And if we could agree on both values ​​and methods for measuring success in reducing recidivism, we could do something that would be pretty interesting.

This idea is called a social impact bond.

Well, a social impact bond is just saying that you can have a contract that pays only if there is an effect, if you get the consent of the government.

That means we can try new things without the embarrassment of having to pay if it doesn't work, but this is still a serious problem for a good chunk of government.

Now, many of you may have noticed a problem at this point. That means it takes a long time to measure whether those results have occurred.

So we have to collect some money.

We will use this contract to raise funds from socially motivated investors.

Socially motivated investors: Do you have an interesting idea?

However, in reality, there are many people who would like to invest in something useful to society if given the chance.

And here's your chance.

Also, do you want to actually work with them and help the government find out if there is a better economic model that will ultimately take a different path to reduce crime and victimization, rather than just getting them out of prison, waiting until they reoffend and then putting them back in prison?

So find an investor, they pay for a set of services, and if those services are successful, better outcomes, measured reductions in recidivism save the government money, and the savings can pay for the outcome.

And investors not only get their money back, but also profit.

So, in March 2010, we signed our first social impact bond with the Department of Justice around Peterborough Prison.

3,000 criminals were to be divided into 3 groups of 1,000 each.

Now, each of these cohorts will be measured over the two years it takes to get out of prison.

They would be given one year to commit a crime and six months to clear the court system, after which they would be compared to groups drawn from police national computers and as similar as possible, and would be rewarded for achieving a hurdle rate of 10 percent reduction for all cases in which no convictions occurred.

In other words, we get rewards for saving crimes.

If we achieve a 10% reduction in all three cohorts, investors could get an annual ROI of 7.5%, and if we outperform, we could get an annual ROI of up to 13%. This is fine.

I mean, everyone wins here, right?

The Ministry of Justice will be able to try new programs and only pay if they work.

Investors have two opportunities. For the first time, we will be able to invest in social change.

I also know that they make a reasonable profit and that the first person to invest in this kind of thing must be a believer.

They need to take care of their social program, but if this proves successful over the next five to 10 years, they will be able to expand their investor community as more people will trust their product.

For the first time, service providers have the opportunity to provide more evidence of what they are doing, actually doing it in a constructive way, and spend five or six years learning and demonstrating the value of what they are doing, rather than the one or two that is common today.

Society wins: less crime, fewer victims.

Well, criminals profit too.

Instead of coming out of prison with £46 in their pockets, half of them don't know where to spend their first night out of jail. In fact, someone meets them in prison, learns about their problems, meets them at the gate, takes them somewhere to stay, ties them to benefits, ties them to employment, drug rehabilitation, mental health, and whatever else they need.

So let's consider another example. It means engaging with children in care.

Social Impact Bonds work in any area where there are currently very expensive provisions with bad consequences for people.

As a result, children placed in state nursing homes tend to perform very poorly.

Only 13 percent of 16-year-olds achieve a reasonable level of 5 GCSEs, compared to 58 percent of the general population.

To make matters worse, 27% of offenders in prison receive care for some time.

And even more alarming, according to Home Office statistics, 70 percent of prostitutes receive constant care.

Nation is not a great parent.

But we have great programs for adolescents at risk of care, and 30 percent of children in care are adolescents.

So we launched a program with the Essex County Council to test intensive family therapy support for families with adolescents in marginalized care systems.

Essex only pays for care savings.

Investors put in £3.1 million.

The program started last month.

Others include homelessness in London, youth, employment and education elsewhere in the country.

There are now 13 social impact bonds in the UK, and there has been an astonishing level of interest in the idea around the world.

So Prime Minister David Cameron has poured £20m into the Social Performance Fund to support the idea.

President Obama has proposed spending $300 million in the US budget to promote ideas and structures of this sort, and many other countries have shown considerable interest.

So what caused this excitement?

Why does this vary so much from person to person?

Now, the first part of what we've been talking about so far is innovation.

This allows us to test new ideas in a way that is not too difficult for everyone.

The second part it brings is rigor.

To address the results, people need to actually test and bring the data into the situation they are dealing with.

To take the city of Peterborough as an example, we're adding case management to all the different organizations we work with so they know what's really going on with different prisoners, and learning from the Department of Justice and what we've pushed to provide data, what's really going on and whether they'll be re-arrested.

And we learn and adapt our programs accordingly.

And this brings us to the third new element: flexibility.

Because in the normal contract of things, when we spend government money, we're using our money, our taxes, and the people in charge of it know it all too well and are tempted to control exactly how the money is spent.

Now, any entrepreneur out there knows that a version 1.0 business plan isn't something that generally works.

So you need the flexibility to adapt your program when trying to do something like this.

And at Peterborough, we started with a program, but we also collected data, and over time we tweaked and modified that program to add various other elements. This has allowed the service to adapt and meet short-term as well as long-term needs. So does greater engagement and long-term engagement from inmates.

The final element is partnership.

At the moment, many of these programs are often the subject of deadlocked debates about whether the state is better, the public sector is better, the private sector is better, or the social sector is better.

In fact, to bring about change in society, we need to bring in expertise from all these actors.

And this creates a structure in which they can be combined.

So where does this leave us?

This left a way for people to invest in social change.

We have met thousands, perhaps millions, of people seeking opportunities to invest in social change.

We have met all public sector advocates who are passionate about making this change.

With this kind of model you can integrate them.

thank you.

(applause)

Throughout our lifetime, our bodies undergo a series of incredible metamorphoses. We grow up, go through puberty, and many reproduce.

Behind the scenes, the endocrine system works constantly to coordinate these changes.

This system influences every single cell, regulating everything from sleep to the rhythm of the heartbeat, as well as growth and sexual maturity.

The endocrine system relies on interplay between three functions: glands, hormones and trillions of cell receptors.

First, there are several hormone-producing glands, three in the brain and seven in the rest of the body.

Each is surrounded by a network of blood vessels, from which components are extracted to manufacture dozens of hormones.

These hormones are then usually pumped into the bloodstream in minute amounts.

From there, each hormone must find a set of target cells in order to cause specific changes.

To find its target, it enlists the help of receptors, special proteins inside or on the surface of cells.

These receptors recognize and bind specific hormones that pass through them.

When this happens, the combination of hormones and receptors causes different effects, increasing or decreasing certain processes within the cell, altering the cell's behavior.

The endocrine system causes massive changes throughout the body by exposing millions of cells at once to carefully controlled amounts of hormones.

For example, consider the thyroid gland and the two hormones it produces, triiodothyronine and thyroxine.

These hormones reach most cells in the body and affect the rate at which cells use energy and how fast they work.

And it regulates everything from breathing rate to heart rate to body temperature to digestion.

Hormones also have effects that are most visible and well known during puberty.

In men, puberty begins when the testicles begin to produce testosterone.

This leads to the gradual development of the genitals, the growth of a beard, a lower voice and increased height.

In women, estrogen secreted by the ovaries signals the onset of adulthood.

It helps your body grow, widens your hips, and thickens your uterine lining to prepare your body for menstruation and pregnancy.

A persistent misconception about the endocrine system is that there are only male and female hormones.

In fact, men and women only have different amounts of estrogen and testosterone.

Both hormones play a role in pregnancy, along with over a dozen other hormones that ensure fetal growth, enable birth, and help mothers nourish their children.

These periods of hormonal change are also associated with mood swings.

That's because hormones can affect the production of certain chemicals in the brain, such as serotonin.

Changes in chemical levels can also lead to changes in mood.

But that doesn't mean hormones have infinite power over us.

They are seen as the main drivers of our behavior, making us slaves to their influence, especially during adolescence.

However, research has shown that our behavior is collectively shaped by many different influences, including the brain and its neurotransmitters, hormones, and various social factors.

The main function of the endocrine system is not to control us, but to regulate bodily processes.

However, illness, stress, and even diet can disrupt that regulation, altering the amount of hormones that glands secrete and changing the way cells respond.

Diabetes is one of the most common hormonal disorders and occurs when the pancreas makes too little insulin, the hormone that controls blood sugar levels.

And hypothyroidism and hyperthyroidism occur when the thyroid gland makes too little or too much thyroid hormone.

Too little thyroid hormone causes slow heart rate, fatigue, and depression, while too much thyroid hormone causes weight loss, insomnia, and irritability.

But for the most part, the endocrine system keeps our bodies in balance.

And through that constant regulation, it drives change that ultimately helps us become who we are.

We have global health challenges today. Current methods of drug discovery and development are too expensive, too time consuming, and fail more often than they succeed.

It really doesn't work. This means that patients who really need new treatments are not getting them, leaving their disease untreated.

We seem to be spending more and more money.

In other words, for every billion dollars we spend on research and development, fewer drugs are approved for market.

More money, less drugs. Hmm.

So what is going on here?

Well, there are many factors involved, but I think one of the key factors is the inability of the tools currently available to test whether a drug works, is effective, is safe before it enters human clinical trials. They do not predict what will happen to humans.

There are two main tools at your disposal.

They are cells in dishes and animal experiments.

Now let's talk about the first, the cells in the dish.

In this way, cells are happily functioning in our body.

We take them out of their native environment, throw them into one of these dishes, and expect them to work.

guess what. it's not.

They don't like that environment. Because it's completely different from what's in their bodies.

What about animal testing?

Well, animals can and can provide very useful information.

They tell us what's going on inside complex organisms.

We learn more about biology itself.

However, animal models often fail to predict what will happen when humans are treated with a particular drug.

So we need better tools.

We need human cells, but we need to find ways to keep them happy outside the body.

Our bodies are dynamic environments.

we are always on the move

Our cells experience it.

They are in the dynamic environment inside our bodies.

They are constantly subjected to mechanical forces.

Therefore, if we want our cells to be happy outside our bodies, we have to become their designers.

We need to design, build and engineer a second home for our cells.

And at the Wyss Institute, we've done just that.

We call it Organ on Chip.

And here is one.

beautiful. But it's pretty incredible.

Here in my hand is a human lung that breathes and lives on a chip.

And it's not just beautiful.

You can do so many things.

That tiny chip has living cells, which are in a dynamic environment and interact with different types of cells.

There are a lot of people trying to grow cells in the lab.

They have tried different approaches.

They've even tried growing tiny mini-organs in the lab.

We are not trying to do that here.

We are simply trying to recreate the smallest functional unit that represents the biochemistry, function, and mechanical strain experienced by cells in the body in this tiny chip.

So how does it work? Let me show you.

We use techniques from the computer chip manufacturing industry to create these structures at scales relevant to both cells and their environment.

There are 3 fluid channels.

In the center, there is a porous, flexible membrane, on which human cells, for example from the lungs, can be added, and below are capillary cells, that is, cells within the blood vessels.

And because mechanical forces can be applied to the chip that stretch the membrane, the cells experience the same mechanical forces that we breathe.

And they experience how they experienced it in their bodies.

The upper channel carries air and the blood channel carries liquid containing nutrients.

The chip is now very beautiful, but what can we do with it?

You can get amazing features inside these tiny chips.

let me show off

For example, it can mimic an infection that adds bacterial cells to the lungs.

Then add human white blood cells.

White blood cells are our body's defense against bacterial invasion, and when they sense inflammation due to an infection, they enter the lungs from the blood and engulf the bacteria.

Now, we get to see this happening live in real human lungs on a chip.

Labeled so that you can see the white blood cells flowing. White blood cells begin to adhere when they detect an infection.

It sticks and tries to enter the lung side from the blood path.

As you can see here, we can actually visualize one white blood cell.

It attaches, wiggles through the cell layers, and exits through the pores to the other side of the membrane, where it engulfs the green-labeled bacteria.

In that tiny chip, I witnessed one of our body's most basic reactions to infection.

It's how we react to immune responses.

It's very exciting.

I would like to share this photo with you. Not only is this picture so beautiful, but it also tells us a tremendous amount of information about what the cells are doing inside the chip.

This indicates that these cells in the small airways of our lungs actually have the hair-like structures that we think are found in the lungs.

These structures, called cilia, actually move mucus out of the lungs.

yes. mucus. Hi.

But mucus is actually very important.

Mucus traps particles, viruses and potential allergens, and these tiny cilia move to clear the mucus.

If it is damaged, for example by cigarette smoke, it can no longer function properly and remove mucus.

And that can lead to diseases such as bronchitis.

The removal of cilia and mucus is also implicated in dreaded diseases such as cystic fibrosis.

But now we can start looking for potential new treatments with the capabilities of these chips.

We didn't just leave our lungs on the chip.

We have a guts about chips.

You can see one of them here.

Then, they placed human enterocytes in the gut on the chip. The cells are undergoing constant peristaltic motion, and the dripping flow within the cells can actually mimic many of the functions expected to be found in the human intestine.

Now you can start modeling diseases like irritable bowel syndrome.

This is a disease that affects many people.

It's really debilitating and there aren't many good treatments for it.

We currently have a whole pipeline of different organ chips under investigation in our labs.

But the true power of this technology comes from the fact that they can be fluidly linked.

Because these cells have fluid flowing through them, several different chips can be interconnected to form what is called a virtual human on the chip.

We are really excited now.

We don't intend these chips to recreate an entire human being, but our goal is to be able to recreate enough functionality so that we can more accurately predict what will happen to humans.

For example, we can now investigate what happens when we inject a drug like an aerosol drug.

If you have asthma, like me, when you use an inhaler, you can see how the drug enters your lungs, how it enters your body, how it affects your heart, etc.

Will it change your heartbeat?

Is it toxic?

Is it cleared by the liver?

Is it metabolized in the liver?

Is it excreted by the kidneys?

You can start studying the body's dynamic response to drugs.

This is truly revolutionary and has the potential to be a game-changer not only for the pharmaceutical industry, but also for various industries as a whole, including the cosmetics industry.

The skin on chips currently being developed in the lab could potentially be used to test whether the ingredients in the products you use are actually safe to put on your skin without animal testing.

You can test the safety of chemicals that are routinely exposed in your environment, such as those found in common household cleaners.

Organs on chips could also be used for bioterrorism and radiation exposure applications.

You can use them to learn more about other deadly diseases like Ebola and SARS.

Organs on chips could also change the way clinical trials are conducted in the future.

At this time, the average participant in a clinical trial is "average."

Many are middle-aged and many are women.

We don't see many clinical trials involving children, but we give drugs to children every day, and the only safety data we have on the drug is from adults.

Children are not adults.

They may not react in the same way as adults.

Other factors, such as genetic differences within a population, may also result in populations at risk of developing adverse drug reactions.

Now imagine if you could take cells from all these different populations, put them on a chip, and create populations on the chip.

This could change the way clinical trials are conducted.

It's the team and the people that do this.

We have engineers, cell biologists and clinicians, all working together.

We are seeing some truly incredible things at the Wyss Institute.

It is truly a collection of disciplines, with biology influencing how we design, engineer and build.

It's very exciting.

We have established significant industry collaborations, such as with companies with large-scale digital manufacturing expertise.

They will help us create not one, but millions of these chips to get them into the hands of as many researchers as possible.

And this is the key to the technology's potential.

Now let me show you our instruments.

This is the instrument our engineers are currently prototyping in the lab, and it provides the engineering control needed to link 10+ organ chips together.

It does another very important thing.

Create a simple user interface.

So a cell biologist like me would come to the scene, take the chip, put it in a cartridge like the prototype there, put the cartridge in the machine the way you make a CD, and off you go.

Plug & play. easy.

So let's just imagine what the future might look like if I could take your stem cells and put them on a chip, or if I could put your stem cells on a chip.

A personalized tip just for you.

Now, all of us here are individuals, and these individual differences mean that we can respond to drugs in very different, sometimes unpredictable ways.

I myself had a terrible headache a few years ago that wouldn't go away and I thought, 'Okay, let's try something different.'

I drank Advil. Fifteen minutes later, I had a full blown asthma attack and was on my way to the emergency room.

Obviously, it wasn't fatal, but unfortunately some of these side effects are fatal.

So how can we prevent them?

Well, one day you can imagine Geraldine being on the chip, Daniel being on the chip, and you being on the chip.

personalized medicine. thank you.

(applause)

That's why people hate me when I'm at work.

In fact, the more I work, the more people hate me.

No, I'm not a meter maid or an undertaker.

I'm a progressive lesbian talking head at Fox News.

(Applause.) So you heard that, right? Just in case?

I'm a gay talking head on Fox News.

I'll tell you how I do it and the most important things I learned.

That's how I get on TV.

I discuss people who are literally trying to erase everything I believe in, in some cases people who don't even want me or people like me to exist.

It's like Thanksgiving with your conservative uncle on steroids, with millions of live TV viewers.

That's pretty much it.

And it's just on air.

The harassing emails I receive are unbelievable.

In the last week alone, we received 238 hateful emails and countless hateful tweets.

I was called an idiot, a traitor, a miser, an asshole, and an ugly man, all in one email.

(Laughter.) So what have I learned from being the victim of all this ugliness?

Now, my biggest lesson is that for decades we've focused on political correctness, but what's more important is emotional correctness.

Let me give you a small example.

You can call it an embankment. Not really.

There are two things I am careful about.

The first is whether the spelling is correct.

(Laughter) (Applause) Just a quick recap, D-Y-K-E.

You will be amazed.

And second, I don't care about words, I care about how I use them.

Are you friendly? Are you just plain naive?

Or do you really want to hurt me personally?

Emotional correctness is the tone, the emotion, the way we say things, the respect and consideration we show to each other.

And what I've come to realize is that political persuasion doesn't start with ideas, facts, or data.

Political persuasion starts with being emotionally right.

So, to be honest, when I first walked into Fox News, I expected to leave some knuckle marks on the carpet.

By the way, mind you, this is not emotionally correct.

But liberals on my side, we can be self-righteous, we can be condescending, we can belittle those who disagree with us.

In other words, we can be politically right but emotionally wrong.

By the way, that means people don't like us. right?

Now, here's the kicker.

Conservatives are really nice.

I mean, it's not everyone, and it's not the people who send me harassing emails, but you'll be surprised.

Sean Hannity is one of the nicest guys I have ever met.

He spends his free time organizing staff at joint parties, and I know he will do all he can if I have any problems.

Well, I think Sean Hannity is 99 percent politically wrong, but his emotional correctness is surprisingly impressive.

That's why people listen to him.

Because no one will agree with you without even listening to you first.

We spend so much time talking about things that we disagree and not enough time discussing our disagreements.

And if we can start caring for each other, we have a chance to build common ground.

In fact, it sounds very silly to say here, but in practice it is very powerful.

So I imagine how people who say they hate immigration are terrified that their communities are changing from what they've known.

Or the people who say they hate teacher unions must be really devastated to see their kid's school going down the drain and they're just looking for someone to blame.

Our challenge is to find the compassion for others that we want others to have.

That is emotional correctness.

I'm not saying it's easy.

Stop replying to harassing emails with tons of despicable profanity on average 5.6 times a day.

Compassion and finding common ground with an enemy is a kind of political and spiritual practice for me, and I am not the Dalai Lama.

I'm not perfect, but I'm optimistic.

I get nothing but harassing emails.

I received a lot of really nice letters.

And the beginning of my all-time favorite quote is, "I'm not a big fan of your political leanings or your sometimes tormented logic (laughs), but I'm a big fan of you as a person."

Well this guy still doesn't agree with me.

(Laughter.) But he's listening – not because of what I said, but because of the way I say it.

And somehow we were able to make a connection even though we had never met.

That's emotional rightness, and that's how you start conversations that really lead to change.

thank you.

(applause)

(Underwater Noise) This video was taken at the Aquarius Underwater Laboratory, about 60 feet below the surface, four miles offshore from Key Largo.

NASA uses this extreme environment to train astronauts and Aquanauts, and last year NASA invited us to join them.

All footage was shot from an open ROV, a robot assembled in a garage.

So ROV stands for Remote Operated Vehicle, which in this case means a tiny robot sending live video back to the top of your computer via its ultra-thin tether.

This is open source. This means publishing and sharing all design files and all code online so that anyone can modify, improve or change the design.

Made mostly of off-the-shelf parts, it costs about 1,000 times less than the ROV that Prime Minister James Cameron used to explore the Titanic.

So ROVs are nothing new.

They have been around for decades.

Scientists use ROVs to explore the ocean.

Oil and gas companies use them in exploration and construction.

What we have built is not unique.

The way we built it is truly unique.

So I'd like to briefly explain how it all started.

So a few years ago my friend Eric and I decided that we wanted to explore this underwater cavern in the foothills of the Sierra Nevada.

We had heard stories of gold lost in robberies during the Gold Rush and wanted to go there.

Unfortunately we had no money and no tools to do it.

So Eric had an initial design idea for a robot, but he didn't know all the parts, so he did what anyone would do in our situation. So I turned to the internet for help.

Specifically, we created this website openROV.com to share our intentions and plans. For the first few months, it was just Eric and I talking to each other on the forums, but soon we started getting feedback from manufacturers, enthusiasts, and indeed professional marine engineers who gave us some suggestions on what we should do.

We kept working on it. we learned a lot.

We continued prototyping and eventually decided we wanted to go cave. We were ready.

So around that time our little expedition got quite the buzz and was featured in the New York Times.

And we were almost overwhelmed by the interest in people asking for kits that let you build this open ROV yourself.

So we decided to post this project on Kickstarter. Once I did, in about 2 hours I had a funding goal and suddenly I had the money to build these kits.

But then I had to learn how to make it.

In other words, I had to learn small-batch manufacturing.

So we quickly learned that our garage wasn't big enough to sustain our growing business.

But we were able to do it and thanks to TechShop we were able to build all the kits. This was a huge help to us and we shipped these kits around the world just before Christmas last year, so it's only been a few months.

But we are already starting to receive videos and photos from around the world, including this shot from under the Antarctic ice.

I also learned that penguins love robots.

(Laughter) So we still put all our designs online and encourage everyone to make their own.

It was the only way we could do this.

By being open source, we are building this decentralized R&D network to move forward faster than other venture-backed companies.

But real robots are only half the story.

The real potential, the long-term potential, lies in the communities of DIY ocean explorers that are forming around the world.

What can we discover when thousands of such devices roam the ocean?

So, you are probably wondering about caves.

did you find the gold?

Well, I didn't find any gold, but I decided that what I did find was far more valuable.

It was a glimpse into the potential future of ocean exploration.

It's not just limited to Mr. and Mrs. James Cameron around the world, it's something we all participate in.

It's the underwater world we're all exploring together.

thank you.

(applause)

Mobility in developing cities is a very specific challenge. Because unlike health, education and housing, mobility tends to get worse as society gets richer.

A clearly unsustainable model.

As in most other developing countries, mobility is not about money or technology, but about equality and equity.

Because of the large disparities in developing countries, for example, when it comes to transportation, it is difficult to understand that an advanced city is not a city where even the poor use cars, but rather a city where even the wealthy use public transportation.

Or bicycles: For example, over 30 percent of the population in Amsterdam use bicycles, even though the Netherlands has a higher per capita income than the United States.

Cities in the developing world are fighting over money and government investment.

More investment in highways naturally means less investment in housing, schools and hospitals, as well as competition for space.

There is a battle for space between those with cars and those without.

Today, most of us accept that private property and a market economy are the best ways to manage most of society's resources.

But there is a problem with this: income inequality is necessary for a market economy to work.

Some have to make more money, some make less.

Some companies are successful. others fail.

So what kind of equality can we expect from a market economy today?

I propose two types, both of which are closely related to the city.

The first is equality in quality of life, especially for children, where all children, beyond obvious health and education, should have access to green spaces, sports facilities, swimming pools and music lessons.

And the second kind of equality is what we can call "democratic equality."

Article 1 of every constitution states that all citizens are equal before the law.

It's not just poetry.

It's a very powerful principle.

For example, if that were true, an 80-passenger bus would be entitled to 80 times more road space than a single-passenger car.

Sometimes we get so used to inequality that we don't realize it's right in front of us.

Less than 100 years ago, women were disenfranchised, and today they were just as disenfranchised as bus jams are considered normal.

In fact, when I became mayor, I applied the democratic principle that a 100-passenger bus is entitled to 100 times more road space than a car, and introduced a bus-based mass transit system on dedicated lanes, putting the public interest before the private interest.

To make the bus sexier, we named it TransMilenio.

And it is also a very beautiful symbol of democracy. Because when you see a bus passing by or an expensive car stuck in a traffic jam, it's clearly democracy at work.

In fact, it's not just a matter of fairness.

No PhD required.

Within 20 minutes, a committee of 12-year-olds will realize that the most efficient way to use limited road space is to create dedicated bus lanes.

Buses, in fact, aren't the glamorous ones, but they are the only way to bring mass transit to every area of ​​a fast-growing developing city.

The capacity is also large.

For example, this system in Guangzhou carries more passengers in our direction than all but one subway line in China, at a fraction of the cost.

We fought for space not just for buses, but for people, which was even harder.

Cities are human settlements and we humans are pedestrians.

We need to walk, just as fish need to swim, birds fly, and deer need to run.

There is a really big conflict between pedestrians and cars when we are talking about developing cities.

What we see here is a picture of the inadequacy of democracy.

What this shows is that people walking are third-class citizens, and people in cars are first-class citizens.

When it comes to transportation infrastructure, it's not highways or subways that make the difference between advanced and backward cities, but quality sidewalks.

Here they built a viaduct, probably very useless and forgot to build a sidewalk.

This is popular all over the world.

Nothing is more important than a car, even for school children.

In the city of Bogota, where I live, we fought a very hard fight to make room for people who should reflect human dignity, to make room for protected bike paths, to take space from cars that have been parked on sidewalks for decades.

First, I used to have black hair.

(Laughter.) And in the process I almost got impeached.

It was a very difficult battle.

But after a very difficult battle, it is finally possible to create a city that respects human dignity to some extent and shows that those who walk and those who have cars are equally important.

In fact, an ideological and political question of great importance everywhere is how to allocate a city's most precious resource, road space.

Cities can find oil and diamonds underground, but it's not as valuable as road space.

How will it be distributed between pedestrians, cyclists, public transport, and cars?

This is not a technical issue and one must remember that it is not a constitutional right in any constitution when allocating parking.

We were also 15 years ago, before there were bike paths in New York, Paris and London. Over 350 kilometers of protected cycle paths were also a very difficult battle.

I don't think protected bike paths are an architectural feature.

Sidewalks are likewise a right, unless we believe that only those who have access to motor vehicles have the right to travel safely without risking death.

And like bus roads, protected bike paths are a powerful symbol of democracy. Because it shows that citizens on $30 bikes are just as important as citizens on $30,000 cars.

And we are living in a unique moment in history.

Over the next 50 years, more than half of the cities that will exist in 2060 will be built.

In many developing world cities, more than 80-90 percent of the cities that will exist in 2060 will be built over the next 40-50 years.

But this is not just a problem for cities in the developing world.

For example, the United States will need to build over 70 million new homes over the next 40 to 50 years.

That's more than all the current homes in the UK, France and Canada combined.

And while I believe that our cities today are seriously flawed, I believe that a different and better city could be built.

What's wrong with our cities today?

For example, in any city in the world today, if you tell a barely-verbal 3-year-old to "watch out for cars," he'll jump in fear. And for good reason. Every year, more than 10,000 children around the world are killed by cars.

We have had cities for 8,000 years and children have been able to get out of their homes and play.

In fact, as recently as 1900, cars didn't exist.

The car was born here less than 100 years ago.

They completely changed the city.

For example, in 1900 no one was killed by a car in the United States.

Just 20 years later, in the 1920s and 1930s, about 200,000 Americans were killed by automobiles.

In 1925 alone, about 7,000 children were killed by cars in the United States.

So we could create cities that prioritize people over cars, cities that give people more public space than cars, cities that show a great deal of respect for the most vulnerable citizens, such as children and the elderly.

I suggest some elements that I think would make the city better. Implementing them in a new, fledgling city is very easy.

Hundreds of kilometers of green roads traverse the city in all directions.

Children walk from home to safety.

You can safely navigate dozens of kilometers of wonderful green roads, such as bike lanes, without danger. Imagine: A city where every other street is dedicated to pedestrians and cyclists.

This is not particularly difficult in a new city that is about to be built.

When I was mayor of Bogotá, we were able to build 70 kilometers of bike lanes in just three years in one of the densest cities in the world.

And this will change the way people live, travel and enjoy cities.

In this photo, one of the very poor neighborhoods has a gorgeous pedestrian cycleway and cars are still in the mud.

Of course, I would like to pave this street for cars.

But what should we do first?

Ninety-nine percent of the residents in these areas do not own a car.

But you know, when a city is just created, it's very easy to incorporate this kind of infrastructure.

And the city grows around it.

And, of course, this is just a small part of what could be better if we created it, which will change the way we live.

And the second factor that solves the very difficult problem of mobility in developing countries in a very low cost and easy way is to create hundreds of kilometers of roads exclusively for buses, buses, bicycles and pedestrians.

This would also be a very low cost solution if implemented from the start and would provide low cost, natural light and comfortable transportation.

Unfortunately, the reality is not as good as my dreams.

All cities in the developing world have major slum problems due to private ownership of land and high land prices.

In my country, Colombia, initially almost half the housing in the city was illegal development.

And, of course, it is very difficult to take mass transit or use a bicycle in such an environment.

But even the most legislated locations are misplaced, far from city centers, where low-cost, high-frequency public transport cannot be provided.

As a Latino, and as Latin America was the most recently organized region of the world, I would respectfully recommend to the less urbanized countries that Latin America has grown from 40 per cent urban in 1950 to 80 per cent urban in 2010 – and to the less urbanized Asian and African countries, such as India, which currently has only 33 per cent urban, that governments should acquire all the land around cities.

In this way, their cities were able to grow in the right places, in the right spaces, along with parks, greenways and bus roads.

The cities we build over the next 50 years will determine the quality of life and even well-being of billions of people for the future.

What a great opportunity, especially for leaders in developing countries and many young leaders.

They can create happier lives for billions of people in the future.

I am optimistic that they will make the city better than our wildest dreams.

(applause)

A few years ago, Harvard Business School chose the best business model of the year.

It chose Somali piracy.

About the same time, I found 544 sailors being held hostage on board the ship. The ships were often anchored just off the Somali coast and within sight.

And with these two facts, I wondered what was going on in the shipping industry.

And I wondered if the same would happen in other industries.

Will 544 airline pilots be stuck inside jumbo jets on the runway for months or a year?

Will 544 greyhound bus drivers show up?

It won't happen.

So I started getting interested.

And then I discovered another fact. That was even more surprising to me than the fact that I didn't know it at the age of 42 or 43.

Thus, we are still fundamentally dependent on shipping.

Perhaps it's because the general public thinks of shipping as an outdated industry, like the ones brought by Moby Dick and Jack Sparrow on their sailing ships.

But shipping doesn't stop there.

Shipping is as important as ever to us.

Shipping carries 90% of world trade.

Since 1970, transportation has increased fourfold.

We rely on it now more than ever.

But for an industry of this magnitude – 100,000 ships at sea – it has become almost invisible.

It sounds silly to say that in Singapore. Because there is enough shipping here to park your ship on top of the hotel.

(Laughter) But in other parts of the world, if you ask ordinary people what they know about shipping, how much maritime trade there is, they'll basically give you a blank look.

You'll ask someone on the street if they've heard of Microsoft.

They know they're building software that runs on computers and sometimes runs, so you should expect the answer to be yes.

But if you ask if you've heard of Maersk, I doubt you'll get the same answer, even though Maersk is just one shipping company out there and makes about as much revenue as Microsoft.

[$60.2 billion] So why is this?

A few years ago, the First Seaman of the British Admiralty, the Secretary of War is not called a Landlord, but he is called the First Seaman, and he said that we, and he meant to say, in the developed countries of the West, we suffer from sea blindness.

We are blind to the ocean as an industry and place of work.

It's just what we fly over, the blue part on the airline's map.

There is nothing to see. Keep going.

So I ran away to the sea to open my eyes, which I had lost in the sea.

A few years ago, I left Felixstowe on the south coast of England aboard the Maersk Kendal, a medium-sized container ship with about 7,000 boxes, and five weeks later arrived here in Singapore much less jetlag than I do now.

And it was a revelation.

We traveled 5 seas, 2 seas, 9 ports and learned a lot about shipping.

One of the first things that struck me when I got on the Kendall was, where is everyone?

Navy friends say they sail with 1,000 sailors at a time, but Kendall had only 21 crew members.

Because the delivery is very efficient.

Containerization made it very efficient.

Ships are now automated.

They can operate with small crews.

But it also means, in the words of a dock chaplain I once met, that the average seafarer on a container ship is either tired or exhausted. Because the pace of modern shipping is very demanding of what shipping calls the human factor. They don't seem to realize that this strange expression sounds a little impersonal.

As a result, most seafarers currently working on container ships often spend less than two hours in port at a time.

They don't have time to relax.

They're at sea for months at a time, but even when they're on board, they don't have access to the internet that 5-year-olds take for granted.

And another thing that surprised me when I got on Kendall was who was sitting next to me. was not a queen. I can't imagine why they put me under her portrait -- but around the dining table in the officer's saloon, I sat next to a Burmese and across from a Romanian, a Moldavian, an Indian.

There were Chinese at the next table, and all Filipinos in the crew cabin.

So it was a regular workboat.

So how is that possible?

Because the biggest dramatic change in shipping in the last 60 years, largely oblivious to it by most of the general public, was the open registry, or flag of convenience.

Vessels can now fly the flags of countries that provide flag registers.

Although less popular, you can also get the flags of the landlocked countries of Bolivia, Mongolia, and North Korea.

(Laughter.) So we have a very multinational, global, mobile crew on our ship.

And it was a surprise for me.

And the ship changed when it reached pirate waters going down the Bab El Mandeb Strait into the Indian Ocean.

It was also shocking. Because, as the captain told me, I suddenly realized that my choice of going through pirate waters on a container ship was insane.

We were no longer allowed to stand on deck.

I have two pirate watches.

And at the time, 544 sailors were being held hostage, some of whom had been held hostage for years due to the nature of shipping and flags of convenience.

Not all of them, but some were. Because it is easy for a few unscrupulous shipowners to hide behind the anonymity afforded by flags of convenience.

What else does our sea blindness hide?

Now, when you go out to sea on a ship or cruise ship and look up at the chimney, you see very black smoke.

That's because the shipping business has very tight profit margins and needs cheap fuel, so they use what's called bunker fuel. People in the tanker industry described this to me as refinery wreckage, or just short of asphalt.

And shipping is the most environmentally friendly transportation method.

In terms of carbon dioxide emissions per tonne per mile, it's about 1,000 times less than an airplane and about 1/10th that of a truck.

But it's not benign because there are so many of them.

Ship emissions are therefore around 3-4%, which is about the same as aircraft emissions.

And if you put your shipping emissions on the list of countries' carbon footprints, it comes in about 6th place, close to Germany.

According to 2009 calculations, up to 15 ships are as polluting as all automobiles in the world in terms of particles, soot and noxious gases.

And the good news is people are talking about sustainable transportation now.

Interesting efforts are being made.

But why has it taken so long?

When will we start discussing and considering transport miles as well as air miles?

We also went to Cape Cod to see the plight of North Atlantic right whales. For me, this was one of the most surprising and thought-provoking moments of my time at sea.

We know about the human impact of fishing and overfishing on the ocean, but we don't know much about what's going on underwater.

And indeed, transport plays a key role here, as transport noise contributes to the damage done to the acoustic habitats of marine life.

Sea creatures such as whales, dolphins, and even 800 species of fish communicate by sound because light cannot penetrate below the surface.

And North Atlantic right whales can infect hundreds of miles.

Humpback whales can transmit sounds throughout the ocean.

But you can also hear the sound of a supertanker crossing the entire ocean. The noise produced by propellers underwater can be at the same frequencies used by whales, which can compromise their acoustic habitat, which whales need in order to breed, find food and mate.

And the acoustic habitat of North Atlantic right whales has decreased by up to 90%.

However, there are still no laws regulating acoustic pollution.

Sorry, I didn't want to get off the ship when I arrived in Singapore.

It was a real pleasure to ride Kendall.

I was treated well by the crew, had a talkative and funny captain, and would have gladly signed for another five weeks, but he said I was crazy to even think of that.

But I wasn't there for nine months at a time like the Filipino sailors. When asked to describe their work, they called it "dollars for homesickness."

They were well paid but still lead lonely and difficult lives in a dangerous and often difficult environment.

But when I get to this part, I am ambivalent. Because we want to pay tribute to the sailors who give us 90 percent of everything, and get so little appreciation and appreciation for it.

I would like to pay tribute to the 100,000 ships that sail in and out of the ocean every day to bring us what we need.

But I also want a little more scrutiny, more transparency, 90 percent transparency about shipping, and for those of us in general who know so little about shipping.

Because I think we can all benefit from doing something very simple: learning to see the ocean.

thank you.

(applause)

I would like to show you how architecture has helped transform the lives of my community and created opportunities for hope.

I am from Burkina Faso.

Burkina Faso is one of the poorest countries in the world according to the World Bank, what is it like to grow up in such a place?

I am one such example.

I was born in a small village called Gund.

Gando had no electricity, no clean drinking water, and no school.

But my father wanted me to learn to read and write.

Therefore, I was separated from my family when I was seven years old and had to stay in a city far from the village without contacting them.

At this location, I sat for six years in a class similar to over 150 other children.

At this time, I happened to come to school and found out that my classmate had died.

Today, not much has changed.

There is still no electricity in my village.

People are still dying in Burkina Faso and access to clean drinking water remains a major problem.

I was lucky. I was lucky Because when you grow up in a place like that, this is a fact of life.

But I was lucky.

I had a scholarship.

I was able to study abroad in Germany.

Now, I don't think I need to explain what a great privilege it is for me to stand before you today.

Coming from my home village of Gand in Burkina Faso to Berlin, Germany to become an architect is such a big step.

But what to do with this privilege?

Ever since I was a student, I wanted to give other children in Gando a better chance.

I just wanted to use my skills to build a school.

But what if you are a student and have no money?

Oh yeah, I started painting and asked for money.

Fundraising was not an easy task.

I even asked my classmates to spend less money on coffee and cigarettes and sponsor school projects.

Amazingly enough, after two years, we were able to raise $50,000.

When I returned to Gando with the good news, people were overjoyed, but were shocked to learn that I was going to use clay.

“Clay buildings cannot withstand the rainy season, so Francisco wants to use them to build a school.

Is this why he spent so much time studying in Europe instead of working with us in the field? ”

My team always builds with clay, but I don't see any innovation with mud.

So I had to convince everyone.

I started talking to the community and was able to convince everyone to start working.

And everyone in the village, both women and men, participated in this construction process.

We also used traditional techniques.

For example, on clay floors, young men will come and stand like that and beat for hours. And then the mother comes and beats, waters and beats in this position for hours.

Then comes the sander.

They start polishing with stones over hours.

And you get this result, which is very detailed, like a baby's butt.

(Laughs) It's not photoshopped. (Laughter) This is a school built together with the local community.

The walls are all made from Gando compressed clay blocks.

The roof structure is usually made of cheap rebar that is hidden in concrete.

Classrooms and ceilings are made using both.

This school had a simple idea to create comfort in the classroom.

Temperatures can reach 45 degrees in Burkina Faso, so we wanted to make the classrooms suitable for teaching and learning with simple ventilation.

And here is the project today, 12 years later and still in top shape.

And kids love it.

And for me and my community, this project was a huge success.

This opened up the opportunity to do more projects with Gando.

I was able to do a lot of projects, but I'll only mention three of them here.

The first is, of course, an extension of school.

How do you explain drawing and engineering to an illiterate person?

That's how I started making prototypes.

The innovation was to build a clay vault.

So I jumped to the top that way with the team and it worked.

the community is looking for. still works.

So we can build. (Laughter.) And we keep building and that's the result.

Kids are very happy and love it.

The community is so proud. Hooray.

And these donkey-like animals love our buildings too.

(laughter) The next project is Gando's library.

Well, we've tried to introduce different ideas into the building, but often we don't have that much material.

What is in Gando is an earthenware pot.

I wanted to use them to make openings.

So, as you can see, we just take it to the construction site.

Cut them out and put them on the roof before pouring the concrete and you get results like this.

Allows hot air to escape from the opening and lets in light.

It's very simple.

My most recent project at Gando is a high school project.

I would like to share this with you.

The innovation of this project is casting mud like casting concrete.

How do you throw mud?

As you can see, we start making a lot of mortar. Once everything is ready and you know the best recipes and the best shapes, it's time to start working with the community.

And sometimes I leave.

they will do it themselves.

That's how I came to talk to you.

Another factor in Gandho is rain.

When it rains, we rush to protect the fragile walls from the rain.

Don't confuse Christo with Jeanne-Claude.

It's just the way we defend our walls.

(Laughter) The rains in Burkina Faso come very quickly and then floods all over the country.

But rain is good for us.

It carries the sand and gravel needed for construction into the river.

Now just wait for the rain to stop.

We collect sand, mix it with clay, and continue building.

That's it.

Gando's projects were always tied to training people. Because when I collapsed and died, at least one person wanted to continue this work from Gando.

But you will be amazed. I'm still alive

(Laughter) And my employees can now use their skills to make money for themselves.

In order to earn money, Gund youth usually have to move from the countryside to the city, sometimes leaving the countryside and never returning, weakening the community.

But now they can stay in the country, work at various construction sites and earn money to support their families.

This work has a new feature.

Yes, you know.

I have won many awards for this work.

Indeed, it presented an opportunity.

I myself have become known.

But the reason I do what I do is for the community.

As a child, I used to go to school and return to Gando every holiday.

After each vacation, I had to say goodbye to the community as I moved from one facility to another.

All Gando women would open their clothes like that and give me their last penny.

In my culture, this is a symbol of deep affection.

My 7 year old was very impressed.

One day I asked my mother, "Why do women love me so much?"

(Laughter) She replied, “They are donating your education in the hope that you will succeed and one day return and contribute to improving the quality of life in your community.”

I now hope that through this work I have made my community proud, that I have proven the power of communities, and that architecture can inspire them to shape their futures.

Merci Beaucoup. (Applause.) Thank you. thank you. thank you. thank you.

thank you. thank you. (applause)

So how many people have ever been in a cave?

Well, how many?

When most people think of caves, they think of tunnels through solid rock, and in fact most caves are like that.

Near this half of the country, most of the caves are made of limestone.

Back in my hometown, there are many volcanoes, so most of the caves are made of lava rock.

But the cave that I want to share with you today is made entirely of ice, specifically glacial ice that forms on the side of Oregon's highest mountain called Mount Hood.

Today, Mt. Hood is just an hour's drive from Oregon's largest city, Portland, home to over two million people.

Well, the most exciting thing for a cave explorer is finding a new cave and being the first human to enter it.

The second most exciting thing for cave explorers is to map the cave first.

With so many people out hiking these days, finding new caves can be very difficult. So you can imagine how excited we were to find three new caves within sight of Oregon's largest city that had never been explored or mapped before.

It felt like being an astronaut. Because we were able to see and do things that no one had ever seen or done before.

So what is a glacier?

Anyone who has ever seen or touched snow knows that it is very light. Snow is just a collection of small ice crystals and is mostly air.

When you crush a handful of snow to make a snowball, it's very small, hard, and dense.

Well, on a mountain like Hood, where annual snowfall exceeds six meters, the snow crushes the air and slowly forms hard blue ice.

Now every year more and more ice piles up on it, eventually becoming so heavy that it begins to slide down the mountain under its own weight, forming a slowly flowing ice river.

When ice packed like this starts to move, we call it a glacier and give it a name.

The name of the glacier where these caves are formed is Sandy Glacier.

Now, each year, as fresh snow falls on the glacier, the summer sun melts the snow, forming small rivers that flow alongside the ice and begin to melt, digging down into the glacier, forming networks of large caverns, sometimes down to the bedrock below.

Now, the strange thing about glacier caves is that new tunnels form every year.

Various waterfalls appear and move around in the cave.

The warm water from the ice tops is boring downwards, and the warm air from the bottom of the mountain actually rises and enters the cave, melting the ceiling back higher and higher.

But the strangest thing about glacier caves is that the entire cave is in motion. This is because glacier caves are formed in chunks of ice the size of small cities that are slowly sliding down a mountain.

Well, this is my caving partner, Brent McGregor.

He and I have both been cave explorers for a long time and climbed mountains for a long time, but neither of us had seriously explored a glacier cave before.

Back in 2011, Brent watched a YouTube video of several hikers who stumbled upon the entrance to one of these caves.

There were no GPS coordinates, all we knew was that it was somewhere on Sandy Glacier.

So in July of that year, when I went out to the glacier, I found a big crack in the ice.

I had to build a snow and ice anchor so I could tie a rope and rappel down into the hole.

This is me looking into the entrance crevasse.

At the end of this hole, we discovered a huge tunnel that extends just above the mountain under thousands of tons of glacial ice.

We hiked through this cave about 800 meters to the end and used survey tools to create a 3D map of the cave on the way back.

So how do you map caves?

Well, cave maps are different from trail and road maps because they have pits and pits leading to overlapping levels.

To map a cave, you need to place survey stations every few feet inside the cave and use lasers to measure the distance between those stations.

A compass and inclinometer are then used to measure the direction of travel in the cave, and the slope of the floor and ceiling.

Now, all of you who are learning trigonometry, that particular kind of math is very useful for making maps like this because you can measure heights and distances without actually going there.

In fact, the more I mapped and studied the caves, the more I found all the math I originally hated in school to be useful.

So, when the survey is done, I take all these data and put them into a computer, and then find someone who can draw very well and have them make a map like this: This will give you both a bird's eye view of the walkway and a side view of the walkway. It's like an ant farm.

This cave was named Snow Dragon Cave because it looks like a giant dragon sleeping under the snow.

Later this summer, as the snow melted from the glacier, more caves were discovered, and we realized they were all connected.

Not long after we mapped Snow Dragon, Brent discovered this new cave not too far away.

The inside was covered with ice, so we had to wear big spikes called crampons on our feet to walk without slipping.

This cave was amazing.

The reason why the ice on the ceiling was blue and shining green was because the sunlight from far above was shining through the ice and illuminating the whole.

And I didn't understand why this cave was so much colder than the Snow Dragon until I got to the end and figured out why.

A huge hole, or shaft, called a mulan, stretched 130 feet straight to the surface of the glacier.

Cold air from the top of the mountain flowed down this hole and blew through the cave, freezing everything inside.

And we were so excited to discover this new pit that we actually returned the following January to be able to explore it first.

It was so cold outside that we actually had to sleep inside a cave.

Our camp is to the left of this entrance room.

The next morning we walked out of the cave to the top of the glacier where we rappelled for the first time with this hole rigged.

I think Brent named this cave "Pure Imagination" because the beautiful scenery we saw there was beyond our imagination.

So what's inside these caves besides really cold ice?

It's so cold that not many people live there, but the entrance is actually covered with snow for about eight months of the year.

But there are some really great ones out there.

Strange bacteria live in the water and actually eat and digest rocks to make their own food and live under this ice.

In fact, this summer, scientists specifically collected water and ice samples to see if tiny life forms that have evolved to live in perfectly harsh conditions, called extremophiles, could be living under the ice, similar to what they hope to one day discover in the polar ice sheets of Mars.

Another really cool thing is that when seeds or birds land on the glacier surface and die, they get buried in the snow and gradually become part of the glacier and sink deeper and deeper into the ice.

As these caverns form and melt into the ice, these artifacts rain down from the ceiling and fall to the floor of the cavern, where we eventually find them.

For example, this is the noble fir seed we found.

It has been frozen in ice for over 100 years and is just beginning to sprout.

This mallard feather was found at more than 1,800 feet deep in Seoryu Cave.

This duck died long ago on the surface of the glacier until its feathers finally dug through over 100 feet of ice and fell into a cave.

And this beautiful crystal was also found on the back of a snow dragon.

Even now, Brent and I find it hard to believe that all these discoveries were essentially hidden in our backyards, waiting to be discovered.

As I said earlier, the idea of ​​discovering in this busy world we live in now seems like something only space travel can do, but it's not.

Every year new caves are discovered that have never been explored before.

So really, it's never too late for any of you to become a discoverer yourself.

You need to focus your eyes and mind on recognizing a discovery because you are willing to seek or go to places less traveled and when you do find it, it may be in your own backyard.

thank you very much.

(applause)

I would like to choose a lighthearted theme, much like what I did in the beginning.

Last time we talked about death and dying.

(Laughter) Today I'm going to talk about mental illness.

(Laughter) But it has to be technical, so I'm going to talk about ect.

(Laughter.) Ever since I had the idea that humans, some of my other people and co-workers, might be weird, some of them might be eccentric, maybe they're suffering from severe depression or what is now known as schizophrenia, I was convinced that this kind of sickness must be caused by evil spirits entering the body.

So the way to treat these early illnesses was to get rid of those evil spirits in some way.

And, as you know, this continues to this day.

However, using a priest was not enough.

Around 450 B.C., when medicine had become somewhat scientific, Hippocrates and his boys tried to find herbs, or plants, that literally warded off evil spirits.

There they discovered certain plants that could cause cramps.

And the herbal botany of the late Middle Ages, up to the Renaissance, is packed with prescriptions for inducing convulsions to ward off evil spirits.

Finally, around the 16th century, a physician named Theophrastus Bombastus Aureolus von Hohenheim is called Paracelsus. The name is probably familiar to people here (laughter) good old Paracelsus. We found that using a measured amount of camphor to induce a seizure could predict the severity of the seizure.

Can you imagine going to the closet, taking out some insect repellent and chewing on it when you're feeling down?

Better than Prozac, but not recommended.

(Laughter) So you can see that in the 17th and 18th centuries, people continued to search for effective drugs other than camphor.

Well, Benjamin Franklin came along and almost had a convulsion when electricity fell on the end of his kite.

So people started thinking about electricity causing convulsions.

And fast forward to about 1932. It was then that three Italian psychiatrists, who were primarily treating depression, began to notice that in patients who were also epileptics, depression frequently reversed after many consecutive epileptic attacks.

Not only will it lift, but it may not come back up.

So they were very interested in triggering seizures and measured the types of seizures.

And they thought, 'We have electricity, so let's plug someone into the wall.

Because of this, people's hair always stands on end and people tremble violently. ”

So they tried it on a few pigs and they didn't kill a single one.

So they went to the police and said, "I know all the lost souls roam the train stations in Rome, muttering gibberish.

A "gaguz" as the Italians call it.

So they found this "Gagz" guy, a 39-year-old guy with really hopeless schizophrenia, as they've known for months, literally defecating on himself without saying anything nonsense, and they took him to the hospital.

So, after about two to three weeks of observation, these three psychiatrists laid him down on a table and connected his temples to a very small current source.

They thought, 'Well, let's try 55 volts and two tenths of a second.

It doesn't do him anything terrible. ”

So they did.

Now, about 35 years ago, when I was thinking about these things for my research project, a first-hand observer said:

he said: ``This guy''--remember, he wasn't even put to sleep--``after this big malnutrition, he got up right away, looked at these three, and said, ``What the hell are you doing, you bastards?

(Laughter.) Well, they were supremely happy, because he hadn't said a single rational word during the weeks of observation.

(Laughter) So they hooked him up again, this time using 110 volts for half a second.

And to my surprise, after it was over, he started talking as if he was completely fine.

He had a small relapse, but they put him through a series of treatments and he was virtually cured.

But of course, having schizophrenia, I relapsed within a few months.

But they wrote a paper on this and everyone in the western world started using electricity to convulse people with schizophrenia and severe depression.

Although not very effective in schizophrenic patients, by the 1930s and mid-40s it was clear that electroconvulsive therapy was highly effective in treating depression.

And of course, back then there were no antidepressants and they were very popular.

They anesthetize and convulse people...

So people end up having real grand mal seizures.

I broke my bones. It is especially unusable for old and frail people.

Then, in the late 1950s, so-called "muscle relaxants" were developed by pharmacologists that were able to induce complete convulsions, electroencephalographic convulsions, without the convulsions in the body other than a slight twitching of the toes. It can be confirmed by EEG.

Again, this was very popular and very convenient.

Well, in the mid-'60s, the first antidepressants came out.

Tofranil was the first.

There were some other methods in the late 70's and early 80's that were very effective.

And patient rights groups seem so upset about the kind of events patients might witness that the very concept of electroconvulsive or electroconvulsive therapy has died out, only to make a comeback in the last decade.

And the reason it's revived is probably about 10 percent of people, severely depressed people, don't respond to anything you do to them.

Now, why am I telling this story at this conference?

I'm telling this story, in fact, long after Richard called me and asked me, as he asked all the speakers, to talk about something new to this audience that we had never talked about or written about.

I've been planning for this moment.

The reason for this is that I am the man whose life was saved by two lengthy ECT almost 30 years ago.

And let me tell you this story.

In the 1960s, I was married.

Using the word "bad" might be an understatement this year.

It was scary.

I'm sure there are enough divorced people in this room to know the animosity and anger.

Being someone who had a very difficult childhood, a very difficult adolescence was associated with near but not outright poverty.

It has to do with growing up in a home where no one speaks English and no one can read or write English.

It had to do with death, sickness, and many other things.

I tended to get a little depressed.

So as the situation got worse and we really started to hate each other, I got progressively depressed over the years trying to save this marriage, which inevitably didn't save.

Finally, I make a schedule. I had all major surgeries scheduled for 1:00 PM, 12:00 PM. Because I couldn't get out of bed by about 11:00.

Anyone depressed here knows what it's like.

I couldn't even remove the cover myself.

Now, you're in a medical center at your university, where everyone knows each other.

And it's obvious to my colleagues, so my referrals started to dwindle.

As the referrals started to dwindle, I became visibly depressed until I was like, 'Oh my God, I can't work anymore.

And in fact, there were no more patients, so it made no difference.

So, on the advice of my doctor, I was admitted to the acute psychiatric ward of a university hospital.

And colleagues who knew me from medical school said on the spot, 'Don't worry, Shep.

Well, do you know what cow sterkas is?

It turned out to have a lot of beef sterkasse.

(Laughter) I know a few people who lied like that to get tenure in that place.

(laughter) (laughter and applause) I mean, I was one of their failures.

But things weren't so simple. Because by the time I got out of that unit, I was completely non-functional.

I could barely see five feet ahead of me.

I limped when walking. I fell to my knees.

I hardly took a bath.

It was scary.

And it was clear to me at the time that nothing was clear to me anymore that I would need a long stay in a dreaded place called a "psychiatric hospital".

So in the spring of 1973 I was enrolled in the Life Institute, formerly called Hartford Retreat.

Founded in the 18th century, it is the largest mental hospital in Connecticut outside of the huge public hospitals that existed at the time.

And they tried everything they could.

They tried regular psychotherapy.

They tried every drug available at the time.

And they had tofranil and others--meraril, who knows.

None of these happened except for jaundice.

And finally, since I was well-known in Connecticut, they decided it would be better to have a meeting with senior staff.

All the senior staff gathered and later found out what had happened.

They gathered everyone's heads and decided that there was nothing that could be done for this surgeon who had by that time been so overwhelmed not only with depression and feelings of worthlessness and inadequacy, but also with obsessive thoughts, obsessive thoughts about chance.

And there were certain figures that terribly upset me every time I saw it, all sorts of ritualistic observances...

Just awful, terrible stuff.

Remember when you were a kid and had to step on every line?

Well, I was an adult who went through all these rituals, and it was so pounding and had a raging terror in my head.

You've probably seen this painting by Edvard Munch, The Scream.

So they decided there was no cure.

But there was actually one treatment that was pioneered at Hartford Hospital in the early 1940s. You can imagine what it is. It was a prefrontal lobotomy.

(imitates crackling) So they made the decision that the only thing this 43-year-old man could do was get a prefrontal lobotomy—again, which I didn't know, but I later found out.

Well, like other hospitals, I was assigned a resident doctor.

He was 27 and was seeing me two or three times a week.

And, of course, I was there, and then, like, three or four months.

He offered to meet with senior staff, and they agreed to meet because he was well-respected at the location.

And he dug into his heels and said, "No, I know this man better than any of you.

I met him many times.

You only saw him occasionally. I read the reports, etc.

I really honestly believe that the underlying problem here is pure depression and that's where all the obsessions come from.

And, of course, you know what a prefrontal lobotomy can do.

There will be consequences ranging from pretty bad to terrible to horrible.

If he did the best he could, he would be no more obsessed and probably not depressed, but his emotions would be dulled, he would never go back to surgery, he would never be the loving father he was to his two children, and his life would change.

The usual result would be something like One Flew Over the Cuckoo's Nest. And for that matter, he remained basically dumbfounded for the rest of his life. ”

"Well, why not try electroshock therapy?" he said.

And do you know why they agreed?

They just thought, "Okay, let's do 10 courses."

So you lose some time. Big deal. It makes no difference. ”

So they gave me 10 courses and the first course, by the way the normal course is from 6 to 8 and it's still 6 to 8, they hooked me up, put me to sleep and put me on muscle relaxants.

6 did not work. Seven was no good. 8 didn't work.

At 9 o'clock I noticed something, which is great, but a change.

And he returned to them, and they agreed to do ten more.

Again, I think there were maybe seven or eight of them, but none of them thought this was going to do anything.

They thought this was a temporary change.

But hey, at 16 and 17, there was a definite difference in how I felt.

By 18:00 and 19:00 I was asleep through the night.

And by the time I turned 20, I had a sense that I could overcome this. I had a sense that now I was strong enough to blow away my obsessions through the act of will.

I was able to blow away my depression.

And I will never forget - I will never forget - standing in the kitchen of the unit - it was a Sunday morning in January 1974 - standing alone in the kitchen and thinking, "I already have the strength to do this."

It was as if a tightly wound wire had been unwound in my head, and I was able to think clearly.

But we need a formula.

I need words to tell myself when I start thinking obsessed, obsessed.

Now, the Gilbert and Sullivan fans in this room will remember "Ladygore," they'll remember Mad Margaret, and they'll remember her being married to a man named Sir Despard Murgatroyd.

And she was going crazy every five minutes during the show.

And he said to her, "I need a word to bring you back to reality. That word is 'Basingstoke,' dear."

And she said, "Bezingstoke, that's it!" And she'll be fine for a little while.

(Laughter) Well, I'm from the Bronx. You can't say "Bedingstoke".

(Laughs) But there was something better.

And it was so simple.

It was, "Oh, motherfucker!"

(laughs) At least for me, it's way better than Basingstoke.

After 20 shock treatments, every time I started thinking obsessively again, again, I said, "Oh, motherfucker."

Things got better and better, and within three or four months I was discharged from the hospital.

I joined a group of surgeons. There, I was able to work with other people in a community that was much closer than in New Haven.

At the end of three years I moved back to New Haven and by then had remarried.

Actually, I brought my wife to make sure we get through this situation.

My children came back and lived with us.

After that, two more children were born.

I have revived my career and it is even better than before.

I soon returned to college and started writing a book.

Well, it's been a wonderful life.

As many of you know, I quit surgery about six years ago to become a full-time writer.

But it was very exciting. I was so happy.

Sometimes you have to say, "Oh shit."

At times I can be a little depressed and a little obsessive.

So I am not free from all this.

But it worked. Always working.

I've never talked about this before, so why did I choose to do so now?

Now, if you know some of these books, you know that some are about death and death, some are about the human body and the human mind, and some are about how there are always mystical thoughts in our minds.

And they always relate to my own personal experience.

After reading these books, I have received thousands of letters about the books from people who think so, and based on the history of my life, the history of my early life, which I describe in the books, some may think that I am a man who survived adversity, I am a man who drank. -- Intoxicated by the bitter wreckage of a near-mortal disaster in childhood, not only unscathed, but stronger.

I really understand it so that I can advise people about death and dying, talk about mysticism and the human spirit.

And I always felt guilty about it.

I always felt that somehow I was a cheater. Because my readers don't know what I just told you.

Certainly known to some in New Haven, but not to the general public.

So one of the reasons I'm here today to talk about this is, frankly and selfishly, to take the burden off myself and let you know that it wasn't a man without trouble who wrote all these books.

But I think what's more important is the fact that a good percentage of this audience is under 30, and of course there are a lot of people well over 30 as well.

For those under the age of 30, it seems to me that almost all of you are either on the verge of a big, exciting career or in the middle of a big, exciting career. what could happen to you

Things change.

accidents happen.

Something from your childhood comes back and haunts you.

You may be thrown off the course.

I hope it doesn't happen to any of you, but it will probably happen to a few people.

Adversity will come to those who do not.

If I can find a way out of this 1970s mental gloom or lack of mentality, and if I can find a way out of this even if my recovery isn't as likely as a group of experienced psychiatrists thought, believe me, anyone can find a way out of any adversity that life presents.

And to older folks who probably haven't gone through something this bad, but who've probably lived through tough times like I did, losing everything and starting over, some of these things will seem very familiar.

There is recovery.

There is salvation.

Every society studied so far has a theme of resurrection. That's because we don't just fantasize about the possibility of resurrection or recovery, it actually happens.

Perhaps the most popular resurrection theme, especially religious themes, is that of the phoenix, the ancient story of being resurrected from its own ashes every 500 years to live an even more beautiful life than before.

Richard, thank you very much.

I'm a man trying to live from the heart, so before I get to the point, I want to tell you that, as a South African, one of the men who inspired me the most passed away a few hours ago.

Nelson Mandela has completed his long walk to freedom.

So this story will be directed to him.

I grew up wondering.

I grew up among those animals.

I grew up in the wilderness of eastern South Africa, in a place called the Londolozi Game Reserve.

This is where my family has run the safari business for four generations.

For as long as I can remember, my job has been to bring people into nature. So I consider it a lovely twist of fate to have the opportunity to bring some of my experiences in nature to this gathering today.

Africa is still a place where people sit around a campfire under the stars and tell stories. So what I have to share with you today is a simple potion of some campfire stories, stories about heroes at heart.

Well, my story is not what you hear in the news. It is true that Africa is a harsh place, but we also know that it is a place where people, animals and ecosystems can teach us about a more interconnected world.

When I was nine years old, President Mandela came to stay with my family.

He had just been released from 27 years of imprisonment and was in a period of sudden readjustment to global icon status.

Members of the African National Congress thought they would have time to rest and recuperate in privacy in the bush, but it's true that lions tend to be a very good deterrent to journalists and paparazzi.

(Laughter.) But it was a defining moment for me as a boy.

I brought him breakfast to bed, then put on my old jersey and slippers and took a walk around the garden.

At night, I sat with my family around a snowy bunny-eared TV, watching footage from the garden of the same quiet man surrounded by hundreds and thousands of people as each night's release was broadcast.

He was a man of incredible humanity who brought peace to a divided and violent South Africa.

Mandela often said that the gift of prison was the ability to go inside and think and create within himself what he most wanted for South Africa: peace, reconciliation and harmony.

Through this immense act of generosity, he became the embodiment of what we call 'ubuntu' in South Africa.

Ubuntu: I owe you

Or a person is not a person without others.

This is not a new idea or value, but I believe it is worth building in this day and age.

In fact, the African collective consciousness says that we experience the deepest parts of our own humanity through our interactions with others.

Ubuntu is active now.

You hold space for me to express the deepest truths of who I am.

Without you, I'm just a guy talking into an empty room. I spent a lot of time doing that last week, but it's not the same this time.

(Laughter) If Mandela is the national and international embodiment, the person who taught me most personally about these values ​​is this man, Solly Murongo.

Solly was born under a tree in Mozambique, 60 kilometers from where I grew up.

He never had a lot of money, but he was supposed to be one of the richest men I've ever met.

Solly grew up tending her father's cows.

Now, I can tell you, I don't know what it's like to be a person who grew up tending cows, but it turns out to be very resourceful.

His first job in the safari industry was repairing safari trucks.

I don't know where he learned that in the bush, but he did.

He then moved on to what we call the Habitat team.

These were the reserve people and were responsible for the welfare of the reserve.

He built roads, rehabilitated wetlands, and combat poaching.

Then one day, when we were out together, he came across a trail of a female leopard.

It was an old trail, but amused he turned and started following it. By the way, the speed with which he moved across the pad trail indicated that this man was a PhD-level tracker.

When I drove past Solly somewhere in the reserve, I looked up in my rearview mirror and saw that he had parked 20 to 50 meters away from the road in case he needed any help.

The only reproach I've ever had against him was when one of my clients said, "Solley, you're a pathologically useful person."

(Laughter) Solly was my go-to when I started professionally bringing people into this environment.

We worked together as a team.

And the first guest we ever had was a charity from the East Coast. They stood by and said to Solly: "Before I go see the lions and leopards, I'd like to see where you live."

So we took them to his house, and this philanthropist's visit to his house coincided with a time when Solly's wife, who was studying English, was going through the phase of opening the door saying "Hello, I love you."

Welcome, I love you." (Laughter) And in this little house to me, there was something very beautiful African, with a big heart in it.

The day Solly saved my life, he was already my hero.

It was a hot day and we found ourselves by the river.

It was hot, so I took off my shoes, rolled up my pants and went into the water.

Solly remained on the shore.

The water was running over sand and clear, so we turned and started heading upstream.

And a few meters ahead of us, there was a place where a tree had fallen from the bank, and its branches touched the surface of the water, shadowing it.

If it was a horror movie, the audience would start saying, "Don't get in there, don't get in there." (Laughter) And, of course, the alligator was in the shadows.

Now, the first thing you notice when attacked by a crocodile is the ferocity of its bite.

Wham! hits the right foot.

it pulls me it changes. I raise my hand You can grab branches.

I am shaking violently.

It's a very strange feeling to have another creature try to eat you, and few things promote vegetarianism as much.

(Laughter) Solly on the shore saw that I was in trouble.

he turns around. he started walking towards me.

The alligator keeps shaking me again.

It bites me for the second time.

I noticed a film of blood running in the water around me and being swept downstream.

It will bite for the second time, so kick it.

My leg goes down my throat. it makes me vomit

I leaned against a branch and looked over my shoulder as I emerged from the water.

My legs are in unspeakable shreds from the knee down.

Cracked bones.

Meat is torn.

I decided in an instant that I would never see him again.

As I emerged from the water, Solly reached the deep section, the channel between us.

He knows, he sees the condition of my feet, he knows there's an alligator between him and me. And you can see that this guy doesn't slow down for a second.

He comes straight into the waterway.

He stepped above his waist.

he approaches me he grabs me

I am still in a weak position.

He picks me up and puts me on his shoulders.

This is another characteristic of Solly, he is insanely strong.

he turns around. he walks me to the bank

he lays me down he takes off his shirt

He wrapped it around my leg and was able to pick me up a second time and take me to the car to see a doctor.

and i will survive

Now — (applause) I don't know how many people have gone into deep waters with alligators around you to come and help, but for Solly it was as natural as breathing.

And he is an amazing example of what I have experienced across Africa.

In a more collective society, we recognize from within that our own well-being is deeply connected to the well-being of others.

Danger is shared. Pain is shared.

Joy is shared. Achievements are shared.

The house is shared. Food is shared.

Ubuntu asks us to open up and share. What Solly taught me that day was the essence of these values, his vivid and empathetic actions in every moment.

Well, the etymology is about people, but I thought ubuntu might just be about people.

Then I met this young lady.

Her name was Elvis.

In fact, Solly named her Elvis because she said she used to walk like she was doing Elvis the Pelvic Dance.

She was born with severely deformed hind legs and pelvis.

She arrived at our reserve from our eastern reserve on a migration route.

When I first saw her, I thought she would die within days.

Yet, for the next five years, she returned each winter.

And we are in the bush and would be very excited to come across this unusual trail.

It looked like curly braces, we tossed it whatever we were doing and followed it around the corner and there she was with her pack.

And the outpouring of emotion when the people on the safari truck saw her, it was this familiarity.

And it reminded me that even people who grew up in the city feel a natural connection with the natural world and animals.

Still, I continued to be amazed that she survived.

Then one day we met them at this little waterhole.

It was like the ground was hollow.

And I watched the matriarch drink, and then she turned in that beautiful slow motion of an elephant, her arms seemed to move, and she began to climb the steep bank.

The rest of the herd turned and began to follow.

And then I saw a young Elvis starting to fire up the hill.

She was visibly aware—her ears were forward, her legs were broken at full strength halfway up her stomach, and she was falling backwards.

She tried a second time, but fell backwards halfway up again.

And on the third try, something amazing happened.

Halfway up the shore, a teenage young elephant came up behind her, propped its trunk under her, and began raking her onto the bank.

And I wondered if the rest of the herd were actually taking care of this young elephant.

The next day, I saw the patriarch breaking a branch and putting it in his mouth, then breaking another branch and dropping it to the ground again.

And there was a consensus among all of us who were guiding people in the area that the elephant herd was actually slowing down to accommodate it.

What Elvis and his flock taught me helped me broaden my definition of ubuntu. And I believe that in wild cathedrals we can see the most beautiful parts of ourselves reflected back.

And we can experience our humanity not only through other people, but through all living things that live on this planet.

If Africa has a gift to share, it is the gift of a more collective society.

And while it's true that ubuntu is an African idea, what I see is that the essence of its value is invented here.

thank you.

(Applause.) Pat Mitchell: Mr. Boyd, we know you've known President Mandela since you were a little boy, heard the news as we all do today, and were deeply distraught and aware that it was a tragic loss for the world.

But we know you heard the news just before you joined this session, so we wondered if you'd like to share any additional thoughts.

Boyd Varty: Thank you, Pat.

I am very happy that the time has come for him to die.

he was in pain.

And, of course, there are mixed feelings.

But I just remember so many incidents like when he was on Oprah's show and asked her what the show was about.

(Laughter.) And she said, "Well, it's about you."

I mean, it's incredible humility.

(Laughter) He is the father of our country and we have a path to follow in South Africa.

And all, they called it Madiba Magic.

He used to go to rugby matches and we were winning.

Wherever he went, things went well.

But I think the magic is with us, and the important thing is that we inherit what he stood for.

That's what I'm trying to do, and that's what people all over South Africa are trying to do.

PM: And that's what you did today. BV: Oh, thank you.

Prime Minister: Thank you. BV: Thank you. Thank you very much.

(applause)

I have a question. Does anyone remember the first time they knew they were going to die?

that's right. I was a young boy and my grandfather had just died. A few days later, I remember lying in bed at night trying to figure out what had happened.

What does it mean that he is dead?

where did he go?

It was as if a hole had opened in reality and swallowed him up.

But then a really shocking question came to me. If he could die, could it happen to me?

Will the hole actually open and swallow me?

Will it open under my bed and swallow me while I'm asleep?

Now, at some point, all children become conscious of death.

Of course it can happen in many different ways, usually in stages.

Our thoughts about death deepen as we age.

And when you go back to the dark corners of your memory, you might remember things like how you felt when your grandfather died and when you realized it could happen to you too, the feeling of a void waiting behind all this.

And this development in childhood reflects the development of our species.

Just as growing up in childhood refined our sense of self and time to allow us to perceive ourselves as mortal, at some point in the evolution of our species, early humans' sense of self and time became so refined that they were among the first to perceive "I am dying."

This is our curse, if you will.

That's the price we pay for being so smart.

We have to live knowing that the worst event that can happen one day will be the end of all our projects, our hopes, our dreams, and our personal world.

We all live in the shadow of our personal apocalypse.

And it's terrifying. Horrifying, isn't it?

There we look for an exit.

And in my case, since I was only about five years old, this meant asking my mother.

Now, when I first started asking what would happen to me when I died, the adults around me at the time gave typically British answers mixed with awkwardness and half-hearted Christianity. And the phrase I heard most often was that Grandpa is now "over there looking down on us" and that if I were to die (of course not), then I would be there too, so death sounded like an existential elevator.

Well, this was not very convincing.

I was watching a children's news program at the time, and it was exactly the era of space development.

Rockets were always flying into the sky, into space, towards there.

But none of the returning astronauts mentioned seeing my grandfather or other deceased people.

But I was terrified, and the idea of ​​taking an existential elevator to visit my grandfather seemed so much better than being swallowed by the void in my sleep.

So I believed it anyway, even if it didn't make much sense.

And this thought process that I went through as a child and over and over again, including as an adult, is the product of what psychologists call bias.

Now, biases are the ways we systematically get things wrong, miscalculate, misjudge, distort reality or see what we want to see, and the biases I'm talking about work like this: If you confront someone with the fact that they're going to die, that person will believe almost any story that tells them it's not true, and in exchange they can live forever, even if it means riding an existential elevator.

Now we can see that this is the biggest bias.

It has been proven in over 400 empirical studies.

These studies are original, but simple.

they work like this.

Take two groups of people who are similar in all relevant ways, remind one group that they will die but not the other group, and then compare their behavior.

In other words, we are observing how when people become aware of their own death, it biases their behavior.

And I get the same result every time. Those who are informed of their mortality are more willing to believe that they can escape death and live forever.

Here is an example. A recent study looked at two groups of agnostics: people who were undecided about their religious beliefs.

Now one group was asked to think about death.

The other group was asked to think about loneliness.

They were then questioned again about their religious beliefs.

Those who were asked to think about dying were twice as likely to express their faith in God and Jesus afterwards.

Twice as likely.

Even though everyone used to be equally agnostic.

But when fear of death arises in them, they run to Jesus.

Now, this goes to show that reminding people of death biases them to believe regardless of the evidence, and it works not just with religion, but with all sorts of belief systems that promise immortality in some way, such as nationalisms that promise to be famous or have children or even continue to live as part of a larger whole.

This is a prejudice that has shaped the course of human history.

Well, the theory behind this bias in over 400 studies is called Terrorism Management Theory, and the idea is simple. Only this.

To deal with our fear of death, we construct worldviews, stories that tell ourselves about the world and our place in it.

And while there are thousands of different manifestations of these immortal stories, I believe that behind the apparent diversity there are really only four basic forms these immortal stories can take.

And we get to see them repeated throughout history, with slight modifications to reflect the vocabulary of the day.

Here I would like to briefly introduce these four basic forms of immortality tales and give you a sense of how they are retold by different cultures and generations using contemporary vocabulary.

Well, the first story is the simplest.

We want to avoid death and the dream of doing so forever in this body in this world is the first and simplest story of immortality, which may sound implausible at first glance, but in fact almost every culture in human history has myths and legends about an elixir of life or a fountain of youth or something that promises to keep us alive forever.

Ancient Egypt, ancient Babylon, and ancient India had such myths.

Throughout European history we find them in the work of alchemists, and of course we still believe it today, we only use the vocabulary of science to tell this story.

So, 100 years ago hormones were just discovered and people expected hormone therapy to cure aging and disease, but now they are looking instead to stem cells, genetic engineering and nanotechnology.

But the idea that science can cure death is just another chapter in a tale of magical elixirs as old as civilization.

But betting everything on the idea of ​​finding the elixir and staying alive forever is a risky strategy.

If you look back at the history of all those who have sought elixirs in the past, the one thing they all have in common is that they are all dead.

So we need a back-up plan, and exactly this kind of plan B is what the second kind of immortality story offers, and that is resurrection.

And it remains in the idea that I am this body, this physical organism.

It accepts that I must die, but nevertheless says that I can rise and live again.

In other words, I can do what Jesus did.

Jesus died and was in [the tomb] for three days, after which he rose again and came to life.

And the idea that we can all be resurrected and live again is orthodoxly believed not only by Christians, but also by Jews and Muslims.

But our desire to believe in this story is so deeply embedded that we are reinventing it for the age of science, using, for example, the idea of ​​cryopreservation.

It's the idea that when a person dies, they can freeze themselves and then at some point when technology is advanced enough they can be thawed, repaired, revived and revived.

So some believe that an Almighty God will resurrect them and bring them to life again, while others believe an Almighty Scientist will do it.

But for others, the whole idea of ​​resurrection or crawling out of the grave resembles a zombie movie too damn bad.

They consider the physical body too dirty and too unreliable to guarantee eternal life, and place their hopes on a third, more spiritual story of immortality: the idea that one can leave the body and continue to live as a soul.

The majority of people on Earth now believe they have souls, and this idea is central to many religions.

But while the concept of the soul, both in its current and traditional form, remains very popular, we are nonetheless reinventing it for the digital age, for example, the idea that by uploading your mind, your essence, your true self into a computer, you can leave your physical body and continue to live as an avatar in the ether.

But of course there are skeptics who say that the evidence in science, especially neuroscience, suggests that your mind, your essence, your true self, is highly dependent on one particular part of your body: your brain.

And such skeptics can find solace in the fourth kind of immortality story, the legacy, the idea that one can live on by the repercussions one leaves in the world, like the great Greek warrior Achilles, who sacrificed his life at the Battle of Troy to win immortality.

And while the pursuit of fame is more pervasive and popular than ever, in the digital age it's even easier to achieve.

You don't have to be a great warrior like Achilles or a great king or hero.

All you need is an internet connection and a funny cat. (Laughter) But some people want to leave a more tangible biological legacy. For example, children.

Alternatively, they prefer and desire to continue living as part of a larger whole, such as nation, family, tribe, gene pool.

But again, there are skeptics who question whether the legacy is truly immortal.

For example, Woody Allen said, "I don't want to live in the hearts of my people.

I want to continue living in my apartment. ”

These are the four basic types of immortality tales, and I've tried to give you a brief overview of how they're retold from generation to generation, with slight variations to suit the fashions of the day.

And I think the fact that they repeat themselves in this way, in similar ways, but with such different belief systems, suggests that we should be skeptical of the truth of certain versions of these stories.

The fact that some believe an Almighty God will resurrect and bring them back to life, while others believe an Almighty Scientist will do it, suggests that neither really believes this, based on the strength of the evidence.

Rather, we believe these stories because we are prejudiced in believing them, and we are prejudiced in believing them because we are so afraid of death.

So the question is, are we destined for a one-time life to be shaped by fear and denial, or can we overcome this prejudice?

The Greek philosopher Epicurus thought it possible.

He argued that while the fear of death is natural, it is not rational.

"Death is nothing to us, because when we are here there is no death and when it is here we are gone," he said.

It's often quoted, but really hard to understand and really hard to internalize. Because the thought of this being gone is very difficult to imagine.

2,000 years later, another philosopher, Ludwig Wittgenstein, said: "Death is not a life event. We are not living to experience death.

"In that sense, life has no end," he added.

So, as a child, it was natural, but irrational, to fear being swallowed by the void. Because being swallowed up by the void is not something that any of us will live to experience.

Now, the fear of death is so ingrained in us that it is not easy to overcome this prejudice, but once we see that the fear itself is irrational and bring to light the ways it may be unconsciously prejudicing us, we can at least start working to minimize the impact it has on our lives.

Now, I think it helps to think of life like a book. Just as a book is defined by its cover or its beginning and end, so too is our life defined by birth and death. Even if the book is limited in beginning and end, it can still encompass distant landscapes, exotic characters and fantastic adventures.

And even though the book is bounded by a beginning and an end, the characters in it know no horizon.

They only know the moments that make up their story, even when they close the book.

Therefore, the characters in the book are not afraid to reach the last page.

Long John Silver isn't afraid to let you finish "Treasure Island."

So should we.

Imagine the book of your life, its cover, the beginning and the end, and your birth and death.

You can only know the moments in between, the moments that make up your life.

Whether before birth or after death, it makes no sense to fear what is outside that covering.

And you don't have to worry about how long the book is, whether it's a cartoon or a blockbuster.

All that matters is making it a good story.

thank you.

(applause)

By 2010, Detroit was the epitome of America's cities in crisis.

The population collapsed by 25% between 2000 and 2010 due to the collapse of housing, the collapse of the automobile industry. It was at the top of America's list of shrinking cities, and many were starting to give up on it.

By 2010, I was asked by the Kresge Foundation and the City of Detroit to participate in leading a citywide planning process to create a shared vision for the city's future.

I am in this line of work as an architect and urban planner and have had careers in other conflict cities, including my hometown of Chicago. Harlem, that's my current home. Washington DC. and Newark, New Jersey.

To me, all these cities still have many unresolved issues related to issues of urban justice, equity, inclusion and access.

By 2010, popular design magazines were also beginning to cover cities like Detroit in detail, devoting entire issues to "restoring the city."

My good friend Fred Bernstein asked me to interview him for the October issue of Architect magazine, and he and I kind of laughed when we saw the magazine come out with the title Can This Planner Save Detroit?

So now I'm smiling with some bewilderment. Because it's utterly ridiculous that one person, let alone a planner, could save a city.

But at the same time I am smiling. I thought it represented a sense of hope that our profession could play a role in thinking about how the city would recover from a severe crisis.

So I'd like to take a moment this afternoon to talk a little bit about our process of restoring the city, and a little bit about Detroit. I want to convey that through the voices of Detroit residents.

So we started the process in September 2010.

It's just after the special mayoral election, and rumors of a city-wide plan are causing a lot of anxiety and fear among Detroiters.

We had planned to hold some community meetings in a room like this to showcase the planning process, and people gathered from all over the city, not only in areas that were stable neighborhoods, but also in areas where many empty homes began to appear.

And most of our audience represented 82 percent of the African-American population living in the city at the time.

So, of course, there is a Q&A portion of the program, where people line up at the microphone to ask questions.

Many of them stepped firmly into the microphone, put their hands on their chests and said, "You know you guys are trying to kick me out of the house, right?"

So that question is very powerful, and when you connect it with stories experienced by many African-American families living in Midwestern cities like Detroit, and indeed some people in Detroit, it was certainly powerful for us in this moment.

Many of them told stories about how they came to own their homes through grandparents or great-grandparents, one of the 1.6 million people who migrated from the rural South to the industrial North, as depicted in this Jacob Lawrence painting, The Great Migration.

They came to Detroit in search of a better way of life.

Many found work in the auto industry, the Ford Motor Company, as depicted in this mural by Diego Rivera from the Detroit Institute of Arts.

The fruits of their labor will provide them with a home that is new real estate for many and a community of other African Americans buying their first home.

The first few decades of life in the North were very successful until about 1950, when the city's population peaked at 1.8 million.

This is the time when Detroit is now beginning to see a second type of migration: migration to the suburbs.

Between 1950 and 2000 the region grew by 30%.

But this migration has left African Americans in place, families and businesses fleeing the city, leaving the city in a state of considerable disrepair, both in terms of people and jobs.

Over the same period, from 1950 to 2000 and 2010, the city's population declined by 60 percent and now stands at over 700,000.

The audience that comes to talk to us that night tells us what it's like to live in such a depopulated city.

Many people say it's one of the few occupied homes in their neighborhood and they can see some abandoned homes from sitting on the porch.

There are 80,000 vacant houses in the city as a whole.

You can also see vacant properties.

They are starting to see illegal activities such as illegal dumping on these properties and know that as the city has shrunk its population so much that there are not enough people to pay the property taxes to support the services it needs, so the cost of water, electricity and gas is rising.

There are about 100,000 vacant lots in the city.

Now, let me briefly explain the sense of scale to everyone. I know this sounds like a big number, but it's hard to understand until you look at a city map.

So the city has an area of ​​139 square miles.

Boston, San Francisco and the island of Manhattan could fit on its site.

So if you put all that vacant or abandoned land together and squash it, it looks like about 20 square miles. That's roughly the size of the 22-square-mile island of Manhattan where we sit today.

So there are many vacancies.

Now some of our audience tell us about some positive things happening in their communities. Many of them have banded together to manage some of the vacant land and have started community gardens. It creates a great sense of control over the community. But they made it very clear to us that it wasn't enough and that they wanted to see their neighborhood return to what their grandparents found it.

Well, since 2010 there has been a lot of speculation about what to do with vacant lots, much of it around community gardening, or so-called urban farming.

So many people say to us, "Why don't we take all that empty land and turn it into farmland?"

Fresh food can be provided and Detroiters can go back to work. ”

When I hear that story, I always imagine the people of the Great Migration rolling in their graves. Because they didn't sacrifice south-to-northern migration to build a better life for their families, and I can only imagine seeing their great-grandchildren return to farming, especially in cities where they could come with a high school education or better than grammar school and get the basic ingredients of the American dream: a steady job and a home of their own.

Detroit is now experiencing a third wave of migration, with a new wave of cultural entrepreneurs emerging.

These people see the same vacant lot or the same vacant house as an opportunity for new entrepreneurial ideas and profits, and a former model can move to Detroit, buy real estate, start a successful business or restaurant, become a successful community activist in their neighborhood, and make a very positive difference.

Similarly, some smaller manufacturing companies have made a conscious decision to move to the city.

The company, luxury watch and bicycle company Shinola, deliberately chose to move to Detroit, saying they were drawn to Detroit's innovative global brands.

They also knew they could take advantage of a workforce that was still skilled in manufacturing technology.

Currently, there is community management in the neighborhood, cultural entrepreneurs have made the decision to move to the city and set up companies, and companies are relocating. All this is behind what is no secret to all of us. The city is under the control of the Emergency Manager and just filed for Chapter 9 bankruptcy in July of this year.

So we started this process in 2010 and by 2013 we unveiled Detroit Future City. It is a strategic plan to lead cities to a better, prosperous and more sustainable existence. It looked at new ways of economic growth, new forms of land use, more sustainable and densely populated areas, reconfigured infrastructure and urban service systems, and an increased ability of civic leaders to take action and effect change, looking at what is, not what is.

Three key duties were very important to our work.

First, the cities themselves weren't necessarily too big, but their economies were too small.

Detroit has only 27 jobs per 100 people, far from Denver, Atlanta, and Philadelphia, which have 35-70 jobs per 100 people.

Second, we had to accept that all this vacant land could not be used in the same way as before, and probably will not be available for some time to come.

It won't be the traditional residential neighborhood it used to be, and although Detroit has had some very productive and successful interventions, urban farming wasn't the only answer. All we had to do was look to these areas with significant populations, with significant vacancies but potential for new, productive, innovative and entrepreneurial uses that could stabilize a community of nearly 300,000 inhabitants.

So we came up with one district typology called livemake districts, where residents can repurpose abandoned buildings and turn them into entrepreneurial enterprises. There are a few of these, but a particular focus is also on focusing on African Americans, who are also the majority of the population at 82%.

So they, too, were able to take the business they probably had outside of their home and grow it into a more prosperous industry, actually acquire real estate, and become actually property owners as well as business owners in the communities in which they live.

Next, we wanted to explore other uses for the land beyond just growing food and turning the landscape into more productive uses. For example, the use of surface lakes and reservoirs allows land to be used for stormwater management, creates neighborhood amenities and recreational areas, and actually helps raise the level of adjacent land.

Alternatively, it can be used as a research site, used to remediate contaminated soil, or used to generate energy.

So the descendants of the migration could either become precision watchmakers at Shinola, like Willie H. in last year's ad, or actually grow a business servicing companies like Shinola.

The good news is that the next generation of Detroiters, whether they're in Detroit now or are about to come, has a future.

So, thank you, Mayor Menino recently reportedly said, "Blow this place up and start over."

Detroit has very important people, businesses, and real estate assets, and there is real opportunity there.

So Detroit may not be what it used to be, but Detroit never dies.

thank you.

(applause)

The Pan-STARRS telescope scans the sky every night as NASA is constantly on alert for possible asteroid impacts.

Candidate objects are inspected each morning by Pan-STARRS staff and usually turn out to be no big deal.

But on October 19, 2017, Pan-STARRS discovered a rapidly moving interstellar object, and this time the usual tracking measurements of position and velocity showed something quite different.

By October 22, we had enough data to recognize that this object did not come from our solar system.

holy cow.

At that time, I received a phone call. It's the call every solar system astronomer has been waiting for.

Let me tell you how exciting this was.

(Laughter) NASA has been expecting interstellar comets to pass through our solar system since the 1970s, but they've never seen one before.

Our solar system is so huge that it would take over 50,000 years just to receive a package from our closest star system, which is 4.4 light years away.

So this is a really big deal.

The interstellar visitor entered the solar system above the planetary plane from the direction of Lyra, making its closest approach to the Sun on September 9, passing within the orbit of Mercury.

This is not a particularly close or unusual distance.

Nearby objects are much easier to see.

Before our discovery, on October 14th, it made its closest approach to Earth within about 15 million miles.

This is very close to astronomical standards.

Now, instead of calling it by its awkward catalog name, we simply called it "Rama" after the cylindrical spacecraft that passed through the solar system in Arthur C. Clarke's classic science fiction novel in 1973.

But even this was not entirely correct, so in honor of the Hawaiian telescope discovery, two experts in Hawaiian culture, a Hawaiian navigator and a linguist, were consulted to suggest a name.

And they suggested the word 'Oumuamua. It means scouts or messengers who contact us from the distant past.

Now, this discovery was important for many reasons, but the most important one for me is, "What can 'Oumuamua tell us about our solar system's past?"

The birth of new solar systems and the process of planetary growth can be violent and laborious.

As giant planets move through the dusty disk that formed, leftover ice and rock debris are ejected from the new solar system.

Now, have you ever had an emotional chill, that excitement that sends shivers down your spine?

Or is it very emotional?

Well this was it for me.

This was a great moment for me.

In fact, matter from another solar system has come close enough for us to observe.

So what would you like to know about Oumuamua, the first visitor from another star system?

Well, you can think of a million things, but there is what you want and what you can get, and "Oumuamua was moving away and disappearing very quickly."

In about a week, the brightness decreased [10] times.

So this is the amount of time you can easily study.

As such, the process of obtaining telescope time (which is typically very competitive and peer-reviewed and can take up to several months) had to be reduced to less than a few days.

Thus began the “polite” competition for resources.

Ok, stop truncating words. It was a fierce battle.

We threw everything away and worked around the clock trying to come up with the perfect proposal to send to the observatory director.

Well, good news. I have time.

Now, from a completely selfish point of view, the first thing we want to know is just how huge 'Oumuamua is.

After all, it passed so close to Earth that we didn't know about it until afterward.

How dire would it have been if it hadn't hit Earth?

Well, impact energy depends on the product of velocity squared and mass, and mass depends on size and material.

So how big is 'Oumuamua and what does it look like?

Well, you can tell by its brightness.

If you don't believe me, compare the brightness of a firefly in your backyard to the brightness of an airplane's navigation lights in the distance.

As you know, planes are much brighter. Because of the distance, it is only faintly visible.

We also need to know the reflectance of 'Oumuamua's surface, but we have no clue, but it's reasonable to assume that it's very similar to a small asteroid or comet in our solar system, or, in technical terms, somewhere between the reflectance of charcoal and wet sand.

Currently, most large telescopes are used in so-called service mode. That means you have to carefully craft all the instructions and send them to the telescope operator, then pray to the weather gods and wait anxiously for the data to come back.

Now, I don't think most of you have careers that depend critically on whether or not last night was cloudy.

Well, there were no second chances here.

Oumuamua decided not to participate due to the weather.

Its brightness was not constant.

Well, here you can see 'Oumuamua running through the stars.

concentrated in the middle.

The stars appear to trail because the telescope follows their movements.

It started out faint, then brightened, darkened, brightened, and dimmed again because sunlight was reflected off the four sides of a rectangular object.

The extreme variations in brightness have led to incredible conclusions about its shape.

As this author puts it, "'Oumuamua is clearly very elongated, with an axis ratio of about 10 to 1."

Assuming it's dark, that means it's about half a mile long.

Nothing else in our solar system looks like this.

Only a handful of objects have an axial ratio greater than 5:1.

So we don't know how this forms, but it could be part of the birth process in our home solar system.

"We thought 'Oumuamua was changing brightness every 7.34 hours.

As more data started coming in from other teams, teams started reporting different numbers.

Why is it that the more we learn about something, the more difficult it becomes to interpret it?

Now, it turns out that 'Oumuamua simply isn't spinning.

It wobbles like a top.

That is, it rotates around the long axis and nods up and down while rotating around the short axis.

This highly energetic and excited movement is almost certainly the result of being violently flung from its home solar system.

Now, how you interpret its shape from its brightness depends very much on how it's rotated. So we have to rethink what it looks like. We think 'Oumuamua could be a flatter oval, as shown in this beautiful painting by space artist Bill Hartman.

So let's go back to energy science.

what is it made of?

Ideally, we would like to introduce a piece of 'Oumuamua into our lab so that we can study it in detail.

But even the private industry can't launch a spacecraft to do something like this within a week, so astronomers have to rely on remote observations.

Astronomers then look at how light interacts with the surface.

Some colors may be absorbed and leave chemical fingerprints, while others may not.

On the other hand, some materials simply reflect blue or red light more efficiently.

In the case of 'Oumuamua, it reflects more red light, much like the organic-rich surface of a comet recently visited by the Rosetta spacecraft.

But not everything that looks reddish has the same composition.

In fact, minerals with tiny iron flakes on their surface can also appear red, similar to the dark side of Saturn's moon Iapetus, shown in these images from the Cassini spacecraft.

Nickel-iron meteorites, or metals, can also appear red.

So we don't know what's on the surface, but we don't know much more about what's under the hood.

However, we do know that it must be at least strong enough not to scatter during rotation, so it probably has a density similar to that of rocky asteroids. Probably even denser like metal.

Well, at least I'd like to show you one of the beautiful color images from one of our ground-based telescopes.

Ok, I'll admit it's not that great.

(Laughter.) We don't have that resolution.

Not even the Hubble Space Telescope offers a better view than this.

But the importance of the Hubble data isn't so much because of the images, but because it extended our observations to two and a half months after its discovery, which means more positions along its orbit will hopefully help us figure out where 'Oumuamua came from.

So what exactly is 'Oumuamua?

We believe it is most likely celestial driftwood, archaeological debris left over from the birth of another planetary system.

Some scientists believe that 'Oumuamua probably formed very close to a much denser star than our own, and that the tidal forces of that star shredded planetary material early in the solar system's history.

Still others suggest that perhaps this was formed during the star's death throes, perhaps during a supernova explosion, as the planet's material was shredded to pieces.

Whatever it is, we believe it to be a natural object, but in fact we cannot prove that it is not man-made.

Colors, odd shapes, and rolling movements all have other possible explanations.

I can't believe this is alien technology, but why not do an obvious experiment and look for radio signals?

That's exactly what happened with the Breakthrough Listen project, but so far "Oumuamua has remained completely silent."

Now, can we send a spaceship to Oumuamua to answer this question once and for all?

Yes, we do have that technology, but it will be a long and expensive voyage, and we are so far from the Sun to get there that the final approach trajectory will be very difficult.

So I think, 'Oumuamua probably has a lot more to teach us, and indeed more surprises may lie ahead as scientists like me continue to study the data.

More importantly, I think this remote visitor really made us realize that our solar system is not isolated.

We are part of a larger environment, and in fact we may be surrounded by interstellar visitors and not even know it.

This unexpected gift probably raised more questions than the answers offered, but we were the first to greet visitors from another solar system.

thank you.

(Applause) Jedida Isler: Thank you, Karen.

Of course, I also enjoyed the story very much. thank you.

As I recall, we were discovered quite late in the journey it came towards us.

Could future technologies like the Large Synoptic Survey Telescope help us detect these things sooner?

Karen Meech: Right. We expect to see a lot of these things. Ideally, I'd like to have time to do all the science, so I'd like to find it when it's approaching the Sun. Even better would be to park the spacecraft somewhere close to Earth at an L4 or L5 position so that when something comes along it can be chased.

JI: Great, thank you. Thanks again Karen.

(applause)

Einstein said, "I never think about the future. It comes quickly."

And of course he was right.

So today I want you to think about what the future looks like now.

Over the past 200 years, the world has experienced two major waves of innovation.

First, the Industrial Revolution gave us machines, factories, railroads, electricity, and air travel, but it also changed our lives like never before.

Then the Internet revolution brought unprecedented access to computing power, data networks, information and communications, changing our lives like never before.

We are now experiencing a new transformation, the Industrial Internet.

Integrate intelligent machines, advanced analytics and the creativity of workers.

It is the marriage of mind and machine.

And our lives will never be the same.

In my current role, I see first-hand how technology is beginning to transform industrial sectors that play a large role in the economy and our lives, such as energy, aviation, transportation and healthcare.

For economists, this is very unusual and very exciting. Because this is a more powerful transformation than the industrial revolution, and before the industrial revolution there was no economic growth to speak of.

So what is this Industrial Internet?

Industrial machines are increasingly equipped with electronic sensors that allow them to see, hear and feel more than ever before, generating vast amounts of data.

Increasingly sophisticated analytics are sifting through your data to provide insights that enable you to operate your machines more efficiently in entirely new ways.

Not just individual machines, but whole systems such as locomotives, planes, power grids, and hospitals.

They are asset optimization and system optimization.

Of course, electronic sensors have been around for a while, but something has changed. The cost of sensors has dropped significantly, and advances in cloud computing have rapidly reduced the cost of storing and processing data.

We are therefore moving into a world where the machines we work with are more than just intelligent. they are great

They are self-aware, predictive, reactive, and social.

It's jet engines, locomotives, gas turbines, and medical devices that communicate seamlessly with each other and with us.

A world in which information itself becomes intelligent and comes to us automatically when we need it, without having to look for it.

We are beginning to deploy a new software-defined machine infrastructure that will enable embedded virtualization, multi-core processor technology, advanced cloud-based communications, software virtualization of machine functions across industrial systems, decoupling machine software from hardware, and remotely and automatically monitoring, managing and upgrading industrial assets.

Why is this important in the first place?

First and foremost, it means proactive condition-based maintenance, which means fixing machines just before they break rather than wasting time on maintenance on a fixed schedule.

And with this, we aim for zero unplanned downtime. This means no power outages or flight delays.

So here are some examples of how these great machines work. Some of the examples seem trivial, others are definitely more profound, but they are both very powerful.

Let's start with aviation.

Today, 10% of all flight cancellations and delays are due to unscheduled maintenance events.

Unexpected things happen.

This results in $8 billion in annual costs to the global aviation industry, not to mention the stress, inconvenience, and missed meetings of sitting helpless in airport terminals, not to mention the impact on all of us.

So how can the Industrial Internet help here?

We have developed a preventive maintenance system that can be installed on any aircraft.

It is self-learning and can predict problems that a human operator would miss.

The aircraft communicates with technicians on the ground during flight.

By the time you land, you'll already know if any repairs are needed.

In the United States alone, such systems prevent more than 60,000 delays and cancellations annually, helping 7 million passengers reach their destinations on time.

Or get medical attention.

Nurses now spend an average of 21 minutes per shift looking for medical equipment.

It seems like a small thing, but it reduces the time you spend caring for your patients.

St. Luke's Medical Center in Houston, Texas has reduced bed turn times by nearly an hour by deploying industrial internet technology to electronically monitor and connect patients, staff and medical equipment.

An hour is critical if surgery is required.

That means more patients can be treated and more lives saved.

Another medical center in Washington state is piloting an application that can analyze medical images from city scanners and MRIs in the cloud to develop better analytics at lower cost.

Imagine a patient with a severe trauma requiring multiple specialist consultations such as neurologists, cardiologists, and orthopedic surgeons.

When everyone can access scans and images instantly and simultaneously, better care can be delivered faster.

So, all of this can not only lead to improved health, but also great economic benefits.

Reducing existing inefficiencies by just 1% could save the global healthcare industry more than $60 billion. This is just a drop in the cost of making healthcare affordable on a sustainable basis.

Similar progress is taking place in the energy sector, including renewable energy.

Equipped with new remote monitoring and diagnostics, wind farms are enabling wind turbines to communicate with each other and pitch and adjust blades according to how the wind blows, now producing electricity at a cost of less than 5 cents per kilowatt hour.

Ten years ago, that cost was six times higher at 30 cents.

The list goes on, but that number will grow quickly as industry data is growing exponentially right now.

By 2020, digital information will account for over 50% of all digital information.

But this is not just a data issue. So I want to switch gears and talk about how this is already impacting the work we do every day. Because this new wave of innovation brings new tools and applications that enable us to collaborate in smarter and faster ways, making our work not only more efficient, but more rewarding.

Imagine a field engineer arriving at a wind farm with a handheld device and telling you which turbines need repair.

The problem was diagnosed beforehand so she already has all the spare parts.

And when you face an unexpected problem, you can use the same handheld device to communicate with your colleagues in the service center, show them what you're seeing, send actionable data for diagnostics, or stream videos that guide you step-by-step through the complex steps required to get your machine back up and running.

And their interactions are documented and stored in a searchable database.

This is a very important point, so let's pause for a moment and think about it.

This new wave of innovation is fundamentally changing the way we work.

And we know that many of you are concerned about the impact of innovation on jobs.

Unemployment is already high and there are constant fears that innovation will destroy jobs.

And innovation is disruptive.

But let me emphasize two things here.

First, we are already experiencing agricultural mechanization, industrial automation, and employment is increasing because innovation is basically growth.

This makes the product more affordable.

It creates new demand, new jobs.

The second is the concern that in the future only highly specialized personnel such as engineers and data scientists will have room to play an active role.

And believe me, as an economist I'm scared too.

But think about it. Just as a child can easily learn how to operate an iPad, a new generation of mobile, intuitive industrial applications will make work easier for workers of all skill levels.

The workers of the future will look more like Iron Man than Charlie Chaplin of Modern Times.

And certainly, new highly skilled jobs will be created. A mechanical digital engineer who understands both machines and data. A manager who understands the industry and analytics and can reorganize the business to take full advantage of technology.

But let's take a step back for now.

Let's see the big picture.

Some argue that today's innovation is so full of social media and silly games that it falls short of the transformational forces of the Industrial Revolution.

They say all the innovations that drive growth are behind us.

Every time I hear this, I can't help but think that even in the Stone Age, one day a group of cavemen must have sat around a fire with very grumpy faces, looking displeased at another group of cavemen rolling stone wheels up a hill and saying to each other:

All the big discoveries are behind us. ”

(Laughter) This technological revolution is as exciting and transformative as anything we've seen before.

Human creativity and innovation have always pushed us forward.

They created jobs.

They have improved their standard of living.

They have made our lives healthier and more rewarding.

So is the new wave of innovation that is beginning to spread across the industry.

In the United States alone, the industrial internet could increase average incomes by 25-40 percent over the next 15 years, driving unprecedented growth rates and adding $10-15 trillion to global GDP.

This is the size of the entire US economy today.

But this is not a foregone conclusion.

We are just the beginning of this transformation and there will be barriers to break through and obstacles to overcome.

We need to invest in new technology.

Organization and management practices will need to be adapted.

A robust cybersecurity approach is required to protect sensitive information and intellectual property and protect critical infrastructure from cyberattacks.

And education systems must evolve to ensure that students have the right skills.

It won't be easy, but it will be worth it.

The economic challenges we face are tough, but as I walk the factory floor and see how humans and smart machines are interconnected and the changes it creates in hospitals, airports, and power plants, I am not only optimistic, but enthusiastic.

This new technological revolution is upon us.

So think ahead. It will happen soon.

thank you.

(applause)

"I felt the funeral in my head, and the mourners here and there walked and walked until the senses penetrated—and when they were all seated, the drum-like service kept beating and beating, until my heart nearly went numb—and then I heard them lift the box and creak my soul in the same lead boots, and again, and the universe began to ring, [all] as the heavens were bells, and the beings, and the ears, and me, and the silence. , some strange race, broken and lonely, here--and the slab of reason broke and I fell further and further--and with each dive I hit the world, and I knew--and--" We know depression through metaphors.

Emily Dickinson could convey it in language, Goya in image.

Half the purpose of art is to depict such symbolic states.

As for me, I always thought I was tough and one of those people who could survive being sent to a concentration camp.

In 1991, I had a losing streak.

My mother passed away, my relationship ended, and I returned to the United States after living abroad for several years, but I was able to get through it all as it was.

But three years later, in 1994, I found myself losing interest in almost everything.

I didn't want to do anything I used to want to do, but I didn't know why.

The opposite of depression is not happiness, but vitality.

And in that moment, it was the kind of vitality that oozed out of me.

Everything seemed too much to do.

When I got home, the red light on my answering machine was blinking, and instead of getting excited to hear from my friends, I was thinking, "How many people have to call me back?"

Or I decided to have lunch, and then I thought, having to take the food out, put it on a plate, cut it up, chew it up and swallow it, it felt like a crossroads to me.

And one thing that's often lost in discussions about depression is knowing that it's ridiculous.

If you try it, you'll know it's funny.

Most people manage to get their message, eat lunch, shower and get ready to walk out the front door and you know it's no big deal, but you're still in that trap and you can't find a way around it.

And I began to feel like I was doing less, thinking less, feeling less.

It was kind of invalid.

Then came anxiety.

If you were told, "I'm going to be depressed next month," you would say, "As long as you know it's going to end in November, you'll be fine."

But if you told me, "I'm going to have some serious anxiety next month," I'd rather cut my wrists than go through it.

It wasn't half a second, it lasted for 6 months, as I slipped and stumbled while walking and felt a constant rush of the ground.

It's a feeling that you're always afraid, but you don't even know what you're afraid of.

And that's when I started to think that life was so painful that the only reason I didn't kill myself was so I wouldn't hurt others.

And then one day, when I finally woke up, I thought maybe I had a stroke. Because I was lying in bed, completely frozen, looking at the phone and thinking, 'Something's wrong, I need to call for help,' but I couldn't reach out and pick up the phone and dial it.

Finally, after four full hours of lying and staring at my phone, it rang. When I managed to answer the phone, it was my father. He said, "We are in trouble. We must do something about it."

Medication and treatment started the next day.

And I also started thinking about this scary question. Who am I if I'm not the tough guy who survived a concentration camp?

And if I had to take a drug, would that drug make me more complete, or would it make me someone else?

And how would I feel if it made me a different person?

Going into battle, I had two advantages.

First, I knew objectively that I had a great life and that if I could only get better, there was something on the other side worth living for.

And the other is that I was able to receive good treatment.

But I still understood that I would have symptoms and relapses, and symptoms and relapses, and symptoms and relapses, until I had to be on medication and therapy forever.

So I thought, "But is it a chemical problem or a psychological problem?"

And do you need chemical treatment or do you need philosophical treatment?”

And I didn't know which one it was.

And it turns out that we're not really advanced enough in either area to fully explain things.

I also learned that both chemical and psychological treatments have a role, and that depression is so embedded within us that it cannot be separated from our character and character.

My point is that the treatments we use for depression are horrible.

they are not very effective.

Very expensive.

They come with a myriad of side effects.

they are a disaster.

But I am so grateful to be living in the present and not 50 years ago when I would have had little to do.

I hope that in 50 years people will hear about my cure and be appalled that anyone could have endured such primitive science.

Depression is a flaw in love.

If you're married to someone and you think, 'When my wife dies, I'll find another wife,' that's not love as we know it.

There is no love without a premonition of loss. And that specter of despair can be the driving force of intimacy.

There are three things people tend to confuse. It's depression, sadness, sadness.

Grief is clearly reactive.

If you've lost something and feel incredibly unhappy, and half a year later you're still in deep grief, but it's functioning a little better, it's probably grief that will eventually resolve itself to some degree.

If you've experienced a devastating loss, feeling terrible, and almost unable to function after six months, it's likely depression caused by a devastating situation.

The trajectory can tell us a lot.

People think depression is just sadness.

It is too much grief, too much grief for too little cause.

In my efforts to understand depression, and in interviewing people who have experienced it, I learned that there are people who, on the surface, seem to have relatively mild depression, but who are completely disabled by it.

Others lived well between episodes of depression, even though what they described sounded like a very severe depression.

And I tried to find out what makes some people more resilient than others.

What is the mechanism for human survival?

And I went out and interviewed people who were struggling with depression, one after another.

One of the first people I interviewed described depression as a slow death. That slow way of dying can lead to actual death, and it was nice to hear the words early on because it was a reminder that this is serious work.

It is a major disability worldwide and people die from it every day.

One of the people I consulted when trying to figure this out was a dear friend I've known for many years. She had a psychotic episode during her freshman year of college and then descended into a dreaded depression.

She had bipolar disorder, or manic depression as it was known at the time.

And she had been on lithium for years and was doing very well until eventually she was taken off the lithium to see how she would get on without it, also had a psychosis and then had the worst depression I've ever seen, she sat in her parents' apartment more or less catatonic, basically motionless, sitting day after day.

And when I interviewed her about that experience a few years later—she's a poet and psychotherapist named Maggie Robbins—she said, "I used to sing 'Where Have All the Flowers Gone' over and over to take over.

I was singing to drown out what my heart was saying: "You are nothing." you are nobody

You don't even deserve to live. ’ And that’s when I really started thinking about suicide. ”

In depression, we don't see ourselves as wearing a gray veil and looking at the world through a haze of bad moods.

You think the veil, the veil of happiness has been taken away and now you see the truth.

It is easy to help a schizophrenic who recognizes that there is a foreign object inside them that needs to be exorcised, but it is difficult for a depressed person to do so. Because we believe we see the truth.

But the truth lies.

I fell in love with the phrase "but there is truth."

And in talking to people with depression, I found that they have a lot of delusional perceptions.

People will say, "Nobody loves me."

And you say, "I love you, your wife loves you, your mother loves you."

At least for most people, that question is easy to answer.

But depressed people also say, "No matter what you do, you're just going to die."

Or they will say, "There can be no true communion between two men.

We are all trapped inside our own bodies. ”

To this I have to say, "That's true, but for now I think we should focus on what we eat for breakfast."

(Laughter) More often than not, it's not the disease that they express, but the insight. And what's really surprising is that most of us know about these existential questions, and they don't distract us much.

There was one study that I particularly liked. A group of people with depression and a group of people without depression were asked to play a video game for an hour, and at the end of the hour, they were asked how many small monsters they thought they had killed.

The depressed group was usually within about 10% accuracy, and the non-depressed people guessed 15 to 20 times as many small monsters (laughter) as they actually killed.

When I decided to write about depression, many people said it would be very difficult to get out of that closet and let people know.

They said, "Do people talk to you differently?"

I said, 'Yes, people talk about me differently.

They talk to me differently as long as they start talking to me about their own experience, or their sister's experience, or their friend's experience.

Now that we know depression is a family secret that everyone has, things are different.

A few years ago I attended a conference. On Friday of the three-day conference, one of the participants took me aside and said, “I have depression and I am a little embarrassed, but I am taking this medicine.

So I did my best to give her all the advice I could.

And she said, "My husband will never understand.

It's just between us because he's the kind of guy that really doesn't make sense like this. ”

And I said, "Yes, that's fine."

On Sunday at the same conference, her husband took me aside [laughs] and he said, "If my wife knew about this, she wouldn't think I was much of a man, but I'm battling this depression and I'm on medication. What do you think?"

They hid the same drug in two different places in the same bedroom.

(Laughter.) And I said I suspect the communication between the couple is causing some of their problems.

(Laughter.) But I was also struck by the troubling nature of such mutual secrecy.

Depression is very exhausting.

It takes a lot of time and energy, and silence about it just makes the depression worse.

Then I started thinking about all the ways people can improve themselves.

I originally started out as a medical conservative.

I thought there were a few treatments that would work, and it was clear what they were. There were medications, there were certain psychotherapies, maybe electroconvulsive treatments, and everything else I thought was nonsense.

But then I discovered something.

If you have a brain tumor and say that standing on your hands for 20 minutes every morning makes you feel better, you may feel better, but the brain tumor is still present and will probably kill you.

But if you're depressed and say that standing on your hands for 20 minutes every day makes you feel better, you've done it well. Because depression is a mood disease, and when you feel better, you are effectively no longer depressed.

That has made me more open to the vast world of alternative treatments.

And I get letters, and I get hundreds of letters from people writing to let me know what worked.

Today someone asked me backstage about meditation.

My favorite letter I received was from a woman who said she had tried therapy, medication, tried almost everything, and found a solution that she wanted to share with the world, and that was to make a little thing out of yarn.

(Laughter) She sent me some of them.

(Laughter) And now I'm not wearing it.

(Laughter) I suggested she should look up Obsessive-Compulsive Disorder on the DSM as well.

Still, when I went to explore alternative treatments, it also gave me perspective on other treatments.

I experienced a tribal exorcism in Senegal, which involved a lot of sheep blood and I won't go into details now, but a few years later, when I was in Rwanda working on another project, I happened to tell someone about my experience and he said, "Well, that's West Africa, we're East Africa, and our rituals are very different in some ways, but there are some rituals that are common to what you're describing."

"But we have had a lot of problems with mental health workers in the West, especially those who came in right after the genocide," he said.

I said, "What kind of trouble did you have?"

And he said, "Well, they would do such a strange thing.

They didn't take people out in the sunshine to start feeling better.

It contained no drums or music to stir the people's blood.

They didn't involve the whole community.

They did not externalize depression as an aggressive psyche.

Instead, they took people one by one into a dingy little room and made them talk for an hour about the bad things that happened to them. ”

(Laughter) (Applause) He said, "We had to ask them to deport."

(Laughter) Now, on the other end of alternative therapy, let's talk about Frank Rusakov.

Frank Rasakov had probably the worst depression I've ever seen in a man.

he was depressed all the time.

When I met him, he was undergoing monthly electroshock therapy.

After that, the state of confusion continued for about a week.

I think you'll be fine for a week.

After that, he would spend a week downhill.

And he was to undergo electroshock therapy again.

And when he met me, he said, "I can't bear to spend a few weeks like this.

I can't let it go like this, and if it doesn't get better, I thought about how to end it. ”

"But," he told me. "I heard about a protocol for a brain surgery called a cingulation at General Hospital in Massachusetts, and I thought I'd give it a try."

And I remember being stunned at that point to think that someone who had clearly had a bad experience with so many different treatments might still have buried somewhere within him enough optimism to reach out again.

And he underwent a cingulation, which was incredibly successful.

he is my friend now

He has a lovely wife and two beautiful children.

On Christmas after the surgery he wrote me a letter and said: "My dad sent me two presents this year. The first was a motorized CD rack from The Sharper Images, which I didn't really need, but I knew he gave it to celebrate the fact that I live alone and have a job that I love."

And another present was a picture of my grandmother who committed suicide.

As I opened the package, I started crying. Then my mother came and said, "Are you crying about a relative you don't know?" And I said, "She had the same disease as me." I am crying while writing to you now.

Not very sad, but devastating. I think I could have killed myself, but my parents stopped me and the doctors encouraged me so I could have the surgery.

I am alive and grateful.

We are living in the right time, even if it is not always the case. ”

I was struck by the fact that depression is so widely perceived as a modern Western middle-class thing, and investigated how it worked in a variety of other contexts. And one of the things that interested me the most was poverty depression.

So I went out to research what was being done for poor people with depression.

And what I discovered is that most poor people don't get treatment for depression.

Depression is probably the result of genetic vulnerabilities that are evenly distributed in the population and environmental triggers that are likely to be more severe for the poor.

Yet, I've found that if you're living a really nice life and you're feeling miserable all the time, you'll wonder, "Why am I feeling this way?"

I must be depressed. ”

And you started looking for that cure.

But if you're living a really bad life and you're feeling miserable all the time, that's how you feel in your life, and you don't think, "Maybe this is treatable."

Depression is rampant among the poor in this country, and it is unresolved, untreated, unaddressed, and it is a grand tragedy.

So I found a scholar doing a research project in the slums outside Washington DC. She picked up women who came in with other health problems, diagnosed them with depression, and provided them with a six-month experimental protocol.

One of them, Rory, came. On the day she came, she said,

She said yes, she was a woman with seven children by the way.

"I used to have a job, but I had to quit because I couldn't leave the house," she said.

I have nothing to say to my children.

I can't wait for them to go out in the morning, then I go to bed, pull the cover over my head, and they come home at 3:00 p.m. ”

"I take a lot of Tylenol, whatever it is, to help me sleep better," she said.

My husband said I was stupid and ugly.

I wish I could stop the pain. ”

Well, she was brought into this experimental protocol, and when I interviewed her six months later, she had taken a daycare job in the United States Navy, split up with an abusive husband, and told me, "My kids are very happy now."

“My new house has one room for the boys and one room for the girls,” she said.

One of them wants to be a preacher, another wants to be a firefighter, and one of the girls says she's going to be a lawyer.

They don't cry like they used to, they don't fight like they used to.

All I need now is my children.

Things keep changing, how I dress, how I feel, how I act.

I can now go outside without fear. I don't think that bad feeling will come back. If it wasn't for Dr. Miranda and all that, if I were still alive, I would still be at home with a hood over my head.

I asked the Lord to send an angel and he heard my prayer. ”

I was so moved by these experiences that I decided I wanted to write an article about them, not just a book I was writing, and was commissioned by The New York Times Magazine to write about depression in the poor.

So I submitted the article, and the editor called me and said, 'This really can't be published.

And I said, "Why not?"

And she said, "That's too outlandish.

Are people at the bottom of society practically ready to run Morgan Stanley after a few months of therapy?

That's too unbelievable. ”

"Never heard of such a thing," she said.

And I said, "The fact that you haven't heard about it shows it's news."

(Laughter) (Applause) "And you're a news magazine."

So after some negotiation they agreed to it.

But I think a lot of what they said was weirdly tied to this aversion people still have to the concept of treatment, the idea that if we go out and treat a lot of people in poor communities, it becomes exploitative. Because we will change them.

There seems to be a false moral imperative all around us that depression treatments, medications, etc. are artificial and not natural.

And I think it's very misguided.

Losing teeth is natural, but no one, at least in my circle, criticizes toothpaste.

And people say, "But isn't depression part of what humans should be going through?"

Aren't we evolved to be depressed?

Isn't that part of your personality too? ”

My point is that moods are malleable.

Being able to feel sadness, fear, joy, joy, and all the other feelings we have is incredibly precious.

And major depression is what happens when that system breaks down.

it is maladaptive.

People will come to me and say, 'But I think I'll get through it if I try for another year.'

And I always tell them, 'I might get over it, but I can't go back to being 37.

Life is short, and it's a whole year you're talking about giving up.

please consider. ”

It's a strange impoverishment of English, and indeed many other languages, to use the same word "depression" to describe how a child feels when it rains on his birthday, or how a person feels about committing suicide.

People say to me, "So is it a continuation of ordinary grief?"

And in a way, I would say, it is a continuation of the usual grief.

There is some continuity, but in the same way there is a continuity between what happens when the iron fence outside your house gets a little rusty and needs to be sanded down and repainted a little bit, and what happens when you leave your house alone for 100 years and it rusts into a pile of orange dust.

And that orange dust spot, that orange dust problem, is the problem we're trying to address.

So now people say, "You're on this happiness potion, are you feeling happy?"

And I'm not.

But I'm not sad about having to eat lunch, I'm not sad about answering the phone, I'm not sad about taking a shower.

In fact, I think I feel more because I can feel grief without disability.

Feeling sad about professional disappointments, broken relationships, and global warming.

Those are the things that make me sad now.

And I said to myself, well what's the conclusion?

How did people with more severe depression and still living better get over it?

What are resilience mechanisms?

And as time went on, I realized that the people who deny their experiences and say, "I used to have depression, I don't want to think about it again, I don't care, I'm just going to get on with my life," are ironically the ones who are most preoccupied with what they have.

Shutting out depression reinforces it.

It grows while you hide from it.

And those who do better are those who can accept the fact that they are in this state.

Those who can tolerate depression can develop resilience.

So Frank Rasakov said to me, "If I were to start over, I wouldn't do it this way, but strangely enough, I'm grateful for what I went through.

I'm glad I was hospitalized 40 times.

This film taught me a lot about love, and my relationships with my parents and doctors are very precious to me and will always be. ”

And Maggie Robbins said, "I was volunteering at an AIDS clinic and I was just talking and talking and talking, and the people I was dealing with weren't very responsive and I thought, 'Not very friendly or kind.'"

It was simply that it would be an opportunity to accept the fact that I did not have AIDS, nor did I die, but did and did.

Our needs are our greatest asset.

It turns out that I have learned to give all I need. ”

Valuing your depression won't prevent it from recurring, but it may make it easier to tolerate the possibility of recurrence, or even recurrence itself.

The problem is more than finding great meaning and deciding that your depression was very meaningful.

It's about trying to make sense of it, and when it happens again, thinking, "This is going to be hell, but I'm going to learn something from it."

My own experience with depression has taught me how big emotions can be and how real they are than facts. And I found that the experience allowed me to experience positive emotions more intensely and more focused.

The opposite of depression is vitality not happiness and these days my life is full of vitality even on sad days.

I felt that funeral in my head, sitting next to the colossus at the end of the world. And on that day 20 years ago, I discovered something within myself that I would call a soul that I never thought I would have until hell suddenly visited me.

I hate being depressed and thought I was going to be depressed again, but I think I found a way to love my depression.

I love it because it forced me to find joy and stick to it.

I love this life because every day I am determined to have a reason to live, sometimes gamely, sometimes against reason in the moment.

And I think it's a very privileged rapture.

thank you.

(Applause.) Thank you.

Nine years ago, I worked for the US government in Iraq, helping rebuild the power infrastructure.

I was there and I took that job because I believe technology can improve people's lives.

One afternoon, as I was having tea with the owner of the Al Rasheed Hotel in Baghdad, he told me: "American, you can put people on the moon, but you can't turn on the lights when you get home tonight."

At the time, the U.S. government had spent more than $2 billion on power rebuilding.

How can you make sure your technology reaches your users?

How do I get it into their hands to be useful?

These are the questions my colleagues at D-Rev and I ask ourselves.

D-Rev stands for Design Revolution.

And so, four years ago, I took over the organization and focused on developing products that actually reach users. It reaches not only users, but also customers who live on less than $4 a day.

One of the main areas we're working on these days is medical devices. It may not be obvious if medical equipment and the Iraqi power grid have anything in common, but they do have some things in common.

Despite advanced technology, it is not reaching the people who need it most.

So let's talk about one of the projects we've been working on, ReMotion Knee. This is an artificial knee joint for above-knee amputees.

And this project started when the world's largest prosthetic fitter, the Jaipur Foot Organization, came to the Bay Area and said, 'We need better knees.'

If you live on less than $4 a day and are an amputee, chances are you lost a limb in a car accident.

Most people think it's a landmine, but this is a car accident.

Getting run over by a truck while walking on the side of the road, trying to jump on a moving train, being late for work and getting your pant legs caught.

And the reality is, if you don't have a lot of money, like this young man named Kamal here, the only real option you have is a bamboo cane.

And how big of an issue is this?

Over 3 million amputees each year require a new or replacement knee.

And what are their options?

This is high end. This is the so-called "smart knee".

Inside is a microprocessor.

You can do just about anything, but it's $20,000, so who's wearing it? Veterans, American veterans returning from Afghanistan or Iraq would be a good fit to wear something like this.

This is a low end titanium knee.

This is a multicentric knee, meaning it is a four bar mechanism that mimics the natural human knee.

But the $1,400 price tag is still too high for people like Kamal.

And finally, we see the low-end knees.

This is a knee designed specifically for the poor.

It's affordable, but you've lost functionality.

The mechanism here is single-axis, and single-axis is like a door hinge.

So you can think about how unstable it is.

This is the type of mechanism used by the Jaipur Foot Organization when they were looking for a better knee. I just wanted you to get a feel for what the leg system is like. Because I'm showing all these knees and I find it hard to imagine how it all fits together.

There is a socket at the top that fits over someone's stump, and everyone's stump is a little different.

Then there are the knees. Here the knee has one axis and you can see how the knee rotates. Then the pylons, then the legs.

And we were able to develop a multicentric knee that works like a human knee and mimics the way humans walk, at a retail price of $80.

(Applause.) But the point is, you can have this great invention, this great design, but how do you get it to the people who need it most?

How can we make sure it reaches them and improves their lives?

So at D-Rev, we did a few other projects and looked at three things we really believe in getting technology to customers, users and people who need it.

And first, the product has to be world class.

It must perform as well as or better than the best products on the market.

Regardless of your income level, you want the most beautiful and best products out there.

I'm going to show you a video of a man named Ash. I see him walking.

He is wearing the same knee system and single axis knee here.

And he's doing a 10-meter walk test.

And you'll notice he struggles with stability when walking.

And what's not obvious and invisible is that walking and preventing falls is psychologically draining.

Well, this is Kamal's video.

You remember Kamal used to have a bamboo cane.

He's wearing one of our knee early versions and doing the same 10m walk test.

And we can see that his stability is much better.

So world class is more than just technical performance.

It also has to do with human performance.

And when we took a closer look, we found that most medical devices were actually designed for Westerners and wealthy economies.

But the reality is that our users, our customers, do a lot. They even sit cross-legged.

I can see them crouching. They kneel and pray.

And our knees are designed to have the most range of motion of nearly any knee on the market.

The second thing we learned leads to my second point. We believe that products should be designed to be user-centric.

And D-Rev goes one step further, saying they need to get their users hooked.

So we don't just consider the end user, we consider everyone involved in the product, for example the prosthetist fitting the knee, but also the context in which the knee is being fitted.

What is your local market like?

How do all these ingredients get to the clinic?

Will they all arrive on time? supply chain.

Anything to ensure that this product reaches the end user and is integrated and used as part of the system.

So I wanted to show you some of the iterations I did during the first version, Jaipur Knee, so here it is.

(click) Did you notice anything?

You will hear a click.

I've verified that the user did indeed change it.

So can you see the black bars there?

Homemade silencer.

It was also confirmed that users are modifying it in other ways.

There you can see an amputee bandaging his knee.

He made cosmetics.

And when you look at your knees, there are sharp edges, right?

So if you wear prosthesis under trousers, skirts or sari, it is obvious that you are wearing prosthesis and in a society where there is a social stigma against being disabled, people are especially sensitive about this.

So here are some of the fixes we made.

I repeated many times, not only this, but also other things.

But here we have version 3 of ReMotion Knee, but if you look here you can see the noise damper. It's quiet.

Another thing we did is smooth out the profile.

I made it thinner.

And what's not clear is that we designed it for mass production.

And this will be my final point.

We truly believe that in order for a product to reach users at the scale it needs, it must be market-driven, and market-driven means the product is sold.

It was not donated. They are not heavily subsidized.

Our products should be designed to deliver value to the end user.

It should also be designed to be very affordable.

However, products that are evaluated by customers are used by customers, and their use creates an impact.

And we, as designers, believe that it is our responsibility to our customers.

And with centralized manufacturing, you can control quality control and achieve an $80 price with built-in profit margins.

And now those profit margins are very important. Because if we want to scale, if we want to reach every person in the world who may need our knees, it has to be economically sustainable.

So I want you to feel where we are now.

We have treated over 5,000 amputees to date. And one of the big metrics we're looking at, of course, is whether it improves lives.

Well, the criteria is, six months later, are people still wearing knees?

The industry average is about 65%.

In our case it's 79% and we want it to be even higher.

Our knees are now worn in 12 countries.

But this is what we want to achieve in the next three years.

The impact doubled in 2015 and doubles every year thereafter.

But then he faced a new challenge: the growing number of skilled prosthetists who could adjust the knee.

So I would like to finish with the story of Purnima.

Purnima lost her leg in a car accident when she was 18. She traveled 12 hours by train to the clinic to get her knee ready. Every knee amputee affects us as designers, but she means a lot to me as an engineer and as a woman. She had just started school to study engineering.

And she said, "Now that I can walk again, I can go back and finish my studies."

And to me, she represents the next generation of engineers who will solve problems and ensure that meaningful technology is delivered to users.

thank you.

(applause)

This is the fifth time that I have stood on this coast, the coast of Cuba, looking out into the distant horizon and once again believing that I could cross all the way across that vast and dangerous wilderness of the ocean.

Not only have I tried four times, but the world's greatest swimmers have been trying since 1950 and still haven't made it.

The team is proud of their four attempts.

It is an expedition of about 30 people.

Bonnie is my best friend and head handler, somehow waking up the will after hours and days of being outside when I thought the last drop of will within me was gone.

Shark experts are among the world's best - less large predators.

This area is home to the most poisonous box jellyfish in the ocean, and I once almost died from the poison.

Add to the vastness of the open ocean, more than 100 miles, the conditions themselves: currents and eddies, and the most unpredictable on earth, the Gulf Stream itself.

By the way, it's funny that journalists and people often ask me before these attempts. "So are you going with a ship or a person or something else?"

(Laughter.) And I'm thinking, what are they imagining?

We're going to do some kind of astronautics -- (Laughter) and maybe put a Bowie knife in your mouth and hunt fish, skin and eat them alive, and drag desalination plants back to get fresh water.

(Laughter) Yes, we have a team.

(Laughter) And, as with any major expedition on Earth, the team is expert, courageous, and full of innovation and scientific discovery.

And we have traveled.

And since the Greeks, there has been a heated debate about whether that is the essence.

Life is a journey, isn't it a true destination?

And we've been on this journey, and the truth is, it's been a thrilling one.

We have not yet reached the other shore, but our sense of pride, commitment, and unwavering commitment remains the same.

When I turned 60, the dream of trying this in my 20s was still alive, dreamed and imagined it.

I think the most famous body of water on Earth today is from Cuba to Florida.

And it was deep. It was deep in my heart.

When I turned 60, it wasn't so much the ego of wanting to be the best as it was about sporting achievements.

It has always existed and is undeniable.

But it was much deeper.

Let's be honest, we're all one way streets, right?

So what are you going to do?

What do we do to move forward so we don't look back and regret it?

And during this year of training, I had a paraphrase of Teddy Roosevelt in my head.

It says, "Please, please.

Now sit in your comfortable chair and you are both the critic and the observer. The brave, on the other hand, enter the ring, fight, get bloodied, get stained, fail again and again, and yet live life boldly, without fear or cowardice. ”

And of course I want to get over it.

It should be very shallow to say that was the goal and that the destination was even sweeter than the journey this year.

(Laughter) (Applause) But the trip itself was worth it.

And by this summer, everyone said it was impossible: scientists, sports scientists, endurance experts, neurologists, and my team, Bonnie.

It was just not possible and Bonnie told me, "But if you're going to travel, I'll see you through to the end, so I'll be there."

And now we are there.

As we looked out, a slightly surreal moment before the first stroke, standing on the rocks of Marina Hemingway, the Cuban flag fluttering in the sky, my whole team on board the boat, holding their hands in the air and saying, “We are here!”

Bonnie and I looked at each other and said this year's watchword—and I've used it in my training—is "Find a way."

Like all of us, you have dreams, but you face obstacles.

None of us can get through this life without heartache and turmoil. If you believe and have faith, you can get knocked down and get back up again, and if you believe that perseverance is a great human quality, you can find your way.

Then Bonnie grabbed me by the shoulder and said, "Let's find our way to Florida."

And so we started, and for the next 53 hours it was an intense and unforgettable life experience.

Elation, awe—I'm not a religious person, but let me tell you, it's awe-inspiring to be in the deep blue of the Gulf Stream and feel the majesty of the blue planet we live in, as if we were breathing and looking down miles and miles below.

I have a playlist of about 85 songs, especially in the middle of the night...

We don't use lights that night, so lights attract jellyfish, lights attract sharks, and lights attract baitfish that attract sharks. So we walk in the pitch black night.

I have never seen such a black black.

I can't see my hands, I can't see the people on the boat, Bonnie and my team on the boat. They know where I am just by hearing my arm clapping. Because there is nothing visual about it.

And I'm kind of tripping over my little playlist.

(Laughter) You can't hear anything because the rubber cap is tight.

I wear goggles, turn my head 50 times a minute, and sing...

(singing) Imagine there's no heaven (laughter) doo doo doo doo doo it's easy if you try doo doo doo doo doo And I can sing that song a thousand times in a row.

(Laughter) Now that's a talent in itself.

(laughter) (applause) And after every job, (singing) Oh, you may say I'm a dreamer, but I'm not the only one222.

(singing) Imagine there's no heaven (laughter) And by the time you've sung thousands of John Lennon's "Imagine," you've swum 9 hours and 45 minutes...

that's right.

(Laughter.) And there is a crisis.

Then vomiting begins, sea water flows out, and you feel sick.

You wear a jellyfish mask for ultimate protection.

It is difficult to swim.

There are scratches on the inside of the mouth, but the tentacles do not bite.

And then hypothermia sets in.

Although the water temperature is 85 degrees, you will still lose weight and burn calories.

And as you approached the side of the boat, you weren't allowed to touch or exit the boat, but Bonnie and her team handed me the sustenance and asked, "How are you doing? Are you okay?"

I'm looking at the Taj Mahal -- (laughter) over here.

I'm in a completely different state -- (Laughter) and I think, "Wow!"

I never expected to see the Taj Mahal here.

It's gorgeous!

I mean, how long did it take you to build it?

It just...

(Laughter) We have a golden rule that we can never tell distance because we don't know it.

What happens between this point and that point?

What will happen to the weather and currents, and to think that I would be stabbed while wearing this kind of armor.

Bonnie made the decision that third morning that I was in pain and hanging by a single thread.

And she said, "Come here," and as I approached the boat, she said, "Look over there."

And I saw the light, because the day is easier than the night, and we thought the day would come.

I saw a line of white light along the horizon and said, "It will be morning soon."

And she said, "No, those are Key West lights."

It took another 15 hours, which would have been a long time for most swimmers.

(Laughter) (Applause) You don't know how much I swam in 15 hours of training.

Okay, so there you go, I somehow didn't count strokes, sing, or quote Dr. Stephen Hawking about the parameters of the universe without making a decision.

I just started thinking about this dream and why and how.

As I said earlier, when I turned 60, it wasn't that specific of a question, "Can I do it?"

It's a routine conspiracy.

That's discipline, preparation, and pride.

But I decided to think twice as I went along. As you know, the popular phrase is "reach for the stars".

And in my case it's all the way to the horizon.

And as I've proven, you may reach out for the horizon and never get there.

But what a fine character and spirit you have built up! What a foundation you have laid to reach those horizons.

And now the shore is approaching.

And there is a little bit of sadness in me.

An epic journey comes to an end.

So many people come to me now and ask, "What's next?"

(Laughter) "That little tracker on your computer?

When are you doing next?

Can't wait to see what's next. ”

They were there for only 53 hours and I have been there for years.

Therefore, epic journeys at sea will never happen again.

But the point, and the point, is that every day of our lives is wonderful.

And when I walked up to that beach, when I staggered up to that beach...

Many times, with a greatly exaggerated ego, I rehearsed what I would say...

(laughs) On the beach.

When Bonnie thought the back of my throat was swollen, she brought the medical team to our boat and said, "She's really starting to have trouble breathing. Another 12, 24 hours in the seawater..."

(Laughter) Bonnie told the doctor, 'Don't worry if she's not breathing.

She'll get mad if I can't talk to her when we get to shore. ”

(Laughter.) But the truth is that the speeches I've been practicing were just for the motivation to practice swimming, but that wasn't the case.

For those spectators and my team, it was a very real moment.

Hooray. I did not do it. Hooray.

And we will never forget it. it will always be part of us.

The three things I was mumbling about when I arrived, the first was "never give up".

i live it

Diana Nyad: To be is to do.

So I don't stand up and say, "Never give up."

I didn't give up.

Second, you can pursue your dreams at any age. You are never too old.

Sixty-four; at any age, at any gender, you have accomplished what no one else has been able to do.

And I am definitely in the prime of my life right now.

(Applause.) Yes.

(Applause.) Thank you.

And the third thing I said on that beach is that this looks like the loneliest endeavor in the world, and of course in many ways it is.

In other ways, and most importantly, it's a team.

And if you think I'm a terrible person, you'll want to meet Bonnie.

(laughs) Bonnie, where are you?

Where are you?

We have Bonnie Stoll.

(Applause) Buddy.

(Applause.) Henry David Thoreau once said, "When you achieve your dreams, it's less about what you get than what you become."

And yes, I am standing in front of you now.

For three months after that swim, I sat with Oprah in President Obama's Oval Office. I have been invited to speak in front of a respected group like you. We just signed a great big book deal.

They are all great things and I don't deny that.

I'm proud of it all, but the truth is that I am that bold and fearless human being that I am walking around with dignity, and I will continue to do so every day until the time comes when these days are over.

Thank you very much. Enjoy your conference.

thank you. thank you!

(Applause.) Thank you. thank you. thank you. thank you! thank you.

(Applause.) Find a way!

Consider playing a game of Monopoly for a moment.

With the exception of this game, the combination of skill, talent, and luck that helped me achieve success in gaming as well as life has become meaningless. Because the game is rigged and you have the upper hand.

You get more money, more opportunities to move around the board, and more access to resources.

And as you think about that experience, ask yourself: How does the experience of being a privileged player in a cheating game change the way you think about yourself and other players?

So we conducted a study on the UC Berkeley campus to explore just that question.

We brought over 100 pairs of strangers into the lab, flipped a coin, and randomly assigned one of the two to be a rich player in a cheating game.

They got double the money. When they passed Go, they collected double their salary. And since they had to roll both dice instead of one, they had to move around the board more.

(laughter) And for 15 minutes we watched what happened through a hidden camera.

For the first time today, I would like to show you a little bit of what we saw.

Again, these were hidden cameras, so please excuse the sound quality.

That's why I added subtitles.

[Video] Rich Players: How Many 500s Do You Have?

Poor Player: Only one.

RP: Are you serious? PP: Right.

RP: I have three. (laughs) I don't know why they gave me so many.

Paul Piff: So the players knew right away that something was going on.

Some obviously have a lot more money than others, but still, as the game unfolded, we saw very noticeable differences, and dramatic differences began to emerge between the two players.

The rich player started moving loudly on the board, literally pounding the board with his pieces.

Signs of dominance, non-verbal signs, displays of power and celebrations were more likely to be seen among wealthy players (game pieces slammed onto the board).

A bowl of pretzels was placed on the side.

It's in the lower right corner.

This made it possible to observe the perfect behavior of the participants.

Therefore, we are simply tracking how many pretzels participants eat.

[Video] RP: Is that pretzel a trick?

PP: I don't know.

Paul Piff: Well, not surprisingly. People are watching us.

They wonder what the pretzel bowl is doing there in the first place.

As you just saw, some even ask, "Is that bowl of pretzels there as a trick?"

Nevertheless, the forces of circumstance inevitably seem to rule, and those wealthy players start eating more pretzels.

(laughs) [Video] RP: I love pretzels.

(Laughter) Paul Piff: And one of the really interesting dramatic patterns that we observed was that as the game progressed, it started to emerge. That is, rich players have actually started to be rude to their opponents. They became increasingly desensitized to the plight of poor players, more likely to show material success, and more inclined to show off how well they were doing.

[Video] RP: I have money...

PP: How much is it?

RP: You owe me $24.

You will soon lose all your money.

I'll take it. I have so much money

I have a lot of money, so I need it forever.

RP 2: I'm going to buy this board in its entirety.

RP 3: We're about to run out of money soon.

At this point I am barely touchable.

(Laughter) Paul Piff: And this is what I find really, really interesting. At the end of the 15 minutes, I asked the players to talk about their experiences during the match.

And when rich players talk about why they inevitably win in this rigged game of Monopoly...

(Laughter) They bought different properties and talked about what they did to be successful in the game.

(Laughter.) And they became much less adaptable to all the different characteristics of the situation that randomly brought them to such a privileged position in the first place. Including coin tossing.

This is a really, really incredible insight into how the mind perceives superiority.

Now, this Monopoly game can be used as a metaphor for understanding society and its hierarchical structure. In society, some people have a lot of wealth and status, others don't. They are of far less wealth and status, and have far less access to precious resources.

Over the past seven years, my colleagues and I have been working to study the effects of this kind of hierarchy.

What we have found from dozens of studies and thousands of participants across the country is that as a person's level of wealth increases, feelings of compassion and empathy decline, and feelings of entitlement and worthiness, and ideologies of self-interest increase.

Research has found that people who are actually wealthier consider greed to be good and moral, and the pursuit of self-interest to be virtuous and moral.

Well, what I want to do today is talk about some of the consequences of this ideological selfishness, why we should care about those consequences, and finally end by saying what we can do.

Some of the first research we did in this area focused on helping behaviors, which social psychologists call “prosocial behaviors.”

And we were very interested in whether the rich or the poor were more likely to offer help to others.

In one study, we bring the rich and poor of our community into the lab and give each of them $10 worth of money.

We told participants that they could keep the $10 for themselves or share some of it with completely anonymous strangers if they wanted.

They never meet the stranger. Strangers never meet them.

And we just monitor how much people donate.

Individuals earning less than $25,000 and in some cases $15,000 a year donated 44 percent more money to strangers than individuals earning $150,000 and $200,000 a year.

We had people play the game to see who was more or less likely to cheat to increase their chances of winning.

One game actually modified the computer to make it impossible to roll the dice beyond a certain score. I couldn't get over 12 in this game, but still...

The more wealthy you are, the more likely you are to cheat in this game and win credits towards the $50 prize (3-4x in some cases).

We did another study to see if people would want to take candy from candy jars that were clearly marked as being for children only -- (Laughter) I'm not kidding -- I know it sounds like a joke.

We made it clear to the participants, "This candy is for children attending a nearby developmental lab.

they are studying this is for them. ”

And we just monitored how much candy the participants consumed.

Participants who felt wealthy ate twice as much candy as those who felt poor.

We also studied cars.

Whether drivers of different types of cars, not just all cars, tend to break the law to a greater or lesser extent.

One of these studies examined whether drivers stopped pedestrians trying to cross at a crosswalk.

Now in California, as we all know, it's law to stop for pedestrians waiting to cross.

Here's an example of how we did it.

It's our Confederates leaving the left side and pretending to be walkers.

When the red truck came to a safe stop, he approached.

In typical California fashion, a bus overtakes us and nearly runs over our pedestrian.

(Laughter) Here's an example of a more expensive car, the Prius, running and BMW doing the same thing.

So we did this with hundreds of vehicles over several days to track who stopped and who didn't.

What we have found is that as car prices rise...

(Laughter) Drivers' tendency to break the law has also increased.

None of the cars in our cheapest car category broke the law.

Nearly 50% of vehicles in our most expensive vehicle category were in violation of the law.

In another study, we also found that wealthier people were more likely to lie when negotiating and to support unethical behavior in the workplace, such as stealing cash from cash registers, accepting bribes, and lying to customers.

Now, I'm not saying that it's only wealthy people who exhibit this pattern of behavior.

Not at all. In fact, I think we all struggle with these competing motivations every day, minute by minute, when to put our own interests above those of others, or which.

Of course it is. Because the American Dream is the idea that everyone has an equal chance to succeed and prosper, as long as they push themselves and work hard.

And part of that means that sometimes we need to put our own interests ahead of the interests and well-being of those around us.

But what we've found is that the wealthier you are, the more likely you are to pursue your vision of personal success, fulfillment, and achievement at the detriment of those around you.

Here we've plotted the median household income received by the 5 percent of the population and the top 5 percent of the population over the last 20 years.

In 1993, the differences between the different quintiles of the population in terms of income were pretty stark.

It's not hard to recognize that there are differences.

But over the last 20 years, that gulf has become a sort of Grand Canyon between those at the top and those who aren't.

In fact, the top 20 percent of the population own nearly 90 percent of the country's total wealth.

We are stuck in an unprecedented level of economic inequality.

What that means is that not only is wealth increasingly concentrated in the hands of a few individuals, but the American Dream is becoming less and less achievable for the greater majority of us.

And if, as we have discovered, the richer you are, the more likely you are to feel entitlement to that wealth, to put your own interests above those of others, and to be more likely to do things in your own interest, then there is no reason to think that such patterns will change.

In fact, there is good reason to think that things will only get worse, and that will be the case over the next 20 years if things continue at the same, same linear rate.

Inequality, or economic inequality, is a concern for all of us today, not just for those at the bottom of the social hierarchy, but because it is even worse for individuals and groups with high economic inequality...

Everyone, not just those at the bottom.

Leading research institutes around the world have produced a plethora of compelling research that reveals that as economic inequality worsens, so does the loss.

Social mobility, what we truly value, physical health, and social trust all decline as inequality grows.

Similarly, as economic inequality increases, negative problems in social groups and societies such as obesity, violence, imprisonment and punishment are exacerbated.

Again, these are consequences that affect all segments of society, not just the few.

Even high-ranking people experience results like this.

What should I do?

This self-perpetuating, harmful cascade of adverse effects may seem like something that has gotten out of control, but there is nothing we can do about it, certainly nothing we can do as individuals.

But in fact, in our own laboratory studies, we have found that small psychological interventions, small changes in people's values, small pushes in specific directions can restore levels of egalitarianism and empathy.

For example, reminding people of the benefits of cooperation and the benefits of community makes the rich just as egalitarian as the poor.

In one study, people were asked to watch a short 46-second video about childhood poverty to remind them of the needs of those around them.

And after watching that, we looked at how willing people were to give their time to a distressed stranger who appeared in front of them in the lab.

After watching this video, an hour later, the wealthy were just as generous with their time to help strangers as the poor were. This suggests that these differences are neither innate nor categorical, but rather flexible to the slightest shift in people's values, or just a little empathy or empathy.

Beyond the walls of our laboratory, we are beginning to see signs of change in society as well.

Bill Gates, one of our nation's richest men, said in his commencement speech at Harvard University that the problem of inequality facing society is the most difficult challenge and what must be done to combat it.

And then there's the Giving Pledge, where over 100 of our country's richest individuals have pledged half their fortunes to charity.

And dozens of grassroots movements like "We are the One Percent," "Resource Generation," and "Wealth for the Common Good" are on the rise. There, the most privileged of the population, the One Percent and the rest, the wealthy, adults and young alike use their economic resources – which is most impressive to me – to use their privileges and their economic resources to fight inequality by advocating social policies, changes in social values, changes in people's consciousness. An act against their own financial interests, but one that may ultimately restore the American dream.

thank you.

(applause)

Hello TEDWomen, how's it going?

(cheers) Not enough.

Hello TEDWomen, what's up?

(Loud cheers) My name is Maysoon Zayed, I'm not drunk, but the doctor who gave birth to me was.

He cut my mom six times in six different directions, choking poor me in the process.

As a result, I have cerebral palsy and am constantly shaking.

look.

I'm tired.

I'm like Shakira, Shakira meets Muhammad Ali.

(Laughter) CP is not genetic.

It's not a birth defect. You can't catch it.

No one put a curse on my mother's womb. My parents are cousins, so I didn't know that.

(Laughter) It only happens by chance, like what happened on my birthday.

Now, I must warn you, I am not an inspirational person.

(Laughter) And I don't want people in this room to feel bad for me. Because at some point in your life you dreamed of being disabled.

Take a trip with me.

It's Christmas Eve, you're in a mall, driving around looking for a parking spot, and what do you see?

There are 16 empty disabled spaces.

(Laughter.) And you say, "God, can't you just be a little handicapped?"

(Laughter) And let me tell you, I have 99 problems, and paralysis is just one of them.

(Laughter) If there were a tyrannical Olympics, I would win a gold medal.

I am Palestinian, Muslim, female, disabled and live in New Jersey.

(Laughter.) (Applause.) If you don't feel good about yourself, maybe you should.

(Laughter) Cliffside Park, New Jersey, is my hometown.

I have always liked the fact that my hood and my affliction share the same initials.

I also like the fact that I can walk from my house to New York if I want to.

Many people with CP can't walk, but my parents didn't believe that they couldn't walk.

My father's watchword was "You can do it, yes, you can do it."

(Laughter) So when my three sisters were mopping, I was mopping too.

If my three older sisters went to public school, my parents would sue the school system to ensure I attended, and if we all didn't get A's, we would all get my mom's slippers.

(Laughter) When I was five years old, my father taught me how to walk. I just put my heels on my father's feet and walked.

Another tactic he used was to hang a dollar bill in front of me and have me chase it.

(Laughs) My inner stripper was so strong.

(Laughter) Right.

No, by the first day of kindergarten, I was walking like a beaten champ over and over again.

(Laughter) When I was a kid, there were only six Arabs in my town, and they were all my family.

(Laughter) Now there are 20 Arabs in town and they are still my family.

(Laughter) I don't think anyone realizes that we're not Italian.

(Laughter) (Applause) This was before 9/11, before politicians thought it appropriate to use "I hate Muslims" as an election slogan.

The people I grew up with had no problem with my faith.

But they seemed very worried that I would starve to death during Ramadan.

I explain to them that I have enough fat to live for a full three months, so fasting from sunrise to sunset is a no-brainer.

(laughs) I've tap danced on Broadway.

Yes, on Broadway. it's crazy.

(Applause.) My parents couldn't afford physical therapy, so they sent me to dance school.

I learned how to dance in heels. This means that you can walk in heels.

I'm from Jersey and I care so much about being chic, so if my friends wore heels, so did I.

And when my friends went to the Jersey Shore to spend their summer vacation, I didn't.

I spent the summer in a conflict zone. My parents were afraid that if we didn't return to Palestine every summer, we would grow up to be Madonnas.

(Laughs) During the summer vacation, my father often healed me.

(Laughter.) But one of the miracle cures we found was yoga.

It's so boring, but before I started yoga, I was a stand-up comedian who couldn't stand.

And now I can do a handstand.

My parents reinforced the idea that I could do anything, that no dream was impossible, and my dream was to appear in the daytime soap opera General Hospital.

(Laughter) I went to college during Affirmative Action and filled all my quotas, so I won an amazing scholarship to Arizona State University ASU.

(Laughter) I was like the drama club's pet lemur.

everyone loved me

I did all the less intelligent kids' homework and got all A's in my class and all of their class.

(Laughter.) Every time we did a scene from The Glass Menagerie, the professors were crying.

But I was never cast.

Finally, in my senior year, ASU decided to do a show called "They Dance Real Throw at Jackson."

It is a play of a girl with CP.

I was a girl with CP.

So I started screaming from the roof, "I finally got the part!"

I have cerebral palsy!

Free at last! Free at last!

Thank God Almighty, I am finally free! ”

I didn't get the role.

(Laughter) Shelly Brown got the part.

I went to the head of the theater department, crying hysterically, as if someone had shot a domestic cat, and asked why. She said it was because people didn't think I could do stunts.

"Sorry, if I can't do the stunts, neither can the character," I said.

(Laughter) (Applause) This is a role I was literally born to play, and they gave the role to an actress who is not paralyzed.

College imitated life.

Hollywood has a despicable history of casting able-bodied actors in disabled roles on screen.

After graduating, I moved back home and my first acting job was as an extra on a soap opera.

My dream was coming true.

And I knew I would soon be promoted from Diner to Wacky Best Friend.

(Laughter.) But instead, I remained a glorified piece of furniture that I could only recognize in the back of my head, and it became clear that casting directors wouldn't hire fluffy, ethnically handicapped actors.

They only hire perfect people.

But there were also exceptions to this rule.

I grew up watching Whoopi Goldberg, Roseanne Barr, and Ellen, and these women had something in common. It's about being a comedian.

So it became a cartoon.

(Laughter) (Applause) My first job was driving a famous cartoonist from New York City to a show in New Jersey. I will never forget the look on his face when I realized the first cartoonist I drove was speeding down a New Jersey turnpike with a CP driving chick on board.

(Laughter) I've performed in clubs all over the US and in the Middle East in Arabic, uncensored and unexposed.

(Laughter) Some say I'm the first stand-up comic in the Arab world.

I never like to be the first to argue, but I know they never heard the offensive little rumors that women are not funny and that we find them hysterical.

(laughter) In 2003, my brother from another mother and father, Dean Obeidala, and I launched the New York Arab American Comedy Festival, which is now in its 10th year.

Our goal was to change the negative image of Arab Americans in the media while also reminding casting directors that South Asian and Arab are not synonymous.

(Laughter) Mainstreaming Arabs was much easier than overcoming the challenge of disability bias.

2010 was a turning point for me.

Invited as a guest on the cable news program "Countdown with Keith Olbermann".

When I walked in dressed like I was going to prom, they dragged me into the studio and sat me in a spinning chair.

(Laughter) So I looked at the stage manager and said, "Excuse me, can I have another chair?"

And she looked at me and said "5, 4, 3, 2...".

And it was live, right?

So I had to hold on to Anker's desk so he wouldn't roll off the screen during the corner, but when the interview ended, I was furious.

I finally got the chance and I let it go, but I knew I would never be asked out again.

But Mr. Olbermann not only invited me back, but made me a full-time contributor and taped me to my chair.

(Laughter) (Applause) One of the fun facts I learned while on the air with Keith Olbermann is that people on the internet suck.

(Laughter) People often say that children are cruel, but I was never teased by either a child or an adult.

Suddenly my disability on the World Wide Web is justified.

I watched clips online and saw comments like, "Oh, why is she tweaking it?"

"Oh, is she retarded?"

And my favorite is "Poor Gumbymouth terrorist.

what is she suffering from?

We should really pray for her. ”

One commenter suggested adding screenwriter, comedian, paralysis, and other disabilities to my credit.

Disability is as visual as race.

If a wheelchair user can't play Beyoncé, then Beyoncé can't play a wheelchair user either.

People with disabilities are the most common — yes, let's give it a round of applause. come.

(Applause.) People with disabilities are the largest minority in the world, but we are the most underrepresented in entertainment.

The doctor said I can't walk, but I'm in front of you.

But if I grew up with social media, I don't think so.

Together we hope to create a more positive image of disability in the media and in everyday life.

Perhaps more positive images would encourage less hate on the Internet.

or maybe not.

Perhaps we still need a village to properly educate our children.

My winding journey has taken me to some amazing places.

I ended up walking the red carpet surrounded by soap diva Susan Lucci and the iconic Loreen Arbus.

I got to be in a movie with Adam Sandler and work with my idol, the amazing Dave Matthews.

I toured the world headlining Arabs Gone Wild.

I was a delegate representing great New Jersey at the 2008 DNC.

And I founded Maysoon's Kids, a charity that wants to give Palestinian refugee children a little of the chance their parents gave me.

But the most memorable moment was when I got to perform for Muhammad Ali, a man who flew like a butterfly, stung like a bee, had Parkinson's, and trembled just like me.

(Applause) (End of applause) This was the only time my father saw me perform live. I dedicate this story to my father's memory.

(Arabic) May Allah bless you.

(English) My name is Maysoon Zayed. If I can do it, you can do it too.

(Cheers) (Applause)

I don't know about you, but I don't understand exactly what technology means in my life.

This past year, I've been thinking about what it really should be.

Should I be a tech pro? Should I hold hands full?

Should I be on guard? Like you, I'm very interested in the latest.

On the other hand, a few years ago, I gave up everything I owned, sold all my technology except my bike, and rode 3,000 miles on the back roads of the United States with just one body, fueled primarily by Twinkies and junk food.

(Laughter) Since then, I've tried in many ways to keep technology close to me so that it doesn't permeate my life.

At the same time, I run a website about cool tools and keep up to date with the latest in technology.

So I'm still baffled as to what technology really means when it concerns humanity, nature, and the spiritual.

And we don't even know what technology is.

And one of the definitions of technology is the first to be recorded.

This is the first example of modern use of technology that I have found.

This was the syllabus proposed in 1829 at Cambridge University for dealing with the applied arts and sciences.

Prior to that, the technology apparently did not exist. But apparently it did.

I love one of Alan Kay's definitions of technology.

He says technology was invented after humans were born.

(Laughter) This sums up a lot of what we're talking about.

Danny Hillis actually has an update on that - he says technology is something that isn't quite working yet.

(Laughter) I think that's a little bit of our current idea as well.

But I was interested in another definition of technology.

Something that once again went back to something more fundamental.

There was something deeper. After struggling to figure it out, I came up with a way of framing questions that might help with research.

And I'm going to talk about this for the first time this morning.

So this is a very crude attempt at thinking out loud.

The question that came to my mind was what does the technology want? It's not about whether you want chocolate or vanilla. What do you want, what are its inherent tendencies and prejudices?

What are the trends over time? One way to think about this is to think of biological organisms that we often hear about.

And the trick that Richard Dawkins did is to look at them as simply as genes, vehicles for genes.

So he's saying, "What does the gene want?" selfish gene.

And I would say, applying a similar trick, what if we looked at our cultural universe through the eyes of technology? What does technology want?

Clearly, this is an imperfect question, just as viewing organisms as genes alone is an imperfect view.

But still very productive. So what I'm saying is, if you take the tech worldview, what does the tech want?

And having asked that question, I think, in fact, we have to go back to life. Because obviously I think if you keep going far back in time to the origins of the technology, it will come back at some point.

So I would like to begin a small quest in life.

And, as we heard from the previous speaker, we don't really know what kind of life exists on Earth right now.

I really don't understand.

Craig Venter's incredible attempt to sequence the DNA of objects in the ocean is amazing.

All of Brian Farrell's research is part of this plan to actually discover all the species on Earth.

One of the things we have to do is create a grid of the Earth and randomly survey all the places where that grid intersects to see what happens to life. And if we do that with a small Mars rover that we've never been to on Earth, we're going to be able to see some incredible species.

This is not another planet. These are the things that are hidden on our planet.

This is an ant that stores mate honey in its abdomen.

Each of these creatures we've described are these awesome things from Jamie and the others, but what they're doing is each hacking the rules of life.

I can't think of a general rule of biology that doesn't have exceptions from some organism.

All things we can think of, and once you've heard Olivia's story about her sexual habits, you'll realize that nothing can be said to apply to all life. Because all those creatures are hacking something about it.

This is a sea slug that runs on sunlight. This is a sea slug that has incorporated chloroplasts inside to drive energy.

This is another version of that. This is a sea dragon, and the blue one at the bottom is a juvenile that has not swallowed acid yet, and has not been given energy by taking in the brown algae pond dregs inside its body.

These are hacks, and looking at the general forms of approaches to hacking life, the current consensus is six kingdoms. Six different broad approaches: plants, animals, fungi, protests, small things, bacteria, archaea. Archaea.

These are general approaches to life. That is one way of looking at life on Earth today.

But a more interesting way, a current way of having a long-term perspective, is to look at it from an evolutionary perspective.

And here we have an evolutionary perspective where evolution emerges from the center rather than progressing beyond linear time.

In the middle is the most primitive, this is the genealogy of all life on Earth. These are all the same six kingdoms.

See where we are at with 4,000 representative species.

But what I like about it is that it shows that all life on Earth today is evolving equally.

These fungi and bacteria are as highly evolved as humans.

They've been around just as long and have gone through similar trials and errors to get here.

But it turns out that each of these are actually hacks and have different ways of finding a way to live life.

And given the long-term trends of life, what would evolution want?

One thing that can be said about evolution is that there is no place on Earth where life has not been discovered.

There is life at the bottom of long-distance drilling cores to the heart of the rocks we dig, and bacteria in the pores of that rock.

And life never retreats anywhere. It is ubiquitous and we want to increase it further.

More and more inert matter on Earth is being touched and animated by life.

Second, we value diversity. We also see specialization.

We see a transition from generic cells to more specific and specialized cells.

And we see a trend towards complexity that is very intuitive.

And indeed, we have current data that show that it is indeed becoming more complex over time.

And finally take this sea slug home.

One of the things we see about life is that it becomes more sociable from within. And that means there are more and more lives in which the whole environment is other life.

Like their chloroplast cells, they are completely surrounded by other life.

They never touch on internal matters. Co-evolution continues.

Five common long-term evolutionary trends are ubiquity, diversity, specialization, complexity, and socialization. Well, I took it and said, "What are the long-term trends in technology?"

Again, my question is, what does technology want?

And surprisingly, I noticed that there is also a tendency towards specialization.

It turns out that there are common hammers, and hammers become more and more special over time.

There is obviously diversity. A huge number.

This is what Japanese families are all about.

In fact, I have a daughter and I gave her a tally counter and gave her the challenge last summer to go around the house and count the types of technology.

6,000 different products were born.

Upon investigation, it seems that there were only about 7,000 items in the house of King Henry VIII of England.

And he was King of England, and that was all England's wealth at the time.

That is, we see a huge variety of types of things.

It's a scene from Star Wars where 3PO comes out and watches the machines build machines. How depraved!

Well, this is actually what we're aiming for: the machine of the world.

And that technology is just thrown away by other technologies.

Most machines only come into contact with other technologies, not non-technologies or even life.

And thirdly, the idea that machines are becoming biological and complex is now clichéd. And the good news is that I was partly to blame for the cliché that machines are becoming biological, and it's very clear.

So the main trends in technological evolution are actually the same as in biological evolution. The same drives us towards ubiquity, diversity, socialization and complexity. This may not come as much of a surprise. Because if you plot the evolution of armor, for example, you can actually follow a branching tree of some kind of evolution type.

In fact, I consider technology to be the seventh kingdom of life.

It can be thought of as the Seventh Kingdom because its operations and mechanics are so similar.

And it will come out of the animal kingdom and be nearly there. Do it and you'll see that you can actually approach technology this way.

Niles Eldridge. He was a co-developer of the punctuated equilibrium theory with Stephen Jay Gould.

However, he collects cornets as a side job.

His collection is one of the largest in the world, with approximately 500 items.

He then treated them as if they were trilobites, or snails, and determined to use morphological analysis to derive their long-term genealogical history.

This is his chart, which is not yet fully published.

But the most interesting thing about this is that if you look at the red line at the bottom, it basically shows the lineage of a type of cornet that is no longer made. That doesn't happen in biology.

When something goes extinct, you can't have it as a parent.

But with technology it happens. And it turns out to be so distinctive that you can actually see this tree and you can actually use it to determine if this is a technical system or a biological system.

In fact, the idea of ​​reviving this whole idea is so important that I started thinking about what would happen with old technology.

And in fact, it turns out that technology never dies.

So I suggested this to a historian of science, and he said, 'So what about steam cars?

They are gone. ’ Well, actually, they are.

In fact, it's close enough to buy new parts for a Stanley steam car.

This is the website of a person who sells new parts for Stanley automobiles. And I love the one-click add-to-cart button to buy the steam valve (lol). I mean, it was just—it was really there.

So I started thinking that maybe it was just a random sample.

I think maybe this kind of thing should be done in a more conservative way.

So I picked up a very large 1895 Montgomery Ward catalog and randomly looked through it. And I took one page -- not quite a random page -- and took a page that was actually harder than the others. Because many pages are still filled with work in progress. But I looked at this page and said, how many of these things are still being made?

And not antiques. I would like to know how many of these are still in production.

The answer is "all of them".

They are all still in production today. So there are people who shell corn.

I don't know who needs a corn sheller.

Even a corn sheller has a plow. I have a fan mill. All these things, again, are not antiques. These are -- you can order these. Go to the web and buy it brand new now. So, in a way, technology never dies.

In fact, for $50 you can buy a Stone Age knife made exactly the same way it was made 10,000 years ago.

Short, bone handle, $50. And really, the point is that this information never really disappeared.

Not just resurrected. It's been going on for a long time.

And in Papua New Guinea, stone axes were made as a business until 20 years ago.

Trying to retire the technology is actually very difficult.

We've all heard stories of the Amish giving up their cars.

I've heard stories of Japanese people abandoning their guns.

I listen to this and that. But I actually went back and tried to find and look at historical instances where there was a ban on technology and when it was revived. because they always come back. And we found that the length of time they were outlawed and banned, or the duration, decreased over time. Basically, you can slow technology down, but you can't kill it. This is a given. Because culture is, in a sense, a collection of ideas.

That's what it is for. This is to keep the ideas from running out.

And when you understand it, and you add this idea of ​​what culture is doing to the long-term trajectory, which is also in the evolution of life, you see that each case, each of the major transitions in life, is actually accelerating what's going on, changing the way evolution happens.

In fact, the way ideas are generated is changing.

So all these stages in evolution are basically increasing the evolutionary potential.

What's happening in life over time is that there are more and more ways to come up with new ideas and new hacks. And the real trick is how to explore how to explore.

And what we see in the singularity predicted by Kurzweil and others is his idea that technology is accelerating evolution.

The way we search for ideas is accelerating.

So if you have lifehacking (life means hacking, survival game) evolution is a way to extend the game by changing the rules of the game.

And the essence of technology is how to evolve for the better.

That is the "Infinite Game".

That's the definition of an "infinite game". Finite games are played to win, infinite games are played to keep playing.

And I believe technology is actually a cosmic force.

Technology didn't originate in 1829, it was actually the beginning of the Big Bang, a moment in which the universe's entire vast billions of stars were compressed. The whole universe was compressed into tiny quantum dots, so tightly packed inside that there was no room for difference.

That's the definition. There was no temperature.

It made no difference. And in the Big Bang it was the possibility of difference that magnified.

So as it expands and things expand, what we have is difference, diversity, options, choices, opportunities, possibilities, possibilities of freedom.

They are all basically the same thing.

And those are the things that technology gives us.

That's what technology gives us: choice, possibility and freedom.

That's it. This opens the door to making a difference.

So hammer, when we grab a hammer, that's what we grab.

That's why we keep getting technology. Because that's what we want. those are good things.

Difference, freedom, choice, possibility.

And every time we create new opportunities, we are allowing the platform to create new opportunities.

And I think that's really important. Because if we can imagine Mozart before the invention of piano technology, what a loss to society.

Imagine Van Gogh was born before the technology of cheap oil paints.

Imagine Hitchcock before cinema technology.

Somewhere today millions of young children are born whose art of self-expression has not yet been invented.

We have a moral obligation to invent technology so that every person on the planet has the potential to understand their true differences.

We want a trillion species of one individual.

That's what technology really wants.

Since there is no answer as to why deforestation occurs, I will omit some counterarguments.

As for the fact that there seems to be bad technology, I have no answer. As to how this affects our dignity, I have no answer, but I can only suggest that perhaps the Seventh Kingdom is so close to the essence of life that we can take it back and use it to monitor life.

Perhaps, in a way, what we're trying to do with technology is find a home for it.

Spraying cotton fields with DDT is terrible, but using it to end millions of malaria deaths in small villages is really good.

Our humanity is actually defined by technology.

Everything we think is really good about humanity is powered by technology. This is an endless game.

that's what we're talking about.

As you know, technology is a vehicle for evolving evolution.

It's a way to explore possibilities and opportunities and create more.

And that's how you actually play games, and that's how you play all games.

That's what technology wants.

So when you think about what technology wants, I think it has a lot to do with the fact that everyone here, and I really believe so, everyone here has a mission. And your mission is to spend your life discovering what your mission is.

Its recursive nature makes it an infinite game.

And if you play well, you'll get others involved, so even that game will be extended and continue without you.

That's the infinite game. And technology is the medium through which we play that endless game.

That's why I think we should embrace technology. Because technology is an integral part of our journey to discovering who we are.

thank you.

(applause)

I live and work in Tokyo, Japan.

And I specialize in human behavior research, applying what I've learned to thinking about the future in different ways and designing for that future.

To be honest, I've been in this business for seven years and have no idea what the future holds.

But I know very well how people behave when they get there.

This is my office. it's there.

It's not in labs and is increasingly found in places like India, China, Brazil and Africa.

We live on a planet of 6.3 billion people.

By the end of this year, about 3 billion people will have mobile connectivity.

And after that it will take about 2 more years to connect the next billion.

I mention this because if you want to design for that future, you need to understand what those people are thinking.

And that's sort of where I figure out what my job is and what our team's job is.

Our research often starts with a very simple question.

Let's take an example. what are you carrying?

If you think about all the things you own in your life, what do you expect to take with you when you walk out that door?

What do you think of when you look around?

What do you carry around with you?

And what do you actually use in it?

This is interesting for us. Because conscious and subconscious decision-making processes imply that whatever you actually carry around and end up using has some sort of mental, emotional, or functional value.

And, to be really frank, people are willing to pay for things of value, right?

So I've spent probably five years researching what people carry around.

Get inside someone's bag. I check people's pockets and purses.

i go to their house We do this all over the world, we have video cameras tracking us all over the city.

It's like being stalked with permission.

And we're doing all this -- and back to the first question, what are people carrying?

And it turns out that people carry a lot of things.

OK, that's fair enough.

But across cultures, genders, and contexts, when asked what the most important things they carry with them, most people would answer keys, money, and, if they have, a mobile phone.

I'm not saying this is a good thing, but this is a problem, right?

I mean, I couldn't take your phone off even if I wanted to.

Perhaps you will kick me out or do something.

For those of you who work for a mobile phone company, this may seem like a no-brainer.

But really, why is the problem? right?

So why are these things so important in our lives?

And our research has shown that it boils down to survival—survival for us, and survival for our loved ones.

So, in the United States, keys increasingly provide access to housing, warmth, and even transportation.

Money is useful for buying food and groceries, and for all sorts of other uses.

And mobile phones have turned out to be excellent recovery tools.

If you prefer this kind of Maslow hierarchy of needs, these three objects are very good at supporting the lowest levels of Maslow's hierarchy of needs.

Yes, they do a lot of other things, but they are very good at this.

And in particular, it is the mobile phone's ability to enable people to travel through space and time.

So you can transcend space just by making a voice call, right?

You can also transcend time by sending messages when it's convenient for you and others to receive them when it's convenient for them.

And it turns out that this is pretty universally appreciated, which is why we have over 3 billion people connected.

And they value that connection.

But you can actually do this on your PC as well.

You can also do them through phone kiosks.

In addition, since mobile phones are personal, they also provide some degree of privacy, which is convenient.

You don't need to get permission from anyone, you can go ahead and do it, right?

However, our survival depends on whether they are brought to us.

But this is a pretty big deal, and we forget about it.

We are humans and that's what we do. It's one of our characteristics.

I think it's a pretty good feature.

So we forget that we are also adaptable and adapt well to our surroundings.

So there are strategies to keep in mind, one of which was mentioned yesterday.

And that, quite simply, is a point of reflection.

And that's the moment you step out of space and turn around, frequently tapping your pocket.

Even women who have stuff in their bags pat their pockets.

And I turn around and look around the space, and some people are talking loudly.

And almost everyone experiences it at some point.

OK, next, most people have a stable home life, but what I mean is they're not traveling all the time, they're always in hotels, but most people have a so-called center of gravity.

And the center of gravity is where we hold these objects.

And these things don't stay in the center of gravity, but are drawn there over time.

That's where you expect to find something.

And really, when you turn around and look inside your house and you're looking for this, this is the first place you look, right?

Well, when doing this research, we discovered an absolutely, 100% guaranteed way to never forget anything.

It is, very simply, that you don't remember anything.

(Laughter) Well, that sounds like something you'd find in a Chinese fortune cookie, right?

But really, this is about the art of delegation.

From a design perspective, it's important to understand what you can delegate to technology and what you can delegate to others.

And I've found that delegation can solve just about anything, if you want to, except for bodily functions like going to the bathroom.

You cannot ask someone else to do it for you.

And aside from entertainment and such, you won't pay someone to go to the cinema for you and enjoy it for you, or at least not yet.

Maybe in the future.

Now let's look at an example of delegation in action.

This is probably what I am most passionate about, the research we do on illiteracy and how illiterate people communicate.

So the United Nations estimates that there are about 800 million people in the world who are illiterate, and this is a figure for 2004.

So we have done a lot of research.

One of the things we were looking at is that if you are illiterate or want to communicate over a distance, you need to be able to identify who you want to communicate with.

It can also be a phone number, email address, or zip code.

Simple question: how do you manage your contact information if you are illiterate?

And in fact millions of people do it.

From a design standpoint, I wasn't quite sure how they did it. So this is just one example of the research we were doing.

And illiterate people turned out to be masters of delegation.

So they delegate that part of the task process—the part they can't do themselves—to someone else.

Let me give you another example of delegation.

This one is a little more sophisticated and comes from a study I did in Uganda about how people who share devices use those devices.

Sente is the Ugandan word for money.

This has a second meaning, which is sending money as airtime. OK?

And it works like this:

For example, in June you are in a rural village.

I am in Kampala and am a salary earner.

I am sending money back and it works like this.

So there is one person in your village who has a phone and that is the phone kiosk operator.

And they very likely have a very simple cell phone as a phone kiosk.

So what I do is buy a prepaid card like this.

Then, instead of using that money to top up your phone, call your local village operator.

And I read the number out to them and they used it to charge the phone.

So they are replenishing value from Kampala and now also in villages.

You get a 10 or 20 percent commission, then the kiosk operator takes a 10 or 20 percent commission and gives you the rest in cash.

Yes, there are two things I like about this.

The first is that anyone who has access to a mobile phone, or who has one, is essentially an ATM machine.

We provide rudimentary banking services to locations without banking infrastructure.

And even if they have access to banking infrastructure, they are not necessarily wealthy enough to have a bank account, so they are not necessarily considered a loyal customer.

There are two things I like about this.

That is, I know that despite all the resources at my disposal, and all sorts of apparent sophistication of ours, I could never have designed something so elegant and in perfect harmony with the local context. OK?

And yes, there are things like Grameen Bank and micro-loans.

But the difference between this and that is that there is no central authority trying to control this.

This is truly street-up innovation.

So it turns out the streets are a never-ending source of inspiration for us.

And if you break any of these here, please return them to the carrier.

will give you something new.

Maybe we can make 3 new ones?

That means buy 3 get 1 free. Such that.

When I walk in the streets of India and China, I see something like this.

And this is where broken things are picked up, repaired, and put back into circulation.

This is from a workbench in Jilin, China, where people can be seen putting the phone down and putting it back in.

They reverse engineer the manual.

This is a kind of hacker manual, written in Chinese and English.

They also write in Hindi.

You can subscribe to these.

Some training institutes have large pools of people to solve these problems.

But what I love about this is that it boils down to a small flat surface, a screwdriver, a toothbrush to clean the contact heads (as contact heads often have dust on them), and someone on the street with the knowledge.

And it's all about the social network of knowledge flying around.

I love this because it challenges the way we design, build, and potentially distribute things.

It challenges the norm.

OK, the street raises so many different questions for me.

This is Viagra that I bought at an underground sex shop in China.

And China is a country with a lot of counterfeits.

And I know you're asking - have I tested it?

I'm not going to answer that, okay.

But I look at stuff like this and think about the implications of trust and peace of mind in the buying process.

Seeing this, we think. For example, how does this lesson apply to online services and the design of future services in these markets?

These are pants from Tibet -- (laughter) --.

And seeing something like this, let's be honest, why would anyone design pants with pockets?

Seeing things like this begs the question, if we took all the features of this thing and redistributed them around our bodies in some sort of personal area network, how should we prioritize where we put things?

Admittedly, this is very trivial, but in fact the lessons here can be applied to such personal area networks.

Here you can see some phone numbers written on top of a hut in rural Uganda.

There is no house number here. It has a phone number.

So what does it mean for people's identities to be mobile?

If an additional 3 billion identities are mobile, isn't it fixed?

Your concept of identity, OK, is already outdated for an additional 3 billion people.

This is how I shift.

And then we go to this photo. Here is the photo I started with.

And this is from Delhi.

This is from a study we did of an illiterate man in a coffee shop.

You can see chai being poured in the back.

And he's an incredibly poor coffee shop worker at the bottom of society.

And he somehow understands Livestrong's values.

And it's not necessarily the same values, but with a certain kind of Livestrong values, actually going to buy and actually exhibiting.

For me, this kind of work embodies this connected world where everything is intertwined and the dots are connected.

OK, the title of this presentation is "Connections and Consequences." This is really kind of a summary of five years of trying to figure out what it would be like if everyone on Earth had the ability to transcend time and space in a personal and convenient way, right?

when everyone is connected.

And there are four things.

First and foremost is the immediacy of the idea, the speed with which it spreads.

I know TED is about big ideas, but the reality is that the benchmarks for big ideas are changing.

If you want big ideas, you have to embrace everyone on the planet, that's the first thing.

The second is object immediacy.

What this means is that as they get smaller and the functions accessible through them grow, these functions, such as banking and identity, simply move around the world very rapidly.

And as the world's population grows to 6.3 billion people, things will spread faster than we can imagine.

The next important thing is that no matter how we design this product, no matter how carefully we design it, as long as it meets our basic needs, the streets will embrace it and find ways to innovate. For example, the ability to transcend time and space.

And it will innovate in ways we can't foresee.

They can do it better than we can, despite our resources.

That's how I feel.

And if we're smart, we'll look at what's happening right now and find ways to let it inform and infuse both what we design and how we design.

And the last is actually the direction of the conversation.

With 3 billion more people connected, they want to be part of the conversation.

And I think our relevance, and TED's relevance, is essentially in learning how to embrace it and listen to it.

And we have to learn how to listen.

Thank you very much.

(applause)

Three and a half years ago, I made one of the best decisions of my life.

As a New Year's resolution, I stopped dieting, stopped worrying about my weight, and learned to eat mindfully.

Now I eat whenever I'm hungry and I've lost 10 pounds.

This is me when I was 13 when I first started dieting.

Looking at the picture now, I think I didn't need a diet, I needed fashion consulting.

(Laughs) But when I thought I had to lose weight and I put it back on, of course I blamed myself.

Over the next 30 years, I went on different diets.

No matter what I tried, the weight I lost always came back.

I'm sure many of you know that feeling.

As a neuroscientist, I wondered why this was so difficult.

Obviously, your weight depends on how much you eat and how much energy you expend.

What most people don't realize is that hunger and energy expenditure are controlled by the brain, almost unconsciously.

Your brain does a lot of work behind the scenes, and that's a good thing. Because how should you express your consciousness politely? --I'm easily distracted.

It's good that you don't have to be conscious of your breathing when you're immersed in a movie.

Don't forget how to walk because you're thinking about what to have for dinner.

Regardless of what you consciously believe, your brain also has its own sense of what to measure.

This is called the set point, but it's a misleading term as it actually ranges from about 10 to 15 pounds.

You can use your lifestyle choices to gain or lose weight within that range, but staying outside of it is much more difficult.

The hypothalamus, the part of the brain that regulates weight, has a dozen chemical signals that tell the body to put on weight, and a dozen more that tell the body to lose weight. The system works like a thermostat, responding to signals from your body by regulating hunger, activity and metabolism to keep your weight stable as conditions change.

That's what the thermostat does, right?

Maintains the same temperature inside your home even when the weather outside changes.

You can try to change the temperature in your house by opening the windows in the winter, but it won't change the thermostat setting. The thermostat will operate the furnace accordingly to heat the room.

The brain works in exactly the same way, using powerful tools to react to weight loss and bring the body back to what seems to be normal.

When you lose a lot of weight, your brain reacts like it's starving. Whether you're fat or thin to begin with, your brain reacts exactly the same.

As much as we'd like to think our brains can tell if we need to lose weight, it doesn't.

When you lose a lot of weight, you become hungry and your muscles use less energy.

Dr. Rudy Liebel of Columbia University found that people who lost 10 percent of their body weight burned 250 to 400 fewer calories because their metabolism was slowed.

That's a lot of food.

This means that a successful dieter needs to eat much less than a person of the same weight who is consistently thin.

From an evolutionary perspective, the body's resistance to weight loss makes sense.

When food was scarce, our ancestors' survival depended on conserving energy, and putting back on weight when food was available would have protected us from the next food shortage.

Throughout human history, hunger has been a much bigger problem than overeating.

This may explain a very sad fact. The setpoint may go up, but rarely go down.

Now, if your mom ever said life was unfair, this is the kind of thing she was talking about.

(Laughter) Even if the diet is successful, the set point does not go down.

Even after seven years of weight loss, your brain keeps trying to put it back on.

If the weight loss is due to prolonged starvation, it would be a wise move.

In the modern world of drive-thru burgers, that doesn't work out so well for many people.

It is this difference between our ancestral past and rich present that is why Dr. Yoni Friedhoff of the University of Ottawa wants to take some patients back to a time when food was scarce, and why changing the food environment is actually the most effective solution to obesity.

Unfortunately, temporary weight gain can become permanent.

Maintaining a high weight for too long (probably years for most of us) can cause your brain to decide it's the new normal.

Psychologists classify eaters into two groups. One group relies on hunger, and the other, like most dieters, tries to control their eating through willpower.

Let's call them intuitive eaters and controlled eaters.

Interestingly, intuitive eaters are less likely to be overweight and spend less time thinking about food.

People who control how much they eat are more likely to overeat in response to advertising, oversized sizes, and all-you-can-eat buffets.

Also, people who control how much they eat are more likely to lead to bulimia with a little indulgence, such as a scoop of ice cream.

Children are particularly susceptible to this cycle of dieting and overeating.

Several long-term studies have shown that girls who diet in their early teens are three times more likely to be overweight after five years, even if they start at a normal weight, and all these studies show that the same factors that predicted weight gain also predict the development of eating disorders.

By the way, parents, another factor was that my family teased me about my weight.

So don't do that.

(Laughter) I left almost all my graphs at home, but I just couldn't help but toss this one. Because I'm a geek. That's my way of doing it.

(Laughter) Here's a study that looked at 14-year mortality risk based on four healthy habits: eating enough fruits and vegetables, exercising three times a week, not smoking, and drinking moderately.

First, let's look at the normal-weight people studied.

The height of the bar represents mortality risk, and the numbers 0, 1, 2, 3, 4 on the horizontal axis represent the number of healthy habits that person had.

And as you might imagine, the healthier your lifestyle, the less likely you are to die during the study.

Now let's see what happens to overweight people.

Those who did not have healthy habits had a higher risk of death.

Bring overweight people back to normal with just one healthy habit.

For obese people without healthy habits, the risk is very high, seven times that of the healthiest group studied.

But a healthy lifestyle can also help obese people.

In fact, if you just look at the group practicing all four healthy habits, you'll find that weight makes little difference.

Even if you can't lose weight and keep it off, you can still control your health by controlling your lifestyle.

Diets are not very reliable.

After 5 years of dieting, most people have regained their weight.

40% of them get even more profit.

Given this, the typical result of dieting is that you are more likely to gain weight than lose it in the long run.

Once I've convinced you that the diet might be the problem, the next question is what to do about it.

My answer in one word is mindfulness.

I'm not saying you should learn meditation or yoga.

I'm talking about mindful eating. That means learning to understand your body's signals to eat when you're hungry and stop when you're full. Because a lot of weight gain ends up eating when you're not hungry.

how do i do that?

Give yourself permission to eat as much as you want and work on figuring out what makes your body feel good.

Sit down to your normal diet without any distractions.

Think about how your body feels when you start and stop eating, and let hunger decide when to stop eating.

It took me about a year to learn this, but it was really worth it.

I am much more relaxed about food than I have ever been in my life.

I often don't think about it.

I forgot I had chocolate at home.

It's like aliens have taken over my brain.

It's not at all.

I have to say that unless you eat frequently when you're not hungry, you probably won't lose weight with this dietary approach, but doctors don't know of approaches that result in significant weight loss for many people. As such, many people now focus on preventing weight gain rather than promoting weight loss.

Let's be honest, if the diet worked, we would already be thin.

(Laughter) Why do we keep doing the same thing and expect different results?

Dieting may seem harmless, but it actually causes a lot of collateral damage.

At worst, it will ruin your life. Obsession with weight can lead to eating disorders, especially in young children.

In the United States, 80 percent of 10-year-old girls say they have dieted.

Our daughters have learned to measure their worth on the wrong scale.

No matter how hard you try, dieting is a waste of time and energy.

It takes willpower to help a child with homework or finish an important project, but willpower is finite, so strategies that rely on consistent application are almost certain to eventually fail when attention shifts elsewhere.

Let me think about one last thing.

What would happen if we told girls on a diet, "It's okay to eat when you're hungry"?

What if we taught them to follow their appetites rather than fear them?

Many of them will be happier and healthier, and many will probably be thinner when they grow up.

I wish someone had told me that when I was 13.

thank you.

(applause)

Here's a photo of my dad and me on the beach at Far Rockaway, actually Rockaway Park.

I'm the one with blonde hair.

My father is a smoker.

It was the 60's.

In the summer of 2009, my father was diagnosed with lung cancer.

Cancer is one of those things that really affects everyone.

A man in the United States has about a one in two chance of being diagnosed with cancer during his lifetime.

If you are a woman, your chances of being diagnosed with cancer are about 1 in 3.

Everyone knows someone who has been diagnosed with cancer.

Now my father's condition is better. Part of the reason is that I happened to be in a trial of an experimental new drug that was specially formulated and very effective against his particular type of cancer.

There are over 200 types of cancer.

And what I want to talk about today is how I can help more people like my father. Because we need to change the way we think about fundraising to fund cancer research.

So, some time after my father was diagnosed, I was having coffee with my friend Andrew Law.

He's the director of the Institute for Financial Engineering at the Massachusetts Institute of Technology (MIT), where I have a position, and we were talking about cancer.

Andrew had done a bit of research on his own, and one of the things he was told and learned from studying the literature was that there really is a big bottleneck.

Developing a new drug is very difficult, but the reason it is so difficult is that in the early stages of drug development, the drug is very risky and very expensive.

So Andrew asked me if we could work together a little bit and work on math and analysis and see if we could find something we could do.

Now I am not a scientist.

As you know, I don't know how to make medicine.

And none of my co-authors Andrew Low, Jose Maria Fernandez, or David Fagnan are scientists.

I don't even know how to make anticancer drugs at first.

But we knew a little bit about risk mitigation, and we knew a little bit about financial engineering, so we started to wonder what we could do.

I'd like to talk about some of the research we've been doing over the last few years that we believe has the potential to fundamentally change the way we research cancer and much more.

We want research to drive funding, not the other way around.

So let me first explain how the drug is financed.

Imagine you are in a laboratory. You are a scientist, but you are not like me. And let's say you develop a new compound that might be effective in treating cancer patients.

Well, what you're doing is testing on animals, testing in test tubes, and so on, but there's this concept of bench to bedside, and in order to get to the bench, the lab, the bedside, and the patient, you have to be tested for drugs.

And the way drugs are tested is basically through a series of experiments, or large-scale experiments called clinical trials, to determine if a drug is safe, if it works, and all that stuff.

So the FDA has very specific protocols.

The first phase of this trial is called toxicity testing and is called Phase I.

The first stage is to administer the drug to healthy people and see if it actually causes disease.

In other words, are the side effects so bad that it's not worth it, no matter how good it works?

Will it cause heart attacks, kill people, or cause liver failure?

And it turns out that the hurdle is quite high.

About a third of all drugs are withdrawn at that point.

The next step is to test whether the drug works and give it to cancer patients to see if they improve their symptoms.

It is also a high hurdle. people will drop out.

And in phase three, we're testing it on a very large sample and trying to determine what the right dose is, is it better than what's available today? If not, why build it?

Once all this work is done, all that really comes out the other side is the very few drugs that start the process.

So those blue bottles save lives and are worth billions, maybe even billions a year.

So here's the question. For example, if I ask you to make a one-time investment of, say, $200 million to buy one of these bottles, please put up $200 million to buy one of those bottles. I can't tell you which one it is. Tell me if you have one of the blue bottles in 10 years.

Does that sound like a good deal for anyone?

No, no, right?

And of course, this is a very, very risky pilot position, and therefore very difficult to get funding for, but at first glance, that's the real proposition.

These should be funded from the beginning.

So Andrew said to me, "What if we stop thinking of these things as drugs?"

What if we start thinking of them as financial assets?”

They have really weird reward structures and stuff, but let's throw them all we know about financial engineering.

Let's see if we can use any tricks to find a way to make these drugs work as financial assets.

Create a huge fund.

In finance, we know what to do with risky assets.

Incorporate them into your portfolio to try to even out your returns.

So I did some calculations and found that this can be achieved. But to do that, we need about 80 to 150 drugs.

The good news is that there are many drugs waiting to be tested.

I'm told there are about 20 years of drug backlog that are waiting to be tested but can't be funded.

In fact, the early stages of the funding process, Phase I and preclinical, are referred to in the industry as the Valley of Death because this is where the drug dies.

It's very difficult to get through, and of course, if you can't get through it, you can't move on to the later stages.

When I calculated it, I found that about 80 to 150 medicines would be needed.

And then I did a little more math and said, "Well, it's about a $3 billion to $15 billion fund."

In other words, you created a new problem by solving an old problem.

The risk has been removed, but it now requires a lot of capital, and such capital is only available on the capital markets.

Venture capitalists and philanthropists don't.

But we need to find ways to convince people in the capital markets who traditionally don't invest in this space to want to invest in it.

Financial engineering helped here as well.

Imagine a mega-fund starting from scratch and issuing bonds and stocks to generate cash flow.

That cash flow will be used to purchase a large portfolio of needed medicines that will begin to move through the approval process, increasing in value with each stage of approval.

Most of them don't succeed, but some of them do. You can sell a portion of the increased value, which not only gives you the money to pay the interest on the bond, but also helps fund your next lawsuit.

Almost self-funded.

Once the transaction is complete, you can liquidate your portfolio and pay off your bonds, giving your stockholders a hefty profit.

That was the theory, and we talked about it, did a lot of experiments, and said let's test it.

We spent the next two years researching.

We spoke with hundreds of experts in pharmaceutical financing and venture capital.

We spoke to the people who developed the drug.

We talked to pharmaceutical companies.

We've actually looked at data from over 2,000 drugs that have been approved, rejected, or withdrawn, and we've run millions of simulations.

And all of that actually took a lot of time.

But in the end, it turned out to be somewhat surprising.

Once the fund was built, it was possible to build it in such a way that it could actually produce low-risk bonds that yielded around 5-8% yields that were attractive to bondholders, and stocks that yielded around 12% returns for stockholders.

Now, these returns may not be attractive to venture capitalists.

They want to bet big and make billions of dollars in profit.

However, it turns out that there are many others who are interested.

That's the sweet spot for pension funds, 401(k) plans, and all other investments.

So we published several articles in academic, medical and economic journals.

But it was only when we actually got the mass media interested in this that we really started to get attention.

We wanted to do more than just make people aware of it.

We wanted people to participate.

So we took all the computer code and made it available online to anyone who wanted it under an open source license.

If you want to run your own experiments and see if this works, you can download it now.

And it worked really well. Because people who didn't believe our assumptions can try their own and see how it works.

Well, we have an obvious problem. The question is, is there enough money in the world to fund this?

You said you have enough drugs, but do you have enough money?

$100 trillion of capital is currently invested in bonds.

That's 100,000,000,000.

I have a lot of money.

(Laughter) But we realized that money wasn't the only thing we needed.

I had to motivate people to get involved and get them to understand this.

And we started thinking about different things that could go wrong.

What are the challenges that might get in the way?

And then there was the long list.

We have assigned different parts of this issue to many people, including ourselves.

So we said, can you start working on credit risk?

Could you start the flow of work on the regulatory side?

Could you start a workstream on how to manage so many projects?

Then we got all the experts together, went through various workflows, and then held a conference.

This conference was held this summer.

It was an invitation-only conference.

It was sponsored by the American Cancer Society and conducted in collaboration with the National Cancer Institute.

We invited experts from various fields deemed important, including government and research center managers, to listen to and discuss reports from five work streams over the course of two days.

It was the first time that people who could make this happen had a conversation like this across the table.

Now, it's common for these conferences to have dinners, where you get to know each other, kind of like what we're doing here.

On the night of this conference, I happened to be looking out the window with my hand on my heart. It was summer. And that was the double rainbow.

So I'd like to think it was a good sign.

Since the conference, we've been staffing between Paris and San Francisco, with many different people working on this to see if we can really make it happen.

We have no intention of starting a fund, but would love to have someone else do this.

Because again, I'm not a scientist.

You can't make medicine.

I will never have enough money to fund even one of those trials.

But if we all work together, with our 401(k)s, 529 plans, and pension plans, we can actually fund hundreds of trials, get well paid for it, and save millions of lives like my father did.

thank you.

(applause)

This is an image of the planet Earth.

It is very similar to the very well known Apollo photographs.

Something is wrong. Click it to zoom in on almost any location on Earth.

For example, here is a bird's eye view of the EPFL campus.

Often you can even see what the building looks like from a nearby street.

This is pretty cool.

But something is missing from this great tour. It's time.

I'm not sure when this photo was taken.

I'm not even sure if it was taken at the same moment as the bird's eye view.

My lab develops tools for time travel as well as space.

What we are asking is, is it possible to build something like the old Google Maps?

Can you see what it was like 100 years ago, 1,000 years ago, just by adding a slider on top of Google Maps and changing the year?

Is that possible?

Is it possible to reconstruct the social networks of the past?

Can you make a medieval Facebook?

So is it possible to build a time machine?

You might say, "No, that's not possible."

Alternatively, you may be able to think in terms of information.

This is what I call the information mushroom.

Vertically, there is time.

Horizontally is the amount of digital information available.

Obviously, in the last ten years we've gotten a lot of information.

And obviously, the further back we go, the less information we have.

If you want to build something like old Google Maps or old Facebook, you need to expand this space and make it look like a rectangle.

How do we do that?

One way is digitization.

There are many resources available, including newspapers, printed books, and thousands of printed books.

All these can be digitized.

Information can be extracted from these.

Of course, the further back you go, the less information you get.

So it may not be enough.

In other words, I can do what a historian can do.

You can guess.

This is what computer science calls a simulation.

When you pick up a logbook, you can assume that it is more than just the logbook of a Venetian captain on a particular journey.

This is in fact thought to be a logbook representative of many journeys of that era.

I am extrapolating.

If you have a painting of a facade, you can assume that it is not just that particular building, but perhaps shares the same grammar with the building that lost the information.

So if you want to build a time machine, you need two things.

We need a very large archive and we need good professionals.

The project I am about to tell you about, the Venice Time Machine, is a joint project between EPFL and the University of Ca' Foscari in Venice.

There is something very strange about Venice. Its administration is highly bureaucratic.

They tracked everything much like Google does today.

The Archivio di Stato has 80 kilometers of archives documenting all aspects of Venetian life for over 1,000 years.

There are all boats going out, all boats coming in.

All the changes that happened in the city will be communicated to you.

That's all.

We are launching a ten-year digitization program aimed at transforming this vast archive into a vast information system.

Our goal is to digitize 450 books per day.

Of course, when it comes to going digital, that's not enough. Most of these documents are written in Latin, Tuscan, and Venetian dialects and must be transcribed, possibly translated, and indexed. This is obviously not easy.

In particular, traditional optical character recognition methods available for printed manuscripts do not work well for handwritten documents.

So the real solution is to take inspiration from another field: speech recognition.

This is an area where what seems impossible can actually be done with the addition of constraints.

If you have a very good model of the language being used, if you have a very good model of the documentation, how well structured are they?

And these are administrative documents.

They are often well structured.

If you split this huge archive into smaller subsets, and those smaller subsets actually share similar functionality, there is a chance of success.

Once we reach that stage, we will be able to extract events from this document.

In practice, perhaps 10 billion events can be extracted from this archive.

And this huge information system can be searched in many ways.

You can ask questions such as "Who lived in this palace in 1323?"

"What was the price of a sea bream at the Realto market in 1434?"

"What was the salary of a Murano glassmaker in perhaps ten years?"

You can also ask bigger questions because they are semantically coded.

And since much of this information is spatial, what you can do is put it in space.

And from there we can kind of reconstruct this extraordinary journey of a city that has been able to sustainably develop over a thousand years and always be in balance with its environment.

That journey can be reconstructed and visualized in many different ways.

But of course, you can't understand Venice by just looking at the city.

We need to put it in the larger European context.

So there is also the idea of ​​documenting everything that worked at the European level.

You can also reconstruct how the Venetian Maritime Empire gradually dominated the Adriatic and how it controlled most of the sea routes from east to south, becoming the most powerful medieval empire of its time.

However, these sea routes have regular patterns, so you can do other things as well.

You can go a step further and create a Mediterranean simulator that actually creates a simulation system and can actually reconstruct even the missing information. This allows you to ask questions as if you were using a route planner.

“If I am on Corfu in June 1323 and want to go to Constantinople, where should I board a ship?”

We can probably answer this question within 1-2-3 days.

"How much will it cost?"

"What is the probability of encountering pirates?"

Of course, as you know, the central scientific challenge of such a project is to identify, quantify and express the uncertainties and discrepancies at each stage of this process.

There are errors all over the place, errors in documents, the captain's name is wrong, and some boats never actually went to sea.

Translations have errors, interpretation biases, and the addition of algorithmic processes leads to recognition and extraction errors, resulting in very, very uncertain data.

So how can we detect and fix these discrepancies?

How can such uncertainty be expressed?

it's difficult. One thing you can do is document each step of the process. In addition to coding historical information, each step documents what is called meta-historical information about how historical knowledge is constructed.

That doesn't guarantee that we'll actually converge on a single narrative of Venice, but perhaps we can actually reconstruct a potential narrative of Venice that's been fully documented.

Maybe there are no maps.

I think I have a few maps.

A whole new form of uncertainty has to be dealt with for a large database of this kind, and the system should take that into account.

And how should this new research be communicated to a large audience?

Again, Venice is special in that regard.

With millions of visitors each year, this place is one of the best places to invent the museum of the future.

Imagine horizontally displaying a restored map of a particular year, and vertically displaying documents that aid in the restoration, such as paintings.

Imagine an immersive system that allows you to go and dive and recreate Venice from a particular year. It is an experience that can be shared within the group.

On the contrary, imagine actually starting with a document, a Venetian manuscript, and actually showing what can be constructed from it, how it can be deciphered, how the context of that document can be recreated.

Here is an image from an exhibition currently taking place in Geneva with such a system.

The bottom line is that research in the humanities is on the cusp of an evolution similar to what happened in the life sciences perhaps 30 years ago.

It's really a question of scale.

We see many projects that cannot be carried out by a single research team, which is very new to the humanities, which often work with small groups or just a few researchers.

Visiting the Archivio di Stato makes me feel that this is more than what a single team can do, it should be a collective common effort.

So what we have to do for this paradigm shift is actually to develop a new generation of “digital humanists” who are ready for this shift.

thank you.

(applause)

(music) For those who have visited or lived in New York City, these photos may look familiar.

This is Central Park, one of America's most beautifully designed public spaces.

But for those who have never visited, these images are not enough.

To really understand Central Park, you have to go to it.

Well, the same applies to music, my brother and I wrote and mapped it specifically for Central Perk.

(music) Today I want to talk a little bit about the work that my brother Hayes and I do. that's us. It's actually about both of us, especially about a concept we've been developing over the last few years: the idea of ​​location-aware music.

Well, my brother and I are musicians and music producers.

We've really been working together since we were kids.

Recently, however, I have become increasingly interested in projects at the intersection of art and technology, from creating visually focused audio and video installations to engineering interactive concerts.

But today I would like to focus on this concept of organizing physical space.

But before I go into any more detail about it, let me tell you a little bit about how we got started with this idea.

My brother and I were living in New York City when artists Christo and Jeanne-Claude created their temporary installation, The Gates, in Central Park.

Hundreds of colorful sculptures graced the park for weeks. Unlike works displayed in more neutral spaces such as gallery walls or museum walls, this was a work that had a dialogue with this very place, and in many ways The Gates did exactly that to celebrate Frederick Olmsted's brilliant design.

This experience stuck with us for a long time, and years later my brother and I returned to Washington, D.C. and began to question whether it would be possible to compose music for the landscape in the same way The Gates reacted to the physical arrangement of the park.

This is what led us this way.

(Music) On Memorial Day, we released our location-aware album, The National Mall. It was released exclusively as a mobile app that acoustically maps entire parks in our hometown of Washington, D.C. using the device's built-in GPS capabilities.

Hundreds of music segments are geo-tagged throughout the park so that as listeners traverse the landscape, the music actually unfolds around them.

So this is not a playlist or list of songs for the park, but rather a series of unique melodies and rhythms that fit together like pieces of a puzzle and blend seamlessly based on the trajectory chosen by the listener.

So think of this as an album-choosing adventure for yourself.

Let's take a closer look.

Let's look at an example here.

With this app, as you make your way towards the grounds surrounding the Washington Monument, you'll hear the sounds of instruments warming up, then turning into the sounds of a mellotron spelling out a very simple melody.

The sound of the violin is added there.

As you continue walking, you'll be joined by a packed choir, and when you finally reach the top of the hill, you'll hear the thunder of drums, fireworks, and all kinds of musical madness, as if all the sounds radiate from this giant obelisk that delimits the center of the park.

But if you were to walk in the opposite direction, this whole sequence would happen in reverse.

And when you actually go outside the park, the music fades to silence and the play button disappears.

We are occasionally contacted by people from other parts of the world who cannot travel to the US but would like to hear this record.

Well, unlike normal albums, this request has not been met.

When they asked for a CD, the reason was that this was not a promotional app or game meant to advertise or accompany a traditional record release.

In this case, the app is the work itself, and the structure of the landscape is intrinsic to the listening experience.

Six months later, we created a place-conscious album in Central Park, a park more than twice the size of the National Mall, with music from Sheep's Meadow to Rumble to Reservoir.

My brother and I are currently working on projects across the country, but last spring we started a project here at Stanford's School of Experimental Media Arts. There, we're creating our biggest positionally conscious album to date. An album that spans the entirety of Highway 1 here on the Pacific coast.

But the GPS and music integration we're working on is really just an idea.

But it speaks to a bigger vision for the music industry, which sometimes struggles to find a foothold in this digital age. The music industry has come to envision these new technologies not just as a way to add extra functionality to existing models, but entirely new ways for people to interact with and experience music.

thank you.

(applause)

The whole model of capitalism and economic model that you and I do, and indeed continue to do business with, was probably built around what Milton Friedman described more succinctly.

And, of course, Adam Smith, the father of modern economics, actually said many years ago about the invisible hand: "If it continues to act in its own interest, it will do what is best for society."

Well, capitalism has done a lot of good things, and I've talked about a lot of good things that have happened, but it likewise failed to meet some of the challenges we've seen in society.

At least the model I grew up with, and the model many people in business grew up with, was a model that speaks to what I call the 3 G's of growth. Competitive, better growth than others. We will continue to increase shareholder value by delivering profitable growth.

Unfortunately, this is not enough and we need to move from this 3G model to what I call the 4th G, the G of Responsible Growth.

And this should be a very important part of creating value.

We not only create economic value, but also create social value.

And the companies that grow are the ones that actually adopt the 4th G.

And the 4G model is very simple. Businesses cannot simply be innocent bystanders to what is happening in society.

They have to start doing their part when it comes to serving the communities that actually support them.

And we need to move to an and/and model of how we make money and do good things.

How can you run a great business and still have a great environment?

And that model is to do well and do good.

But this issue is easier said than done.

But how do we actually make it happen?

And I believe the answer to that is leadership.

It will redefine a new business model that understands that combining these is the only license to operate.

To do that, we need companies that can really define their role in society in terms of a purpose much larger than the products and brands they sell.

And it doesn't matter the companies that really define the true North—the ones that are non-negotiable in good or bad times, ugly.

You have something to represent.

Values ​​and purpose will be the two driving forces of the software that will create the enterprises of tomorrow.

Now I would like to talk a little bit about my own experience.

I joined Unilever in 1976 as a management trainee in India.

And when I showed up on my first day of work, my boss said, "Do you know why you're here?"

I said, "I'm here to sell a lot of soap."

And he said, "No, you are here to change your life."

You are here to change your life.

Well, I thought it was pretty silly.

We are a company that sells soap and soup.

What are we doing to change lives?

And then I realized that the simple act of selling bar soap could save more lives than a pharmaceutical company could.

I don't know how many people know that 5 million children are under the age of 5 because of simple infections that can be prevented by the act of washing hands with soap.

We run the world's largest handwashing program.

We have a hygiene and wellness program that currently has 500 million people participating.

The purpose is not to sell soap, but there is a bigger purpose.

And indeed, brands can be at the forefront of social change.

The reason is that when 2 billion people use your brand, it becomes an amplifier.

Small actions can make a big difference.

Let's take another example. I was walking through one of the Indian villages.

Now, those who have done this will realize that this is not a walk in the park.

And this lady, one of our little distributors, who was beautiful and very, very modest, was at home, but she was nicely dressed outside, with her husband behind her, her mother-in-law behind her, her sister-in-law behind her.

This woman is part of our Project Shakti, and the social order is changing because she really teaches women how to run small businesses and how to deliver nutrition and hygiene messages.

There are now 60,000 such women in India.

It's not about selling soap, it's about seeing if you can change people's lives in the process.

Small actions make a big difference.

Our R&D people are working not only to provide you with great detergents, but also to ensure that you use less water.

The recently released “One Rinse” allows you to save water each time you do laundry.

500 billion liters of water will be available if all users can use it.

By the way, this is equivalent to one month's worth of water for an entire huge continent.

So just think about it.

Small actions can bring about big changes.

And I can go on and on.

Sorry for the words from our food chain, great products and sponsors, Knorr, Hellman's and all those great products.

We are committed to ensuring that all agricultural ingredients are sourced from sustainable sources, i.e. 100% sustainable sources.

We were the first to say that we intend to purchase all palm oil from sustainable sources.

I can't tell you how many people know that not purchasing palm oil from sustainable sources could result in deforestation, which is responsible for 20 percent of the world's greenhouse gases.

We accepted it first. It's all because we sell soap and soup.

My point here is that companies like yours and companies like mine need to understand that they have to define their purpose with responsibilities and play a role in the communities in which they operate.

We introduced what we call Unilever's Sustainable Living Plan. It reads: "Our aim is to make sustainable living the norm and we will change the lives of 1 billion people in 2020."

Now the question is, where do we go from here?

The answer is very simple. We are not going to change the world alone.

There are many of you and many of us who understand this.

The problem is that we need partnerships, we need collaborations. And importantly, we need leadership to enable us to drive this from here and be the change we want to see around us.

thank you very much.

(applause)

I am honored to be in Edinburgh, Scotland, the birthplace of needles and syringes.

Less than a mile from here in this direction, in 1853 a Scotsman applied for the first patent for a needle and syringe.

His name was Alexander Wood and he attended the Royal College of Physicians.

This is the patent.

What is surprising even now is that it looks almost the same as the needles in use today.

Even so, the tree is 160 years old.

So let's turn to the field of vaccines.

Most vaccines are administered using a needle and syringe, a technology that is 160 years old.

And, as it should be, admit that vaccines are a successful technology on many levels.

After clean water and sanitation, vaccines are one of the technologies that have extended our lives the most.

It is a rather difficult act.

But like any technology, vaccines have their drawbacks, and needles and syringes are an important part of that story, this old technology.

So let's start with the obvious. Many of us don't like needles and syringes.

I share that opinion too.

However, 20% of the population has something called needle phobia.

It's not just that I hate needles. People who actively avoid vaccination due to needle phobia.

And that's a problem in terms of vaccine deployment.

Now, another important issue associated with this is needlestick injuries.

And the WHO publishes figures suggesting that cross-contamination from needlestick injuries kills about 1.3 million people a year.

These are early deaths.

Now, you've probably heard of these two, but needles and syringes have two other drawbacks. You may not have heard of it much.

One is that it could hamper the development of the next generation of vaccines in terms of immune response.

Second, this could also be the cause of the cold chain problem I'm about to talk about.

I'll tell you about the research that I and my team are doing at the University of Queensland, Australia, on technologies designed to tackle these four problems.

The technology is called Nanopatch.

Well, this is a nanopatch specimen.

To the naked eye it looks like a square smaller than a postage stamp, but under a microscope you can see thousands of tiny bumps invisible to the human eye.

And this particular square has about 4,000 protrusions compared to a needle.

And I designed those protrusions to play an important role in working with the skin's immune system.

So this is a very important feature associated with Nanopatch.

We are currently creating nanopatches using a technique called deep reactive ion etching.

And because this particular technology is borrowed from the semiconductor industry, it can be deployed in high volume at low cost.

Next, the vaccine is dry-coated on the projections of the nanopatch and applied to the skin.

The easiest way to apply is with your finger, but fingers have some limitations, so we devised an applicator.

It's a very simple device, you could call it a sophisticated finger.

It is a spring-operated device.

What we do is apply the nanopatch to the skin -- (click) -- and immediately a few things happen.

First, the projections of the nanopatch pierce the tough outer layer, releasing the vaccine very quickly. It actually releases within a minute.

Then remove the nanopatch and discard.

And in fact, the applicator itself can be reused.

That's an overview of Nanopatch, and you'll quickly see some key benefits.

We've been talking about not using needles. These are invisible protrusions. And of course, it also avoids the problem of needle phobia.

Now let's step back and consider two other very important advantages. One is the improvement of the immune response by childbirth and the second is elimination of the cold chain.

So let's start with the first idea of ​​immunogenicity.

It takes a while to understand, but I'll try to explain it in simple terms.

So let's take a step back and briefly explain how vaccines work.

Vaccines therefore work by introducing safe forms of bacteria, called antigens, into our bodies.

That safe bacterium, its antigens, trick our bodies into mounting an immune response, learning and remembering how to deal with invaders.

When a real invader comes along, the body quickly mounts an immune response to combat the vaccine and neutralize the infection.

So it works.

Most vaccines are administered using this old technique and a needle the way it is now done today using a needle and syringe.

But it can also be argued that needles suppress our immune response. Lacking the skin's immune sweet spot.

To illustrate this idea, we need to travel through the skin, starting with one of these protrusions and applying a nanopatch to the skin.

And we see this kind of data.

Now this is the actual data. You can see that there is one projection from the nanopatch applied to the skin and their colors are different layers.

Now, speaking of the scale, if the needle is shown here, it's too big.

It's 10 times bigger than its screen size and 10 times deeper.

It's completely off the grid.

You can immediately see these bumps on your skin.

The red layer is the tough outer layer of dead skin, while the brown and magenta layers are packed with immune cells.

As an example, the brown layer contains a specific type of cell called Langerhans cells, and every square millimeter of our body is filled with Langerhans cells and immune cells, as well as other unstained cells in this image.

But we soon find out that the nanopatch actually achieves that penetration.

We target thousands of specific cells within the width of a hair on the surface of the skin.

Now, as the person who invented this and designed it to happen, I found it exciting. But so what?

But what if we target cells?

What does that mean for the world of vaccines?

The world of vaccines continues to improve.

It's becoming more systematic.

But we won't know if a vaccine works until we roll up our sleeves, vaccinate and wait.

It is still a gambler's game today.

So we had to take that gamble.

We got the flu vaccine, applied it to the nanopatch, applied the nanopatch to the skin and waited. And this is in live animals.

After waiting a month, this turned out.

Here is a data slide showing the nanopatch-generated immune response compared to needles and syringes into muscle.

Therefore, the horizontal axis shows the dose in nanograms.

On the vertical axis is the immune response generated and the dashed line indicates the protective threshold.

If that line is crossed, it is considered protective. If it's below that line, it's not.

So the red line is mostly below that curve, and in fact there is only one point where needles provide protection and that is at the high dose of 6,000 nanograms.

However, notice immediately the distinctly different curve obtained with the blue line.

That's what Nanopatch does. Nanopatch dosage results in a completely different immunogenicity curve.

It's a really fresh opportunity.

Suddenly, an entirely new instrument appeared in the world of vaccines.

We can push it in one direction. In other words, you get an effective but too expensive vaccine that provides protection at a dose 100 times lower than needles.

This could make a $10 vaccine suddenly drop to 10 cents, which is especially important in developing countries.

But there is another angle to this as well. You can take a currently ineffective vaccine and cross that line to get protection.

And certainly in the world of vaccines it could be important.

Consider the big three: HIV, malaria, and tuberculosis.

It kills about 7 million people a year, and there is no proper vaccination against them.

So with this new lever on the Nanopatch, it might be possible to do just that.

We can push that lever and help our vaccine candidates cross the line.

Of course, we have studied many other vaccines in my lab that have achieved similar responses and similar curves as we achieved with the flu.

Now I would like to talk about another important drawback of today's vaccines. It's the need to maintain a cold chain.

Cold chain, as the name suggests, is the requirement for vaccines to be kept refrigerated throughout manufacturing and use.

There are some logistical challenges with this, but there are ways to make it happen.

This is a bit of an extreme example, but it helps illustrate the logistical challenges of what it takes to refrigerate vaccines and maintain the cold chain, especially in resource-poor settings.

Too warm will destroy the vaccine, but interestingly, too cold can destroy the vaccine as well.

Now the stakes are very high.

The WHO estimates that up to half of the vaccines in use in Africa may not be working properly because the cold chain has malfunctioned at some point.

This is a big problem, because it's a liquid vaccine, it has a needle and a syringe tied to it, and if it's a liquid, it needs refrigeration.

A key property of our nanopatch is that the vaccine is dry. No need to refrigerate if dry.

My lab has shown that the vaccine can be stored at 23 degrees Celsius for over a year without any loss of activity.

That's an important improvement.

(Applause) We are very happy.

And importantly, we have fully and truly demonstrated the nanopatch in a laboratory environment.

And as a scientist, I love it, I love science.

But as an engineer, as a biomedical engineer, and as a human being, I'm not going to be satisfied until I can deploy this, get it out of the lab, and get it to the masses, especially those who need it most.

So we started this special journey, but this journey started in an unusual way.

Started from Papua New Guinea.

Well, Papua New Guinea is an example of a developing country.

Roughly the same size as France, it suffers from many of the key barriers that exist in today's vaccine world.

I have a logistics problem. The country has only 800 refrigerators to keep vaccines cold.

Like this facility in Port Moresby, many are old, many are out of order, and many are not in the Highlands where they are needed.

It's a challenge.

But Papua New Guinea also has the highest incidence of HPV, human papillomavirus and cervical cancer [risk factors] in the world.

However, the vaccine is too expensive and not available in large quantities.

For these two reasons, using the properties of nanopatches, we are going into the field, working with nanopatches and bringing them to Papua New Guinea. I plan to track it down soon.

Well, doing a job like this is not easy.

It's hard work, but there's nothing else in this world that I want to do.

And looking to the future, I would like to share my thoughts with you. It's about a future where the current 17 million deaths a year from infectious diseases are a historical footnote.

And that's a historical footnote achieved by improved radically improved vaccines.

Today, as I stand before you in the 160-year-old birthplace of needles and syringes, I present to you an alternative approach that can help you do just that. It is a needleless, painless nanopatch with the ability to eliminate the cold chain and improve immunogenicity.

thank you.

(applause)

Pat Mitchell: This is your first time back on stage at TEDWomen.

Sheryl Sandberg: First time here. Nice to meet you all. It's always so nice to look outside and see so many women.

As others know, it's not a normal experience for me.

PRIME MINISTER: So when we first started talking, maybe the subject was not social media and we assumed it was, but I think we were very much mindful of the lack of leadership positions, especially in the areas of technology and social media.

But how did it evolve into your idea and ultimately into your TED talk?

SS: So I was really scared to stand on this stage and talk about women. Because, like most of us, I grew up in the business world.

The reason you never say you're a woman is because someone might find out you're a woman, right?

they might notice. Worse, when you say "woman," the person on the other side of the table thinks you're asking for special treatment or complaining.

Worse, they're about to file a lawsuit. So I passed -- (laughter) right? Throughout my business career, I have never spoken, never publicly, about being a woman.

But I also knew it wouldn't work.

When I graduated from college over 20 years ago, I thought that all my co-workers were male and female, and the people above me were all male. Because your generation has done a great job fighting for equality. Equality is now ours. And it wasn't.

Because, year after year, I became less and less, and now I was often the only woman in the room.

And I consulted a lot of people about whether or not I should give a talk about women at TEDWomen, and they said, "No, no."

It will put an end to your business career. You can't be a serious business owner and talk about being a woman. You will never be taken seriously again.

Fortunately, it was a proud few people like you who told me I should speak. And I asked myself the question that Facebook founder and my boss, Mark Zuckerberg, would ask all of us.

And if you're not scared, the answer is to get on the TED stage and talk about women and leadership. And I did and survived. (Applause) Prime Minister: I don't think we just survived. Cheryl, I remember when you and I were standing backstage together and you turned to me and told me a story.

And I said, really at the last minute, we should share that story.

SS: Oh, yes. Prime Minister: What was the story?

SS: Well, it's an important part of the journey. So I -- TEDWomen -- the first one was in Washington D.C. -- so I live here. So I got on the plane the day before and my 3-year-old daughter clung to my leg. "Mom, don't go."

And since Pat is a friend, regardless of the speech I had planned, it was chock full of facts and figures and nothing personal, so I told Pat the story. I said, "Well, I'm having a rough day."

Yesterday my daughter clung to my leg and said "Don't go".

And you looked at me and said, I have to tell that story.

On stage at TED? said. are you kidding?

Are you going to go on stage and admit that your daughter was clinging to my leg?

And you answered "yes". Because if you want to talk about getting more women into leadership roles, you have to be honest about how hard it is.

And I did. And I think that's a very important part of the journey.

The same thing happened when I wrote the book. I started writing books. I wrote the first chapter and thought it was great. It was chock-full of data and figures, with three pages on the Matrilineal Maasai and their sociological patterns.

My husband read it and said, "This is like eating flour." (Laughter) No one -- sorry Wheaties if anyone -- no one, no one will read this book.

And through the process, I realized that I had to be more honest, more open, and tell my story. My story of still feeling insecure in many situations. My first failed marriage. cry at work

I felt like I didn't belong there and to this day I feel guilty.

And part of my journey, starting from this stage, going “lean in” and towards the Foundation, is to be more open and honest about these challenges so that other women can be more open and honest, and we can all work together towards true equality.

PM: I think one of the most striking parts of the book, and in my opinion, one of the reasons why it's been so nerve-wracking and resonating all over the world is that you're a personal person in the book, observing something very important for other women to know, but revealing that you've had the same challenges as many other women in the face of obstacles and barriers and perhaps people who don't believe in the same things.

So talk about that process. You decide to expose your private parts and then put yourself in an expert position on how to solve those challenges.

SS: What happened after I gave the TED talk, you know, I never thought I would write a book. I am neither a writer nor a writer. And it was viewed a lot and started to have a big impact on people's lives.

I thought this was great. One of the first letters I received was from a woman who had a very big promotion offer at work and she turned it down.

So she watched this TED talk, went back to work the next day, went home, and gave her husband a shopping list. (Laughter.) And she said, "I can do it."

And it wasn't just the women in business that really mattered to me, but also the people from all walks of life, even though I've heard from and inspired many women.

There was a doctor who was my doctor at Johns Hopkins University, whom I met, who said that until he saw my TED talk, he had no idea that half the students in his medical class were women, and that they spoke less during rounds than men.

So he started paying attention, and as he waited for his hands to go up, he noticed that the men were raising their hands.

So he started urging the women to raise their hands more, but to no avail.

So he said to everyone, don't raise your hands anymore, I'll call you back.

So he could call men and women alike. And he proved to himself that the women knew the answer as well or better, and that he could go back and tell them.

And she was a stay-at-home mom, and she lived in a very tough neighborhood and didn't have great schools. She said she had a TED Talk. Although she never worked for a company, she said the TED Talk inspired her to go to school and fight for better teachers for her children.

And I think that was part of finding my voice.

And I realized that other women and men can also find their own voice through this book, which is why I transitioned from speaking to writing.

PM: In this book, you not only express your voice clearly and powerfully, but you also share what you've learned - the experience of others in your lessons.

And that's what I think in terms of putting myself in a state -- you've become kind of an expert in how you lean.

So how did it feel in your life?

I'm committed to not just publishing a book, not just a best-selling and most-watched talk, but starting a movement where people have begun to literally describe what they do in the workplace.

SS: I mean, I'm grateful, I'm honored, I'm happy, and that's just the beginning.

So I'm not sure if I'm an expert or if someone else is. I certainly did a lot of research.

I have read all the research and perused the material and the lessons are very clear. Because here's what we know: What we do know is that stereotypes keep women out of leadership roles around the world.

Very impressive. "Lean In" is very global and I've been around the world talking about it, and the cultures are very different.

Even within our countries, Japan, Korea, China, Asia and Europe are very different. Except for one thing, gender.

All over the world, men are expected to be strong, assertive, aggressive and have a voice, no matter what the culture. We believe women should speak when spoken to and help others.

Women are now called "great" all over the world. Every language has the word "bossy" to describe a little girl.

This is a word that is not often used for little boys. Because when a little boy leads, there is no word against it, it is expected. But when a little girl leads, she becomes great.

I know there aren't many men here, but bear with me.

If you are male, you should express your gender.

Raise your hand if you've been told you're too aggressive at work.

(Laughter) There are always numbers, but the utilization rate is about 5 percent. Now get ready, gentlemen.

If you're a woman and have been told you're too aggressive at work, raise your hand.

(Laughter) That's what viewers are saying in every country in the world, and it's deeply backed by data.

Now, do you think women are more aggressive than men? Of course not.

It's just that we're judging them through a different lens, and many of the personality traits they have to exhibit to perform at work, produce results, and demonstrate leadership are what we think are bosses for men and bosses for women.

And the good news about this is that recognizing it can change this.

One of the happiest moments of this entire journey was when I was on stage with Cisco CEO John Chambers after the book was published.

he read a book He stood on stage with me and invited me in front of the entire management team, men and women, and said, We thought we were good at this. I thought I was good at this.

And after reading this book, I realized that we, my company, call all senior women too aggressive. And I'm standing on this stage, sorry.

And we want you to know that we are never going to do the same thing again.

PM: Can we send that to as many other people we know? (Applause) SS: So John is doing it because he believes it's good for the company, so acknowledging these biases in this way can change the situation.

So the next time you see someone calling a little girl "big", you'll walk over to them with a big smile and say, "That little girl isn't big. That little girl has executive leadership skills." (laughter) PM: I think that's what you're telling your daughter. SS: Of course.

PM: And you focused on this book. And like you said, the reason in writing it was to create a dialogue about this.

So let's put this out there and face the fact that in an era where we are opening more doors and giving more opportunities, women are still not in leadership positions.

It's been months since the book Lean In focused on that point, but there are still some remaining challenges, many of which we must embrace and look within ourselves. what changed?

Have you seen any changes?

SS: Well, we definitely have more conversations, which is great.

But what really matters to me, and to all of us, is action.

So wherever I go, CEO, they're mostly men, tell me, women all want to be paid as much as men, that's why you pay me so much.

And to them I say, I am utterly sorry. (laughs) Not at all. This means that women should be paid the same as men.

Everywhere you go, women say they want a raise.

Everywhere we go, women say they have better relationships with their spouses, want more help at home, want promotions at work to deserve, and, importantly, believe they do too. even the smallest things.

One state governor said he didn't realize more women were actually literally sitting on the edge of the room. She said she now has a rule that all female employees must sit at the table.

The foundation I started with my book, Lean In, helps women and men start circles. Small groups, up to 10 people, you can form as many groups as you like and meet once a month.

At this point, I thought the number of circles was about 500. that would have been great.

500 times is roughly 10.

There are over 12,000 circles in 50 countries around the world.

PM: Wow, that's great.

SS: And these people meet every month.

I was one of them in Beijing.

A group of women, all around 29 or 30, set up the first Lean In circle in Beijing. Some of them grew up in very poor rural China.

These women are 29 years old, unmarried and described as “left behind” by society, but the process of coming together once a month helps them define who they are.

what they want in their careers. The kind of partner they want, if necessary.

I looked at them, went around and introduced myself, all saying their names and where they were from. And I said, 'I'm Sheryl Sandberg, this was my dream.

And I kind of started crying.

Yes, I admit it. right? I've talked to you before.

But the fact that a woman who grew up in a remote rural village in the world and was told to marry someone she didn't want to marry can now go see a group once a month, turn it down, and find life on her own terms.

That's the change we want.

PM: Were you surprised by the global nature of the message?

Because when this book was first published, I think a lot of people thought it was a very important handbook for growing young women.

They need to see this, anticipate barriers, recognize them, expose it, and have a dialogue about it, but understand that it's really for women. Do it. Pursue the corporate world.

Yet, as you say, the book is read in rural and developing countries.

What parts of it surprised you and perhaps gave you new perspectives?

SS: This book is about confidence and equality.

And all over the world, it turns out that women need more confidence. Because the world says we are not equal to men.

All over the world, we live in a world where men get "and" and women get "or".

I've never met anyone who asked how they do it. (Laughter) I'll speak to the man in the audience again. Raise your hand when asked, "How do you do it?"

(laughs) It's for men only.

women, women. Raise your hand when asked how you do it.

We think men have jobs, kids and can do anything.

We think women can't do that, but it's ridiculous. Because the majority of women around the world, including in the United States, work full-time and have children.

And I don't think people fully understand how broad this message is.

There is a circle set up for rescued sex workers in Miami.

They are using the "lean in" to help people get back to a fair life, really bailing out prostitutes and taking advantage of it.

There is a Dress for Success group in Texas that is using this book for women who have never been to college.

And we know that groups exist all the way to Ethiopia.

And I think these messages about equality—that they say women can't have what men can have, how we assume leadership belongs to men, how we assume the voice belongs to men, these affect us all and I think are very universal.

And that's part of what TEDWomen does.

It unites us all in the cause we believe in: more women, more voices, more equality.

PM: Now, if you were invited to speak at TEDWomen again, would it be a result of this experience for you personally, and what do you think you've learned about women and men through this journey?

SS: I think I'll say -- I tried to say this strongly, but I think I can say it even stronger -- that the status quo is not good enough.

It's not enough, it's not changing fast enough.

Since I gave a TED Talk and published a book, another year of data has come out of the US Census.

And do you know what we found?

In the United States, the wage gap for women remains static.

1 dollar and 77 cents.

64 cents for black women.

If you're Latino, it's 54 cents.

Do you know when was the last time that number went up?

year 2002.

We are stagnant and stagnant in so many ways.

And I think we're not really honest about that for so many reasons. Talking about gender is very difficult.

We shy away from the word "feminist," but I think it's a term we really need to embrace.

We have to get rid of the bossy word and take back the word "feminist" -- (Applause) I'd like to say it louder, but we need to get rid of the word "bossy" and take back the word "feminist." Because we need it.

(Applause) Prime Minister: And we all need to lean more.

SS: It's pretty slanted.

PM: Thank you Cheryl.

Thank you for leaning over and saying yes.

SS: Thank you.

(applause)

I must say that two years ago there were no problems.

Two years ago I knew exactly what an icon looked like.

It is like this.

Not only was he an icon for everyone, but at the time I was the default curator of Italian Renaissance painting.

And in a way, it's also the default choice.

A very soulful image of Leonardo da Vinci's "Woman with an Ermine".

And I use this word soulful on purpose.

Then this, or rather these. Two versions of Leonardo's 'Our Lady of the Rocks' were about to be played together in London for the very first time.

At the time, it was an exhibition that I was struggling to plan.

I literally had my eye on Leonardo and was there for 3 years.

I mean, he was every part of my brain.

During those three years, Leonardo showed me what painting could do.

About taking you out of your own material world into the spiritual world.

In fact, he said he believes the painter's job is to paint everything visible and invisible in space.

It's hard work. Yet somehow he achieves it.

I think he shows us the human soul.

He shows us the ability to move ourselves into the spiritual realm.

Seeing visions of a universe more perfect than our own.

In a way, to see God's own plan.

So, in a way, this was what I believed icons to be.

Around that time, I started talking to Tom Campbell, director of the Metropolitan Museum of Art, about my next move.

In fact, this movement has brought me back to the earlier life I started at the British Museum, back to the three-dimensional world of sculpture and decorative arts, taking over the Department of European Sculpture and Decorative Arts here at the Metropolitan Museum of Art.

But it was an incredibly busy time.

All conversations took place during a very specific time of the day - over the phone.

In the end, I accepted the job without actually being here.

Again, I had visited there several years ago and it was a special visit then.

So it was just before Leonardo's show started that I returned to New York's Metropolitan Museum of Art to see new territory.

To see what European sculpture and decorative arts are like beyond the Renaissance collections I was already familiar with.

And on the first day, I thought it would be better to go around the galleries.

I think 57 of these galleries are the same as 57 baked beans.

I went through it and started in my Italian Renaissance comfort zone.

Then I moved bit by bit and felt a little lost at times.

My mind was also full of the upcoming Leonardo exhibition, so I found this.

And I thought: What have I done?

There was no connection at all in my mind, and in fact, if any emotion happened, it was some kind of backlash.

This object felt completely alien.

Stupid on a level I still don't understand stupidity.

And things got even worse - there were two of them.

(Laughter) So I actually started thinking about why I hate this object so much.

What was the structure of my disgust?

Well, with a lot of gold, it's very vulgar.

Quite frankly, it's very rich.

The use of gold was absolutely abhorrent at the time, as Leonardo himself spoke out against the use of gold.

And there are small pretty flowers blooming here and there. (laughs) And the last one is pink. That motherfucker pink.

It's a very artificial color.

That is, colors that cannot actually be found in nature, colors that appear to be shades of it.

The object also has its own tutu. (laughter) This little, fluffy, butt piece in the bottom of the vase.

Oddly enough, it reminded me of my niece's 5th birthday party.

A place where all the little girls come as princesses or fairies.

There was someone who came as a fairy princess.

You must have seen what it looks like.

(Laughter.) And then I realized that this object was in my mind, virtually born from the same mind, the same womb as the Barbie ballerina. (Laughter) And then there's the elephant. (laughter) Extraordinary elephants with little weird, evil faces and Greta Garbo eyelashes, golden tusks, and more.

I realized that this was an elephant who had nothing to do with the majestic procession of the Serengeti.

It was Dumbo's nightmare. (Laughter) But something more serious was also happening.

These items seemed to me typical of what I and my liberal-left friends in London had always seen as summing up something lamentable about eighteenth-century French aristocracy.

According to the label, these pieces were made in the Sèvres manufactory, made in porcelain in the late 1750s, and designed by a designer named Jean-Claude Duplessis, who, as I later learned, was actually an extraordinary man.

But to me they epitomized a kind of utter helplessness of the eighteenth-century aristocracy.

My colleagues and I have always thought that these objects somehow epitomized the idea that a revolution could happen.

Or indeed, thank God, a revolution has taken place.

There was actually some kind of idea that if you have a vase like this, there is only one possible fate.

(Laughter.) So I was in a kind of panic attack.

But I took the job and kept looking at these vases.

I had to because it's on a direct subway route.

So almost everywhere I went they were there.

They had a kind of queer fascination, like a car crash.

A place I couldn't help but see.

As I did so, I began to think: So what are we actually looking at here?

And what I started with was understanding that this was really the best design.

It took a while.

But, for example, that tutu, in fact, is a work that dances in its own way.

It's surprisingly light, yet has an amazing balance.

It contains such sculptural elements.

And the play between colors and gilding and sculptural surfaces, which are actually very carefully arranged, is really quite remarkable.

And then I realized that I put this piece in the kiln four times, at least four times, to get here.

How many chance moments can you think of that could happen in this piece?

And remember two, not just one.

So he has to reach two perfectly matching vases of this kind.

And this waste problem.

Actually, the end of the trunk was originally a candle holder.

That is, there should have been candles on either side.

Imagine the effect of candlelight on its surface.

A slightly uneven pink and a beautiful gold.

It would have sparkled like a small firework indoors.

And at that moment, fireworks actually went off in my brain.

Someone reminded me that the word "fancy" in a way encapsulates this object for me, but actually comes from the same root as the word "fantasy". And that this object, in itself, is in some ways as much a gateway to somewhere else as a painting by Leonardo da Vinci.

This is an object of imagination.

Think of those crazy 18th-century operas set in the Orient.

Think about the chaise longue, and perhaps the opium-induced apparitions of pink elephants, at which point the object begins to make sense.

This is just an object for escapism.

This is a story about escapism, in which the French aristocrats made a very deliberate effort to distinguish themselves from the common people.

But it's not the escapism that makes us particularly happy today.

And again, as I keep thinking about this, I realize that in a way we are all victims of some kind of oppression by the triumph of modernism. That is, the form and function of an object must, or are assumed to follow, each other.

And irrelevant embellishment is truly, essentially, viewed as criminal.

In a sense, it is a triumph of bourgeois rather than aristocratic values.

That seems fine.

Except for the fact that it becomes a kind of isolation of the imagination.

So, just like in the 20th century, so many people had the idea that their faith was done on the Sabbath and the rest of their lives—the washing machine and the orthodontic life—on another day.

After that, I think we started doing the same thing.

We have allowed ourselves to live a fantasy life in front of our screens.

In the dark of the cinema, the TV is in the corner of the room.

We have, in a way, eliminated the imaginative stationarity that these vases represented in people's lives.

So maybe it's time to bring this back a little.

I think that's starting to happen.

For example, in London, anomalous buildings have emerged over the last few years.

It has a sci-fi flavor to it in a way, turning London into a fantasy playground of sorts.

Now it's really nice to look out from tall buildings.

But there is still resistance.

London called these buildings Gherkins, Shards and Transceivers and brought these towering buildings down to earth.

We don't want these anxiety-inducing imaginative journeys to occur in our daily lives.

I feel lucky to have come across this object.

(Laughter) I found him on the internet when I was looking for references.

And there he was.

And unlike the pink elephant vase, this one was kind of love at first sight.

In fact, dear readers, I married him. I bought him

And he now graces my office.

He is a Staffordshire figure created in the mid-19th century.

He represents actor Edmund Keene, who plays Shakespeare's Richard III.

And in fact, it is based on higher-grade porcelain.

So on an art-historical level, I loved his multi-layered nature.

But more than that, I love him.

It would have been impossible without the pink Sèvres vase in Leonardo's time.

I love his orange and pink pants.

I like how she just finished washing the dishes and seems to be about to go to war. (Laughs) He seems to have forgotten his sword, too.

I love his little pink cheeks and the munchkin energy.

In a way, he's like my alter ego.

I think he's a little dignified, but mostly pretty vulgar. (Laughter) And I hope you're energetic too.

I let him into my life because the pink elephant vase from Sèvres allowed me to do so.

And before Leonardo, I understood that this object could become part of the daily journey for me sitting in my office.

I sincerely hope that others will also visit the works in the museum, take them home and find them for themselves, allowing them to flourish in their imaginative lives.

thank you very much.

(applause)

My job is to design, build and research robots that communicate with people.

But this story doesn't start with robotics, it starts with animation.

When I first saw Pixar's Luxo Jr., I was amazed at how something as trivial as a desk lamp could convey so much emotion.

I mean, look at these. By the end of the film, you actually feel something in the two pieces of furniture.

(Laughter.) And I said, I have to learn how to do this.

So I made a really wrong career decision.

(Laughter.) And my mom was when I did it.

(Laughter) I quit a very comfortable tech job at a great Israeli software company and moved to New York to study animation.

There I lived with my roommate in a collapsed apartment in Harlem.

I am not using the term metaphorically. In fact, one day our living room ceiling collapsed.

Whenever we covered a news story about building violations in New York, we put the report in front of our building as a sort of backdrop to how bad things were.

Anyway, I went to school during the day and sat at night drawing pencil animation frame by frame.

And I learned two amazing lessons.

One is that looks don't really matter when you want to evoke emotions. Everything is in motion and in the timing of how things move.

The second is what one teacher told us.

He actually played a weasel in "Ice Age."

And he said, "As an animator, you are an actor, not a director."

So if you want to find the right motion for your character, don't think about it, use your body to find it.

Stand in front of the mirror and act out in front of the camera whatever you want, then bring it back to your character.

A year later, I was in the Robotic Life group at MIT.

This was one of the first groups to study the relationship between humans and robots.

And I still had dreams of building an actual, physical Luxo Jr. lamp.

However, I found that the robot did not move at all in this fascinating way that I had become accustomed to in my animation studies.

Rather, they were all, how to say, like robots.

(Laughter) And then I thought, what if I took everything I learned in animation school and used it to design a desk lamp for a robot?

So I went through the design frame by frame to make this robot as graceful and attractive as possible.

And here, when I see the robot interacting with me on my desktop, I'm actually redesigning the robot, so without my realizing it, the robot is kind of digging its own grave by helping me.

(Laughter) I didn't want it to be a mechanical structure that gave me light, but more like a helpful, quiet apprentice who was always there when I needed it and didn't disturb me much.

And if you're looking for, say, a battery and can't find it, it will tell you where the battery is in a subtle way.

You can see my confusion here.

i am not an actor.

And I want you to realize that the same mechanical structure can appear gentle and caring at one moment and violent and confrontational at another, just by the way it moves.

The structure is the same, only the movement is different.

Actor: "What do you want to know? Well, what do you want to know?"

He was already dead!

I just lay there, my eyes glistening! ”

(Laughter) But graceful movement is just one component of this whole fabric called human-robot interaction.

At the time, I was a PhD student working on human-robot teamwork, a team of humans and robots working together.

I was studying engineering, psychology, and teamwork philosophy, and at the same time found myself in a teamwork situation, with my best friend who was actually here.

And in such situations, it is easy to imagine that robots will be there with us in the near future.

It was after Seder of the Passover.

After folding many folding chairs, I was amazed at how quickly we found our rhythm.

Everyone did their part so there was no need to split the task.

There was no need to verbally communicate this. Everything just happened.

And I thought, humans and robots don't look exactly alike.

When humans and robots interact, it's more like a game of chess. Humans do something, robots analyze human behavior, robots decide what to do next, plan it, and do it.

Then the human waits until it's his turn again.

So it's pretty much like the game of chess, which makes sense since chess is great for mathematicians and computer scientists.

It's all about information, analysis, decision-making and planning.

But I didn't want the robot to be a chess player, but more like a executor who just clicks and works with me.

So I made my second dreaded career choice. I decided to study theater for the first semester.

I finished my PhD and went to acting classes.

I actually attended a play. I hope you don't have that video yet.

(Laughter) And I got all the books on acting, including the 19th century books I borrowed from the library.

I was really surprised because my name was the second name on the list. The previous name was from 1889.

(Laughter) And this book was like waiting 100 years for robotics to be rediscovered.

And the book shows how every muscle in the body can be moved to suit any kind of emotion the actor wants to express.

But the real discovery came when I learned about method acting.

It became very popular in the 20th century.

And in method acting, he says, you don't have to plan every muscle in your body. Instead, you should use your body to find the right movements.

You have to use your sensory memory to reconstruct your emotions and think in your own body to find the appropriate expressions. I improvise and act as a partner in the scene.

And this came to me while I was reading about a trend in cognitive psychology called embodied cognition. This trend speaks to a similar mindset.

We think with our bodies. We don't just think with our brains and move with our bodies, our bodies give feedback to our brains to generate our actions.

And it was like lightning.

I went back to my office and wrote this never-published paper called Acting Lessons for Artificial Intelligence.

And it took another month to put on the then-first-ever play where humans and robots acted together.

That's what you've seen in actors before.

So I thought. How can we create an artificial intelligence model, a computer, a computational model, that models ideas like improvisation, risk taking, taking chances, and even making mistakes?

Maybe you can make better robot teammates.

So I worked on these models for quite some time and implemented them in a large number of robots.

Here you can see a very early example of a robot using this embodied artificial intelligence to try and mimic my movements as closely as possible.

It's kind of like a game.

Let's see.

When I try it, I find it deceiving.

And it's a bit like what actors do when they mirror each other and try to find the right sync between each other.

And then I ran another experiment and asked people in the city to try out this idea of ​​embodied artificial intelligence by using robotic desk lamps.

So, I actually tried using two types of brains for the same robot.

This robot is the same lamp you saw, in which I put two brains.

Half of the people have brains that look like traditional computerized robotic brains.

It waits its turn, analyzes and plans everything.

Let's call it the computational brain.

Another got more of the brain of a stage actor, a risk-taker.

Let's call it Adventure Brain.

Sometimes we act without knowing all there is to know.

Make mistakes from time to time and fix them.

And I had them do this very tedious task that took almost 20 minutes. We had to work together, somehow simulating a kind of repetitive factory job.

What I discovered was that people actually love this adventurous robot.

They thought it was more intelligent, more dedicated, a better member of the team, and contributed more to the team's success.

They even called it "he" and "she", but people with calculating brains called it "it" and no one called it "his" or "she".

When the adventurous minds talked about it after the assignment, they said, ``In the end, we got along well mentally and were able to give a high five.''

whatever that means.

(Laughter) That sounds painful.

People with calculating minds are like lazy apprentices, they said.

It just did what it had to do and nothing more. It's pretty much what people expect from robots. So I was surprised that people had higher expectations of robots than what everyone in robotics thought robots should do.

And in a way, I thought, maybe now is the time. Just as method acting changed the way people thought about acting in the 19th century, from a highly calculated and deliberate way of acting to a more intuitive, risk-taking and embodying way of acting, I thought it might be time for a similar revolution in robots.

A few years later, I had my next research position at Georgia Tech in Atlanta, working with a group that worked with robotic musicians.

And I thought, music, it's the perfect place to observe teamwork, coordination, timing and improvisation. And I got this robot that plays the marimba.

And the marimba, for people like me, was this giant wooden xylophone.

And while watching this, I also looked at other works of human-robot improvisation. Yes, there are other works of human-robot improvisation, but they were also a bit like a game of chess.

Humans play, robots analyze their performances and improvise their own parts.

So this is what musicians call call-and-response interactions, and it fits very well with robots and artificial intelligence as well.

But I thought, using the same ideas I used in my theater and teamwork studies, I might be able to make the robots jam like a band.

Everyone is talking to each other and nobody stops.

So I tried to do the same thing, this time with music. Robots don't know what they're actually playing, but they do what their jazz teacher taught them when they were 17, just by moving their bodies and taking the opportunity to play.

She said that when she improvises, she sometimes loses track of what she's doing, but she still does it.

So I tried to make a robot that didn't know what it was actually doing, but still worked.

Let's take a look at a few seconds of this performance where a robot improvises after listening to a human musician.

And how the human musician reacts to the robot's actions, guesses from the action, and is even surprised at what the robot came up with at some point.

(music) (music ends) (applause) Being a musician is more than just taking notes. Otherwise no one will go see them live.

Musicians also communicate with their bodies, other band members, and audiences, and use their bodies to express their music.

So I thought, since we already have robot musicians on stage, why not make them full-fledged musicians?

And I started designing the socially expressive head of the robot.

The head doesn't actually touch the marimba, it just expresses what the music is like.

These are napkin sketches I took at an Atlanta bar in a dangerous location halfway between my lab and my home.

So I spent an average of 3-4 hours a day there.

In my opinion.

(Laughter) And then I went back to the animation tools and tried to understand not only what the robot musicians would look like, but specifically how they would move. This is to show that the robot musician doesn't like what other people are playing. And maybe even show the beat you're feeling in the moment.

So we finally got the funding to actually build this robot, which was nice.

I will show you the same kind of performance this time with social expressiveness.

And notice one thing. It shows us the beats that the robot is actually picking up from the human, while at the same time giving the human the feeling that the robot knows what it is doing.

It also explains how the movement changes as soon as the solo begins.

(music) Now it shows that it sees and hears me.

(music) Look at the last chord of the song again.

And this time the robot communicates with its body when it's busy with its own business and ready to coordinate the final code with me.

(music) (musical ending) (last chord) (applause) Thank you.

I hope you can understand how much this part of the body that is not in contact with the instrument actually helps you play music.

And at some point -- we're in Atlanta, so of course one day a rapper will come to our lab -- and we'll have the rapper come in and have a little jam with the robot.

Here you can see the robot basically reacting to the beat.

Notice two things. One is how fascinating it is to participate in robots that move their heads.

It makes me want to move my head.

And second, even though the rapper is really focused on his iPhone, he turns around as soon as the robot turns to him.

So even if it's only on the fringes of his vision, in the corners of his eyes, it's very powerful.

The reason is that we cannot ignore physical objects moving in the environment.

We are wired for that.

So if you're having trouble, it's probably because your partner is looking at their iPhone or smartphone too much. It would be nice to put a robot there to draw attention.

(laughter) (music) (end of music) (applause) When I introduce you to the last robot we worked on, it came out of an amazing discovery we made. At some point, people didn't care that robots were intelligent, that they could improvise and listen, and that they could do all these embodied intelligence things that I had spent years developing.

They seemed to really like the fact that the robot was enjoying the music.

(Laughter) And they didn't say that the robots were moving to the music, they said they were "enjoying" the music.

So we thought, why not adopt this idea and designed a new piece of furniture.

This time it wasn't a desk lamp, but a speaker dock, one of the things you plug your phone into.

And what if the speaker dock could not only play music, but actually enjoy it?

Again, here are some early animation tests.

(laughs) And here's what the final product looked like.

(music) (music ends) So many bobbing heads.

(Applause) There were a lot of bobbleheads in the audience, so you can see how robots are influencing people.

And it's not just fun and games.

One of the reasons I'm so interested in bodily communicating and bodily locomotion robots, and I'll tell you a little secret we roboticists keep, is that at some point in your life, all of you will be living with robots.

Somewhere in your future, robots will come into your life.

Your children's lives if you don't.

And I want these robots to be more fluent, more engaging, and more graceful than they currently look.

To that end, I think robots need to be more like stage actors and musicians than chess players.

Perhaps they should be able to take a chance and improvise.

Perhaps they should be able to anticipate what you are going to do.

After all, we are human, so we may even make mistakes and need to be able to correct them.

And perhaps robots that aren't perfect for humans are perfect for us.

thank you.

(applause)

So some time ago when I was in Casablanca, Morocco, I met a young single mother named Faiza.

Faiza showed me pictures of her young son and told me the story of his conception, pregnancy and birth.

It was a remarkable story, but Faiza took the best for last.

"You know, I'm a virgin," she told me.

"I have two medical certificates to prove it."

Here in the modern Middle East, 2000 years after Christ's advent, the virgin birth is still a reality.

Faiza's story is just one of the hundreds I've traveled to in the Arab region over the years and talked to people about sex.

Okay, I know this might sound like a dream job, or perhaps a very questionable profession, but to me it's something else entirely.

I am half Egyptian and Muslim.

But I grew up in Canada, far from my Arab roots.

Like many people across the East and West, over the years I have sought to better understand my origins.

My choice to look at sex stems from my background with HIV/AIDS as a writer, researcher, and activist.

In the Middle East and North Africa, sex is at the center of emerging infectious diseases. These regions are one of only two regions in the world where HIV/AIDS is still on the rise.

Sexuality is now an incredibly powerful lens for studying any society. Because what happens in our intimate lives is reflected by the forces of the larger stage: politics and economics, religion and tradition, gender and generation.

As I've discovered, if you really want to get to know someone, start by looking inside their bedroom.

Indeed, the Arab world is vast and diverse.

But crossing it are three red lines. These are topics that should not be contested in words or deeds.

The first is politics.

But the Arab Spring changed all that, with rebellions blossoming across the region since 2011.

Now, while those in power, old and new, are clinging to business as usual, millions of people are still rebelling and pushing towards what they want for a better life.

The second red line is religion.

But now, with the rise of groups such as the Muslim Brotherhood, religion and politics are becoming intertwined.

And at least some people are beginning to question the role of Islam in public and private life.

What do you think about the third red line, the off-limits subject?

AUDIENCE: Sex.

Shereen El Feki: Louder, I can't hear you.

AUDIENCE: Sex.

SEF: Again, don't be shy.

AUDIENCE: Sex.

SEF: Of course you are, it's sex. (Laughter) Across the Arab region, the only accepted context for sex is marriage. Approved by parents, sanctioned by religion and registered by the state.

Marriage is a ticket to adulthood.

If you don't get married, you can't leave your parent's house, you can't have sex, and you can't give birth to a child.

It is a social fortress. It is an impregnable fortress that can withstand any attack.

And around the fortress is a vast area of ​​taboos against everything: premarital sex, condoms, abortion, homosexuality.

Faiza was living proof of this.

Her virginity declaration wasn't wishful thinking.

The major religions of the region exalt premarital chastity, but patriarchy leaves boys as boys.

Men have sex before marriage, but people more or less turn a blind eye.

Not so with women. A woman is required to be a virgin on her wedding night, that is, to present an intact hymen.

This is not a personal matter, but a matter of family honor, especially male honor.

So women and their relatives go to great lengths to preserve this tiny anatomy, from female genital mutilation to virginity testing to hymen repair surgery.

Faiza chose another route: non-vaginal sex.

Only she got pregnant again.

However, Mr. Faiza was not actually aware of it because there was little sex education at school and little communication within the family.

When Faiza's condition became difficult to hide, her mother helped her escape from her father and siblings.

Honor killings are a real threat to countless women in the Arab region.

And when Faiza eventually reached a hospital in Casablanca, the man who had offered to help her tried to rape her instead.

Unfortunately, Faiza is not alone.

In Egypt, the subject of my research, I have seen many troubles both inside and outside the citadel.

Marriage has become such an expensive proposition that many young people cannot afford it.

They are expected to bear the costs of their marriage, but cannot find work.

This is one of the main factors behind the recent riots and one of the reasons why the age of marriage is rising in many parts of the Arab region.

There are also career women who want to get married but are unable to find a husband because it goes against gender expectations. As one young Tunisian doctor told me, "Women are becoming more and more open.

But this man is still in the prehistoric stage. ”

And there are men and women who cross the heterosexual line, have same-sex sex, and have different gender identities.

They are subject to laws that punish their activities and even their appearance.

And they face daily struggles with social prejudice, family despair, and religious fire and brimstone.

Now, it wasn't all rosy in the matrimonial bed either.

Couples who want greater happiness in their marriage, greater sexual happiness, but are at a loss as to how to achieve it, especially the wife who fears being seen as a bad woman if she sparks in the bedroom.

And there are those whose marriages are actually veiled into prostitution.

They have been sold by families, often to wealthy Arab tourists.

This is just one facet of the burgeoning sex industry across the Arab region.

Raise your hand if this sounds familiar in your area.

yes. The Arab world does not have a monopoly on sexual frustration.

While there is still no Arab Kinsey Report to tell us exactly what is going on inside bedrooms across the Arab region, it is clear that something is wrong.

The double standards of men and women, sex as a source of shame, family control that restricts individual choice, the wide chasm between appearance and reality—what people do and are willing to admit—and a general reluctance to move beyond private whispers to serious and sustained public debate.

A doctor in Cairo summarized it for me: "Here, sex is the opposite of sport.

About football everyone talks about it, but very few people play it.

But when it comes to sex, everybody does it and nobody wants to talk about it.” (laughter) (music) (Arabic) SEF: I want to give you some advice, follow it and you will be happy in life.

When your husband reaches out to you, when he grabs a part of your body, sigh deeply and stare at him with lustful eyes.

When he penetrates you with his penis, try to have flirtatious conversations and move your body with him.

hot stuff!

And these handy tips may sound like they come from "The Joy of Sex" or YouPorn.

But in fact, they originate from a 10th-century Arabic book called the Encyclopedia of Pleasures, which covered sex from aphrodisiacs to zoophilia and everything in between.

This encyclopedia is just one in a long line of Arabic erotica, many written by religious scholars.

Going back to Prophet Muhammad, Islam has a rich tradition of being outspoken about sex. We speak openly not only about the issues of sex, but also about the pleasures of it, for women as well as men.

1000 years ago we had an Arabic sex dictionary.

A language that covers all possible sexual characteristics, positions and preferences, a linguistic system rich enough to compose the female bodies displayed on this page.

Today this history is largely unknown in the Arab region.

Even educated people often feel more comfortable talking about sex in a foreign language than in their native language.

Today's sexual landscape is much like Europe and America, which are on the brink of a sexual revolution.

But it turns out that while Western countries are open to sex, Arab societies seem to be heading in the opposite direction.

In Egypt and many of its neighbors, the shutdown is part of a broader shutdown of political, social and cultural ideas.

And it is the product of a complex historical process that has taken root with the rise of Islamic conservatism since the late 1970s.

Conservatives around the world say no to any challenge to the sexual status quo.

In the Arab region, they label these attempts as a Western conspiracy to undermine traditional Arab and Islamic values.

But what really matters here is one of their most powerful means of control: sex wrapped in religion.

But history shows us that, even down to the days of our fathers and grandfathers, there were times when people were more pragmatic and tolerant, willing to consider alternative interpretations, whether it was abortion, masturbation, or the inflammatory topic of homosexuality.

It's not black and white as conservatives have us believe.

In these matters, as in many other matters, Islam offers us at least 50 shades of gray.

(laughter) Throughout my travels, I have met men and women who explore the realm throughout the Arab region. Sexologists looking to help couples find greater happiness in their marriages, innovators bringing sex education into schools, and small groups of lesbian, gay, transgender, and transsexual men and women reaching out to their peers with online initiatives and real-world support.

More women, and more and more men, are speaking out and resisting sexual violence on the streets and in the home.

There are also organizations trying to help sex workers protect themselves from HIV and other occupational hazards, and NGOs like Faiza helping unmarried mothers find their place in society and, importantly, be with their children.

Today, these efforts are often small, underfunded, and face stiff opposition.

But I am optimistic that in the long term, times will change and they and their ideas will take hold.

Social change in the Arab region does not occur through dramatic confrontations, beatings, or baring, but rather through negotiation.

We are not talking about a sexual revolution here, but a sexual evolution that learns from the rest of the world, adapts to local conditions, and forges its own path rather than following the path blazed by other peoples.

It is my hope that that path will one day lead us to the right to control our own bodies and access the information and services we need to live a satisfying and safe sex life.

The right to freely express one's thoughts, the right to marry the person of one's choice, the right to choose one's partner, the right to be sexually active or not, the right to decide whether and when to have children, all without violence, coercion or discrimination.

We are far from this situation right now across the Arab region, and many things need to change: laws, education, media, the economy, the list goes on and on, but it is at least the work of a generation.

But it begins with my own journey of questioning the common wisdom of sex life.

And it's a journey that has only served to strengthen my faith and my appreciation of the local history and culture by showing me the possibilities that once seemed so absolute.

At a time when many countries in the Arab region are in turmoil, talking about sex, challenging taboos and exploring alternatives may sound like a luxury.

But at this crucial moment in history, if we do not anchor liberty and justice, dignity and equality, privacy and autonomy in our private and sexual lives, it will be very difficult to achieve that in public.

The political and the sexual go hand in hand, and that applies to all of us.

Wherever we live, wherever we love.

thank you.

(applause)

I think that the Coca-Cola cans on the top of Mount Everest and the monks on Monterey are the result of globalization.

(laughter) So I just came from the Himalayas two days ago in response to your kind invitation.

So I would like to invite you to the Himalayas themselves for a while.

And to show where meditators like myself, who started out as a molecular biologist at the Pasteur Institute, found their way to Mt.

These are some of the pictures I was lucky enough to be there to take.

There is Mount Kailash in Eastern Tibet, which is a wonderful environment.

This one is from the Marlborough region.

(Laughter) This is a turquoise lake.

meditator.

August 1st is the hottest day of the year anywhere in eastern Tibet.

And the night before we camped, and my Tibetan friends said, "We're going to sleep outside."

They said "yes but it's summer now".

(Laughter) So now we talk about happiness.

As a Frenchman, I have to say that there are many French intellectuals who do not consider happiness to be of any interest at all.

(Laughter.) I just wrote an essay on happiness, and there was controversy.

And someone wrote an article, "Don't impose the dirty work of happiness on us."

(laughs) "We don't care about being happy. We have to live with passion.

We like the ups and downs of life.

We like suffering because it's so good when it's gone for a while. ”

(laughter) This is the view I saw from the balcony of Himalayan Hermitage.

The size is about 2m x 3m and is always welcome.

(Laughter) Now let's think about happiness or happiness.

First of all, despite what the French intellectuals say, no one seems to wake up in the morning and think, "Can I suffer all day?"

(Laughter) So, consciously or not, directly or indirectly, short-term or long-term, what we do, what we want, what we dream is somehow related to our deep, deep desire for happiness and well-being.

As Pascal said, even those who hang themselves somehow seek the cessation of suffering.

However, an examination of Eastern and Western literature reveals an incredibly diverse range of definitions of happiness.

Some people say that I only believed in remembering the past and imagining the future, never in the present.

Some say that happiness is now. It is the freshness quality of the present moment.

And this led the French philosopher Henri Bergson to say, "All the great thinkers of mankind have left happiness obscure, allowing each to define his own terms."

Well, if it's a secondary interest in life, that's fine.

But now, if it is what determines the quality of every moment in our lives, we should know better and have a clearer idea of ​​what it is.

And perhaps the fact that we don't know it is why so often we turn our backs on happiness when we seek it.

We want to avoid suffering, but somehow we seem to be running toward it.

And it can come from some kind of confusion.

One of the most common is happiness and joy.

But looking at these two characteristics, pleasure depends on time, its object and place.

It is due to natural changes.

A beautiful chocolate cake: We are disgusted when the first cup is delicious and the second cup is not so good.

(Laughter.) That's the nature of things.

I used to be a fan of Bach.

You hear 2 times, 3 times, 5 times.

It can be very tiring if you have to listen non-stop 24 hours a day.

If you feel very cold, come near the fire, it's so wonderful.

After some time and a little back, it will start to burn.

It will use itself as you experience it.

And again, it could be - and it's yours - it's not something that radiates out.

For example, you may experience intense pleasure, but others around you may suffer greatly.

So what is happiness?

Of course, happiness is a very vague term, so let's just say happiness.

Therefore, I think the best definition of happiness, according to the Buddhist view, is that it is more than just a pleasant feeling.

It is a deep stillness and fulfillment.

A state that actually permeates and underlies all emotional states, and all the joys and sorrows that can occur in life.

For you, it may come as a surprise.

Is it possible to have such happiness while being sad?

Because we are talking about another level.

Watch the waves approaching the shore.

When you're at the bottom of a wave, you hit the bottom.

I hit a solid rock.

Everyone rejoices when surfing at the top.

In other words, it goes from elation to depression. No depth.

If you look at the open sea now, you may find a beautiful and calm sea like a mirror.

Storms may occur, but the depth of the sea is still there.

Well, what do you think?

It can only be a state of being, not just a temporary feeling or feeling.

Even joy--it can be a fountain of happiness.

But there is also wicked joy, and you can take pleasure in someone else's suffering.

So how do we proceed in our quest for happiness?

I believe that it would be great if we could meet all the conditions and say, “I have everything to be happy, everything to be happy.”

That very sentence already reveals fate, the destruction of happiness.

to have it all.

Also, when things go wrong, we try to fix things on the outside, but our control over the outer world is limited, temporary, and often illusory.

Now let's look at the internal state.

Isn't it the mind that transforms external conditions into happiness or suffering?

And isn't it strong?

We know from experience that even the so-called "little paradise" can be completely unhappy at heart.

The Dalai Lama once lived in Portugal, and there was extensive construction going on everywhere.

So one night he said, "Look, you're doing this, but why not build something in yourself?"

And without it, he said, "even if you get a high-tech apartment on the 100th floor of an ultra-modern, comfortable building, if you're deeply dissatisfied in your heart, you're just looking for a window to jump out of."

Now, on the contrary, I know many people who manage to maintain their peace, inner strength, inner freedom, and confidence even in the most difficult circumstances.

Now, if the inner situation is more powerful, then of course the outer situation will have an effect. Living longer and healthier, having access to information and education, being able to travel and having the freedom is great.

But this is not enough.

The experience of translating everything is in the mind.

So when we ask ourselves how we feed the conditions of happiness, the internal conditions, and the conditions that undermine our happiness.

So this requires some experience.

We must know for ourselves that there are certain states of mind that serve to thrive in this prosperity, in this happiness, in what the Greeks called eudaimonia.

Some things negatively affect this well-being.

So, from our own experience, anger, hatred, jealousy, arrogance, obsessive desires, obsessive attachments, etc. do not make us feel so good after experiencing them.

And they are also detrimental to the well-being of others.

So we can think that the more they invade our minds, the more miserable and distressed we feel, like a chain reaction.

On the contrary, from afar, we all know, deep down, the acts of selfless generosity that can save a child's life and make someone else happy without anyone knowing.

We don't need that recognition. No gratitude is necessary.

The mere fact of doing so, our innermost nature, provides such fulfillment.

And we always want to be like that.

So is it possible to change our way of being or change our minds?

Aren't those negative or destructive emotions inherent in the nature of the mind?

Can changes occur in our emotions, dispositions and moods?

To do this, we need to ask what the nature of the mind is.

And from an empirical point of view, consciousness has a primary quality, which is simply the fact of being cognitive, being aware.

Consciousness is like a mirror in which all images emerge.

There are ugly faces and beautiful faces in the mirror.

Mirrors allow that, but mirrors are not polluted, modified, or altered by their images.

Similarly, behind every thought there is a naked consciousness, a pure consciousness.

This is nature.

It cannot be inherently tainted with hatred or jealousy. Because if it was always there – like a dye that permeates all fabric – it would always be found somewhere.

We know that we are not always angry, we are not always jealous, we are not always generous.

So the basic structure of consciousness is this pure cognitive quality that distinguishes it from stone, and all emotions are temporary and therefore subject to change.

That is the basis of mind training.

Mind training is based on the idea that two opposing mental factors cannot occur simultaneously.

Love can turn into hate.

But you cannot simultaneously want to do harm and do good to the same object, the same person.

You cannot shake hands or give blows in the same gesture.

Therefore, there exists a natural antidote to the emotions that destroy our inner well-being.

That's the way to go.

A kind of inner feeling of freedom, as opposed to intense attachment and attachment.

Mercy, loving-kindness over hatred.

But naturally, each emotion will require a specific antidote.

Another way is to try to find a general antidote to all emotions, which is just observing the essence.

Normally, when we get irritated, hateful, upset, or obsessed with someone, our minds turn to that object again and again.

The obsession and annoyance intensify each time the subject is faced.

So it's a self-perpetuating process.

So what we should focus on now is not to look outward, but to look inward.

Look at the anger itself.

It looks very menacing, like rolling monsoon clouds and thunderstorms.

You think you can sit on clouds, but when you go there, it's just fog.

Likewise, if you see an angry thought, it will vanish like frost in the morning sun.

If you do this over and over again, each time you let go of your anger, there will be less and less tendency, tendency for it to rise again.

And finally, it may rise, but only crosses its head, like a bird crossing the sky without leaving a trace.

This is the principle of mind training.

Now, all these flaws, tendencies in our minds have taken time to accumulate, so it will take time to reveal them.

But it's the only way.

Transformation of the mind – that is what meditation means.

It means getting used to a new way of being, a new way of perceiving things, better suited to the reality, the interdependence, the flow and the continual change that is our being and our consciousness.

As for the interface with cognitive science, we need to get to it, so perhaps this was a subject on brain plasticity that had to be addressed in a very short time.

Until the last two decades, all nominal ties were thought to be more or less fixed in number and quantity upon reaching adulthood.

Well, recently it turned out that that could change a lot.

A violinist who practiced the violin for 10,000 hours said that some areas of the brain that control finger movement are significantly altered, strengthening synaptic connections.

Can human nature do that?

With loving kindness, patience and tolerance?

That is what the great meditators have done.

Some researchers who have come to labs in places like Madison, Wisconsin and Berkeley have meditated for 20 to 40,000 hours.

They attend retreats for three years, where they meditate twelve hours a day.

And for the rest of my life I will be working 3 or 4 hours a day.

They are the true Olympic champions of mind training.

(Laughter) This is a place where meditators gather -- you can see it's kind of inspiring.

Well, here we have 256 electrodes.

(Laughter.) So what did they find?

Scientist Embargo -- A paper will be submitted to Nature and hopefully accepted.

It deals with the state of mercy, unconditional mercy.

We have asked meditators who have practiced it over the years to place their minds in a state where there is nothing but loving-kindness, total availability to sentient beings.

Of course, during training we use objects to do that.

We think of those who are suffering and those we love, but at some point it can become an all-pervading state.

Here are the preliminary results: I can show you because it has already been shown.

The bell curve shows 150 controls and the focus is on the difference between the right and left frontal lobes.

Simply put, people with more activity in the right prefrontal cortex are more depressed and withdrawn.

On the left side, it's the opposite: altruism, happiness, expression, and curiosity.

In other words, people have a basic line. You can also change it.

If you want to see a comic book movie, go left.

If you are happy with something, go more to the left.

If you are hit with a bout of depression, you are going to the right side.

where -0.5 is the full standard deviation of meditators who meditated on compassion.

It's completely off the bell curve.

So we don't have time to go through all the different scientific results.

Hopefully they will come.

But after three-and-a-half hours of fMRI observation, they found that it looked like it had just stepped out of a spaceship.

Other labs, such as that of Paul Ekman at Berkeley, have also shown that some meditators can control their emotional reactions more than they think.

For example, like a startling experiment.

Putting a man in a chair with a device like this that measures your physiology is like going off a bomb. It's a very instinctive reaction and in 20 years I haven't seen anyone not jumping off.

Some meditators don't try to stop it, they just go completely open and think that the impact is just a small event like a shooting star, and they don't move at all.

So the point is not to create some sort of circus of exceptional beings who can jump and so on.

Rather, it can be said that the training of the mind is important.

This is not a soul supplement vitamin.

This is what determines the quality of every moment in our life.

We are ready to spend 15 years making education a reality.

We love jogging and fitness.

We strive to stay beautiful.

But we spend an astonishingly short amount of time dealing with what matters most: how our minds work. This, too, is the ultimate determinant of the quality of our experience.

Compassion should now be put into action.

That's what we try to do in different places.

This one example alone is worth the effort.

A woman with bone tuberculosis was left alone in a tent to die with her only daughter.

What will she be like in a year from now?

We have done various schools and clinics in Tibet.

And I just leave you with the beauty of that look that speaks to my happiness beyond words.

(laughs) And the Tibetan jumping monks.

(laughs) Flying monks.

thank you very much.

Some of my fondest childhood memories are spending time with my grandmother, Mamal, in our four-family home in Brooklyn, NY.

Her apartment was an oasis.

It was a place where you could sneak a cup of coffee. The coffee was really warm milk with just a hint of caffeine.

she loved life

She worked in a factory, but saved up some change and traveled to Europe.

And I remember poring over those pictures with her and then dancing to her favorite music.

And when I was 8 and she was 60, something changed.

She no longer worked or traveled.

She no longer dances.

There was no more coffee time.

My mother took a day off from work and took her to the doctor, but they couldn't diagnose her.

And her father, who worked nights, spent every afternoon with her to make sure she had enough to eat.

For our family, caring for her ended up costing us everything.

And by the time the diagnosis was made, she was in a deep spiral.

Now, many of you will recognize her symptoms.

My grandmother had depression.

She suffered a severe, life-altering depression from which she never recovered.

And at the time, little was known about depression.

But even today, 50 years later, there is still much to learn.

Today, women are 70% more likely than men to experience depression during their lifetime.

And despite this high prevalence, women are misdiagnosed 30-50% of the time.

We now know that women are more likely than men to experience symptoms such as fatigue, sleep disturbance, pain and anxiety.

And these symptoms are often overlooked as symptoms of depression.

And these gender differences occur not only in depression, but across a great many diseases.

So my grandmother's struggles led me to a lifelong quest.

Today, I lead a center whose mission is to understand why these gender differences occur and to use that knowledge to improve women's health.

Today we know that every cell has a gender.

Now, this is a term coined by the Institute of Medicine.

What that means is that men and women are different down to the cellular and molecular level.

That means we are different in every organ.

From the brain to the heart to the lungs to the joints.

Well, data on women's health beyond reproductive function were scarce until just 20 years ago.

But then in 1993 the NIH Recovery Act was signed.

And the law mandated the participation of women and minorities in clinical trials funded by the National Institutes of Health.

And in many ways the law works.

Women are now regularly participating in clinical studies, and we know that there are significant differences in how women and men perceive illness.

But surprisingly, what we've learned about these differences is often overlooked.

So we need to ask ourselves why we leave women's health to chance.

And we leave it to chance in two ways.

The first is that we still have much to learn and we have not invested in fully understanding the extent of gender differences.

And second, we are not taking what we have learned and applying it routinely to clinical care.

we are not working hard enough.

So, here are three examples of how gender differences are impacting women's health and why we need to do more.

Let's start with heart disease.

It kills the most women in America today.

This is the face of heart disease.

Linda was a middle-aged woman who had a stent in one of her arteries going to her heart.

She sought medical attention again as her symptoms returned.

Her doctor performed the golden test, a cardiac catheterization.

I didn't see any clogs.

Linda's symptoms continued.

She had to quit her job.

And then she found us.

When Linda came to us, we had another cardiac catheterization and this time we found clues.

However, another test was needed to make the diagnosis.

So we did a test called intracoronary ultrasonography, which uses sound waves to see the arteries from the inside out.

And what we discovered was that Linda's illness did not resemble the typical male illness.

A typical male disease looks like this.

There is a discrete blockage or stricture.

Linda's illness, like many female illnesses, goes like this:

Plaques are laid out more evenly and more diffusely along the artery, making them less visible.

So for Linda, and for many women, the gold standard test was not gold.

Well, Linda got proper treatment.

She has returned to her old life and fortunately she is fine today.

But Linda was lucky.

She found us and we found her sick.

But for many women, this is not the case.

We have all the tools.

We have the technology to diagnose

However, these gender differences are often overlooked.

What about treatment?

A groundbreaking study published two years ago asked a very important question: What is the most effective treatment for heart disease in women?

The authors examined papers written over a decade, and hundreds of papers had to be discarded.

And they found that 65 percent of the excluded people were excluded because the analysis did not distinguish between women and men, even though women were included in the study.

What a lost opportunity!

The money had run out, but I had no idea how the women were living.

And none of these studies have contributed to the all-important question of what is the most effective treatment for heart disease in women.

I would like to introduce my godmother Hortense, my colleague's relative Hung Wei, and someone you may recognize, Dana, the wife of Christopher Reeve.

The three women have something very important in common.

All three were diagnosed with lung cancer, which is today the leading cause of cancer death among women in the United States.

All three were non-smokers.

Sadly, Dana and Hung Wei passed away from an illness.

What we do know now is that nonsmoker women are three times more likely to be diagnosed with lung cancer than nonsmoker men.

Interestingly, when women are diagnosed with lung cancer, they tend to live longer than men.

Well, here are some clues.

Our researchers found that specific genes are present in both female and male lung tumor cells.

And these genes are activated mainly by estrogen.

And overexpression of these genes is associated with improved survival only in young women.

This is a very early finding and it is not yet known if it is relevant for clinical care.

But discoveries like this offer hope and could offer a life-saving opportunity for both women and men.

Here's an example of how taking gender differences into account can drive science forward.

A few years ago, new lung cancer drugs were being evaluated, and when the authors surveyed whose tumors had shrunk, they found that 82% were women.

This led them to question:

And what they found was that the gene mutations targeted by the drug were much more common in women.

And this has enabled a more individualized approach to lung cancer treatment that includes gender.

This is what can be achieved if women's health is not left to chance.

We know that when you invest in research, you get results.

Let's take a long-term look at mortality from breast cancer.

Next, let's look at mortality from lung cancer in women over time.

Next, let's look at the amount invested in breast cancer (investment per death) and the amount invested in lung cancer.

Today, it is clear that our investments in breast cancer are paying off.

It may not be fast enough, but it's getting results.

You can do the same for lung cancer and all other diseases.

Now let's get back to talking about depression.

Depression is the leading cause of disability for women in the world today.

Our researchers found differences in the brains of women and men in areas related to mood.

And if you put a man and a woman in a functional MRI scanner, it's the kind of scanner that shows how the brain is functioning when it's activated. So putting them in the scanner would put them under stress.

You can really see the difference.

And we believe that findings like this hold some clues as to why we see such a very important gender difference in depression.

But even with these differences, 66 percent of brain studies that start with animals are done in either male animals or animals with indistinguishable sex.

So I think we need to ask the question again. Why leave women's health to chance?

And this is the question that plagues scientists and medical practitioners who believe that we are on the verge of dramatically improving women's health.

We know that every cell has a gender.

We know these differences are often overlooked.

Therefore, we know that today women are underrepresented by modern science and medicine.

We have the tools, but we lack the collective will and momentum.

Women's health is an equal rights issue as important as equal pay.

And it is a question of the quality and integrity of science and medicine.

(Applause.) So imagine how much momentum we could achieve in advancing women's health if we considered whether these gender differences existed in the first stages of our research programme.

Or if you analyze the data by gender.

So people often ask me: "What can I do?"

And here's what I suggest: First, I encourage you to think about other causes that are important to you and think about women's health the same way you care.

And second, and just as importantly, as a woman, you need to ask your family doctor or those who care for your loved ones, "Is this disease or treatment different for women?"

Now this is a deep question. The answer is probably yes, but doctors may not know the answer, at least not yet.

But if you ask a question, the doctor will probably go looking for the answer.

And this is very important not only for ourselves, but also for everyone we love.

Be it mother, daughter, sister, friend or grandmother.

It was my grandmother's suffering that inspired my work to improve women's health.

That's her legacy.

Our legacy is to improve the health of women in this generation and generations to come.

thank you.

(applause)

I've spent the last few years trying to solve two mysteries. That's why productivity is so disappointing at every company I work for.

I have worked with over 500 companies.

In spite of all technological advances: computers, IT, communications, telecommunications, the Internet.

Mystery #2: Why is there so little engagement at work?

Why do people feel so miserable even when actively disconnected?

Disengage a colleague.

Acts contrary to the interests of the company.

Regardless of any affiliation event, celebration, HR initiative, leadership development program to train managers on how to motivate their teams.

Initially, I thought it was a chicken and egg problem. That means people are less engaged and therefore less productive.

Or vice versa, because they are less productive, we put more pressure on them and they become less involved.

However, as we proceeded with our analysis, we discovered that these two problems actually share a common root cause that is related to the fundamental pillars of management.

Our method of organization is based on two pillars.

Hard -- structures, processes, systems.

Soft things - feelings, emotions, interpersonal relationships, traits, personality.

And whenever a company implements a restructuring, restructuring, restructuring or culture change program, it chooses these two pillars.

Now we are trying to refine and combine them.

The real problem is that while this is the answer to the two riddles, these pillars are obsolete.

Everything you read in business books is based on one or the other or a combination of both.

they are obsolete.

How do these approaches work in the face of new business complexities?

The difficult approach is basically to start with strategies, requirements, structures, processes, systems, KPIs, scorecards, committees, headquarters, hubs, clusters, etc.

We forgot all about metrics, incentives, committees, middle offices and interfaces.

Basically what's happening on the left side is more complex and becomes the new complexity of business.

Quality, cost, reliability and speed are required.

And every time a new requirement arises, we use the same approach.

We basically create a purpose-built structural processing system to handle the new complexities of our business.

A hard-line approach only complicates the organization.

Let's take an example.

A car company's engineering department is a five-dimensional matrix.

Expanding any cell of the matrix reveals another 20-dimensional matrix.

It has Mr. Noise, Mr. Petrol Consumption and Mr. Anti-Collision properties.

For new requirements, we have a dedicated department responsible for adjusting engineers to meet new requirements.

What happens when new requirements emerge?

A few years ago, a new requirement appeared on the market: longer warranty periods.

So the new requirement is serviceability, making the car easy to repair.

Otherwise, when you bring the car into the garage to fix the lights, if you have to remove the engine to access the lights, the car will have to stay in the garage for a week instead of two hours, exploding your warranty budget.

So what would be the solution using the hard approach?

If repairability is a new requirement, the solution is to create a new feature, Mr. Repairability.

And Mr Repairability creates a repairable process.

It has a remediability scorecard, remediability metrics, and ultimately remediability incentives.

This outperformed 25 other KPIs.

What percentage of this is variable compensation?

Dividing the maximum 20% by the 26 KPIs yields a repairability difference of 0.8%.

How did their choice to simplify change their behavior? Zero.

But what if the impact is zero? Mr. Remediability, Processes, Scorecards, Assessments, Coordination with the other 25 coordinators have no impact.

Faced with new business complexities, the only solution is to not draw boxes on the report line.

It's basically an interaction.

how the parts work together.

connection, interaction, synapse.

It's not the skeleton of a box, it's the nervous system of adaptability and intelligence.

Basically, you can call it cooperation.

When people work together, they use fewer resources. in everything.

As you know, the problem of reparability is a question of cooperation.

When designing your car, consider the needs of those who repair cars in your after-sales garage.

If we don't work together, it will take more time, more equipment, more systems, more teams.

What we need is more inventory, more inventory and more working capital when procurement, supply chain and manufacturing are not aligned.

Who will pay for it?

Shareholder? Are you a customer?

No, they will refuse.

So who's left? Employees who must make up for their lack of coordination with hyper-personal effort.

Stress, burnout, overwhelm and accidents happen.

No wonder they leave.

How are hardware and software going to facilitate cooperation?

The pain point: Banks don't cooperate when there's a problem between the back office and the front office. What is the solution?

They create a middle office.

What will it look like in a year from now?

I used to have one problem between the back and front, now I have two.

Between back and middle, between middle and front.

In addition, you have to pay for middle office costs.

A hard-line approach cannot foster cooperation.

You can only add new boxes, new bones to your skeleton.

A Soft Approach: Getting people to work together requires them to like each other.

The more they improve their interpersonal feelings and like each other, the more they cooperate.

That's totally wrong.

It can even have the opposite effect.

Look, I have two TVs at home. why?

You don't really have to cooperate with your wife.

(Laughter) Because you don't have to impose trade-offs on your wife.

And it is precisely because I love my wife that I try not to impose tradeoffs on her.

If I don't love my wife, one TV is enough. Watch my favorite football game. If unsatisfied, what about books and doors?

(Laughter) The more we like each other, the more we avoid true cooperation, which strains our relationship by imposing hard trade-offs.

Then purchase a second TV or escalate the above decision to arbitration.

Arguably, these approaches are outdated.

To deal with complexity and strengthen your nervous system, we created what we call the Smart Simplicity approach, based on simple rules.

Simple Rule #1: Understand what other people are doing.

what is their real job?

To understand what's really going on, you have to go beyond the surface of boxes, job descriptions, and containers.

Me, designer, I know that if I run the wires here, I'll have to remove the engine to access the lights.

Next, we need to harden the integrator.

An integrator is not an intermediary office, but a manager, an existing manager that you augment to give others the authority and interest to work together.

How can managers be strengthened as integrators?

By deleting layers.

Too many layers push people too far away from the action, requiring KPIs and metrics, and a poor proxy for reality.

They don't understand reality, making metrics and KPIs even more complex.

By removing the rules, the bigger the company, the more integrators you need, and therefore the fewer rules you need to give managers discretion.

And we do the opposite. The bigger we get, the more rules we create.

And finally we come to the rule encyclopedia Britannica.

The amount of power needs to be increased so that everyone can exercise their own judgment and intelligence.

We need to provide people with more cards so that they can take risks, work together, and have the necessary amount of cards to get out of isolation.

Otherwise they will withdraw. they will leave

These rules come from game theory and organizational sociology.

You can increase the shadow of the future.

Create a feedback loop that exposes people to the consequences of their actions.

This is an action taken by a car company that determined that Mr Repairability had no impact.

They told the design engineer: "Well, three years from now when a new car hits the market, you're going to move into the after-sales network and you'll be responsible for the warranty budget. If the warranty budget explodes, you're going to explode in your face."

We also need to remove the buffer that makes us self-sufficient and increase reciprocity.

When you remove these cushions, you grab my nose and I grab your ears.

I will be happy to cooperate.

Remove the second TV.

Workplaces are full of second TVs that don't create value and only provide dysfunctional self-sufficiency.

Those who cooperate should be rewarded, and those who do not should be held accountable.

Jorgen Vig Knudstorp, CEO of The Lego Group, showed us some great ways to use Lego.

He says the blame isn't for failure, but for not helping or asking for help.

it changes everything.

Suddenly it became my interest to be transparent about my true weaknesses and true expectations. Because I know you can't blame me for failing, but I can blame you for helping or not asking for help.

Doing this has many implications for organizational design.

Stop drawing boxes, dotted lines, and solid lines. You focus on their interactions.

It has many implications for the monetary policy we adopt.

On human resource management practices.

Then you'll be able to manage the new complexity of your business without adding complexity.

You can create more value at a lower cost.

Work performance and satisfaction are improved at the same time by removing the common root causes that hold them both back.

Complexity: Business leaders, this is your battle.

The real battle is not against your competitors.

This is silly and very abstract.

When will we meet to fight our competitors?

The real battle is against ourselves, our bureaucracy, our complexity.

Only you can fight, you can do it.

thank you.

(applause)

Joe Cowan: I have stage fright.

I've always had stage fright, not just a little bit, but a lot of it.

It didn't bother me until I was 27.

That was when I started writing songs, but even then, I was playing them just for myself.

Just knowing my roommate was in the same house made me uncomfortable.

But after a few years, writing songs was no longer enough.

I had so many of these stories and ideas that I wanted to share with people, but I was physiologically unable to do so.

I had this irrational fear.

But the more I wrote, the more I practiced, the more I wanted to perform.

So the week of my 30th birthday, I decided to go to this local open mic and forget about this fear.

Well, it was full when we arrived.

There were about 20 people there.

(Laughter.) And they all looked angry.

But I took a deep breath, signed up to play, and felt a lot better.

It was pretty good, but until about 10 minutes before my turn, my whole body rebelled and a wave of anxiety came over me.

Now, when we feel fear, the sympathetic nervous system is activated.

So adrenaline rushes, heart rate increases and breathing quickens.

Next, shutdown of non-essential systems such as digestion begins. (Laughter) So the mouth gets dry, the blood is drawn away from the extremities, and the fingers get stuck.

Your pupils dilate, your muscles contract, your Spider-Man senses tingle, and basically your entire body is satisfied with the trigger. (laughs) In that state, it is not suitable for playing folk music.

(Laughter) I mean, your nervous system is stupid.

TRUE? 200,000 years of human evolution and you still can't tell the difference between a sabre-toothed tiger and 20 folk singers at an open mic on Tuesday night?

(Laughter.) I've never been so scared. Until now.

(laughter and cheers) So now it's my turn, and somehow I get on stage, start singing, open my mouth to sing the first line, and this absolutely horrible vibrato -- you know, when the voice shakes -- pours out.

And this is not the good kind of vibrato like an opera singer, this is just my whole body jerking with fear.

I mean, it's a nightmare.

I'm embarrassed, the audience is clearly uncomfortable, they're focusing on my discomfort.

It was so bad.

But that was my first real experience as a solo singer-songwriter.

And then something good happened. It was just a glimpse of the connection with the audience that I expected.

and wanted more. But I knew I had to work through this tension.

That night, I promised myself that I would come every week until I was no longer nervous.

And I did. I went every week, and sure enough, my symptoms did not improve week after week. The same thing happened every week. (Laughter) I didn't waver.

And then I had an epiphany.

I remember it well because I don't have much inspiration. (laughs) I should have written a song that took advantage of the tension.

The only time it looks real is when you have stage fright, and the more nervous you are, the better the song should be. easy.

So I started writing songs about stage fright.

First, I really think about the problem, the physical symptoms, how I feel, how the listener feels.

And I knew I would be singing about half an octave higher than normal because I was nervous, considering my trembling voice etc.

Having a song that explained what was happening to me gave the audience permission to think about it while it happened.

They didn't have to think badly of me because I was nervous, they could experience it with me and we were all a big happy, nervous and uncomfortable family. (Laughter) By thinking about my audience, embracing my problem, and using it, I was able to remove a blocker to my progress and turn it into a critical part of my success.

And having a stage fright song helped me get over that biggest problem right after the performance started.

And then I was able to move on and play the rest of the songs a little easier.

And in the end, I didn't have to play stage fright songs at all.

Except when I was really nervous like now. (Laughter) May I play a song about stage fright?

(Applause.) Can I have a sip of water?

(music) Thank you.

♫ No kidding, you know, ♫ ♫ This stage fright is real. ♫ ♫ And if I'm trembling here singing, ♫ ♫ Well, you know how I feel. ♫ ♫ And the mistake I make is ♫ ♫ tremolo caused by the shaking of the whole body. ♫ ♫ While you're sitting there feeling ashamed of me, ♫ ♫ Well, you don't have to. ♫ ♫ Well, maybe just a little. ♫ (Laughter) ♫ And I'm going to try to imagine you all without clothes. ♫ ♫ But singing in front of naked strangers scares me more than anyone else. ♫ ♫ I'm not going to go into this at length, ♫ ♫ But my body image has never been my forte. ♫ ♫ Frankly, I'd like you to be dressed, ♫ ♫ so you're not even really naked. ♫ ♫ And I'm the one with the problem. ♫ ♫ And you tell me don't worry so much, you'll be fine. ♫ ♫ But I'm the one who lives with you ♫ ♫ And I know what's going to happen. ♫ ♫ Your advice is kind, but slow. ♫ ♫ Unless you're a little patronizing. ♫ ♫ And that sarcastic tone doesn't help me when I sing. ♫ ♫ But we shouldn't be talking about things like this now. ♫ ♫ Really, I'm on stage and you're in the crowd. Hi. ♫ ♫ And I'm not making fun of my irrational uncultivated fear, ♫ ♫ And I'm sure hell wouldn't have been here if I hadn't been prepared to face this ♫ ♫. ♫ ♫ But if I make just one sound out loud, ♫ ♫ you will see that I am slowly but surely recovering. ♫ ♫ And maybe next week I'll play your guitar ♫ ♫ My voice is as clear as water and everyone is singing. ♫ ♫ But maybe I'll get up and start the groove, ♫ ♫ The vocal cords move, ♫ ♫ at a speed slightly faster than the sound. ♫ (applause)

I want to rethink education.

Last year, a new four-letter word was invented.

starts with M.

MOOC: Massive Open Online Course.

Many organizations offer these online courses for free to millions of students around the world.

Anyone with an internet connection and a desire to learn can access these great courses from the best universities and earn a certificate upon completion.

Now, in this discussion today, I would like to focus on another aspect of MOOCs.

We are taking what we are learning and developing technologies on a large scale and applying them on a small scale to create a mixed model of education to truly reinvent and rethink what we do in the classroom.

Now our classrooms can take advantage of the change too.

This is a classroom at MIT, this tiny three-letter institution in the northeastern United States.

And this is the classroom about 50-60 years ago, and this is the classroom today.

What has changed?

The seats are colored.

husband.

Education hasn't changed at all in the last 500 years.

The last great innovation in education was the printing press and textbooks.

Everything else around us has changed.

Everything has changed, from healthcare to transportation, but education has not changed.

Access is also a big problem.

So what you're seeing here isn't a rock concert.

And it's not Madonna at the end of the stage.

This is a classroom at Obafemi Awolowo University in Nigeria.

Now, I'm sure you've all heard about distance learning, but I think the students are in the back, 200 feet away from the instructor, and they're getting distance learning.

I truly believe that technology can now transform both the quality, scale and access of education.

For example, edX is transforming education through online technology.

Given that education has been calcified for 500 years, redesigning or micromanaging it is really unthinkable.

It really has to be completely rethought.

It's like riding a plane from an oxcart.

Even the infrastructure has to change.

everything must change.

We need to move from blackboard lectures to online exercises to online videos.

A must go for interactive virtual labs and gamification.

We must grade entirely online, interact with colleagues, and utilize discussion boards.

Everything really has to change.

That's why edX and many other organizations are applying these technologies to education through MOOCs to really increase access to education.

You've heard this example before. When we started our first course about a year and a half ago, it was a course in hard circuits and electronics at MIT. 155,000 students from 162 countries have enrolled in this course.

And there was no marketing budget.

Now, 155,000 is a big number.

This number is more than the total number of alumni in MIT's 150-year history.

It was a difficult course with 7,200 successful applicants.

The number 7,200 is also big.

If I taught two semesters each year at MIT, I would have to teach for 40 years before I could teach that many students.

Now, these sheer numbers are just part of the story.

So today I would like to talk about another aspect of MOOCs, another perspective.

We apply what we developed and learned in large-scale learning to small-scale classrooms to create a blended learning model.

Before we get into that, let me tell you something.

When my daughter turned 13 and became a teenager, she stopped speaking English and started speaking this new language.

I call it teeny.

It's a digital language.

There are two sounds, Moan and Silence.

"Honey, please come to dinner."

"Hmm."

"Did you hear me?"

silence. (Laughter) "Can you hear me?"

"Hmm." So we had a huge communication problem, and we weren't communicating at all until one day I had this epiphany.

I texted her. (Laughter) The answer came immediately.

I said, "No, it must be a coincidence."

She must have thought that some friend had called her.

So I texted her again. Boom, another reaction.

I said, this is great.

And our lives have changed since then.

I email her and she replies.

It was really great.

(Applause.) So our millennials have a different structure.

Now that I'm older, I'm not a millennial, although my youthful appearance might not believe it.

But our children are really different.

Millennials are completely used to online technology.

So why fight in the classroom?

Let's not fight. Accept it.

In fact, I believe so - and I have two thumbs and can't text very well - but I'm willing to bet that evolution will make our children and grandchildren much better at texting with really, really little thumbs, and that evolution will solve all of that.

But what if we embrace technology, embrace the natural tastes of millennials, and get serious about creating these online technologies to blend into their lives?

So what we can do is:

So instead of driving the kids into the classroom and kicking them out at 8 in the morning, I hated going to class at 8 in the morning, so why force them to do that?

Instead, you can watch videos and engage in interactive exercises in the comfort of your dorm room, bedroom, dining room, bathroom, or anywhere else you find most creative.

They then come to the classroom and interact directly.

They can argue among themselves.

Together they can solve problems.

They can work with professors to get them to answer their questions.

In fact, this was happening without our knowledge when we were teaching our first courses on circuits and electronics around the world using edX.

Two high school teachers from Santo High School in Mongolia used our video lectures and interactive exercises by flipping their lessons. High school learners (age 15), mind you, went to their homes to do these things, came to class, interacted with each other, and did physical lab work as you can see in this image.

And the only way we discovered this was because they were blogging and we stumbled across the blog.

Other pilots were also doing it.

So we partnered with San Jose State University in California to pilot an experimental blended course in our circuits and electronics course.

You will hear it often. The course has become something of a petri dish for us to learn.

There, the students again had the instructor flip the classroom to blend the online and face-to-face, and the results were astonishing.

Do not take this result to the bank yet.

I'll be experimenting a little more, so please wait a little longer. However, early results are impressive.

So, traditionally, semester by semester for the past few years, this course was still a hard course, with a semester failure rate of about 40-41 percent.

By the end of last year, the failure rate had dropped to 9% in this mixed class.

So the results can be very good.

Before I dive into this, I'd like to take the time to discuss some key ideas.

What's the key idea to make all of this work?

One idea is active learning.

The idea here is that instead of having students walk into a classroom and watch a lecture, we turn this into a so-called lesson.

Lessons are interleaved with a series of videos and interactive exercises.

So students might watch a 5-7 minute video followed by an interactive exercise.

Consider this the ultimate Socraticization of education.

I teach by asking questions.

And this is a form of learning called active learning, which is actually driven by a very early 1972 paper by Craik and Lockhart. There they stated and found that learning and retention are actually strongly related to the depth of mental processing.

Students learn better by manipulating the material.

The second idea is to go at your own pace.

Now, when I go to the lecture room, if you're like me, you'll lose sight of the professor within five minutes.

I wasn't that smart, and sometimes I would scramble to take notes and forget the lecture for the rest of the day.

Wouldn't it be better to use online technology to provide students with videos and interactive engagements instead?

They can hit the pause button.

They can rewind professors.

You can even silence the professor's remarks.

So this form of self-pacing is very helpful for learning.

Our third idea is immediate feedback.

The computer scores your exercises with immediate feedback.

I mean, how else can you teach 150,000 students?

Your computer scores all exercises.

And we all turn in our homework and the grades come back in two weeks and you forget all about it.

I feel like I haven't received my undergraduate homework yet.

Some are not evaluated.

So you get instant feedback so your students can apply their answers.

Get instant feedback if you make a mistake.

The more you try it over and over again, the more attractive it becomes.

They got immediate feedback and this little green check mark you see here is becoming something of a cult symbol on edX.

Learners say they go to sleep dreaming of green check marks at night.

In fact, one of the learners who took the Circuits course early last year continued to take Berkeley's software course at the end of the year. This learner had to say the following about a green check mark on a discussion board when he had just started his course. I wonder if I wanted to meet you When was the last time you saw a student post a comment like this about their homework?

My colleague Ed Bertzinger, head of the MIT physics department, has this to say about instant feedback: He pointed out that instant feedback turns teaching moments into learning outcomes.

The next big idea is gamification.

As you know, all learners are very enthusiastic about things like interactive videos.

They sat and shot all day long until they caught the alien spacecraft.

Now you can apply these gamification techniques to learning and build online labs.

How do you teach creativity? How do you teach design?

This can be done through online labs, and computing power can be used to build online labs.

As this little video shows here, you can involve your students in the same way they design with Lego.

Here learners are building circuits as easily as Lego.

And this can also be scored by computer.

The fifth is peer learning.

That's why we use discussion forums, discussions, and Facebook-like interactions here to really help students learn, not as a distraction.

let me talk

When I ran a circuit course with 155,000 students, I couldn't sleep for three nights before the course started.

I told the TAs that I would monitor the forums 24/7 and answer questions.

They answered questions from 100 students.

What do you do with 150,000?

So one night at 2am I was sitting there and I think I had a question from a student from Pakistan. He asked a question, and I said, okay, let's type in the answer, I don't type so quickly, so I started typing in the answer, and before I was done, another student from Egypt suddenly came up with the answer, which wasn't quite right. So I am amending my answer and before I finished a student from the US came.

Another answer has emerged.

And I sat back down in a trance.

Boom, boom, boom, the students were discussing and interacting with each other. By 4am that night, I was completely mesmerized and had this epiphany. And by 4am in the morning they had found the correct answer.

And all I had to do was congratulate them for the good answer.

It's really great to let us know that students are learning from each other and learning by teaching.

Now, this is not all about the future.

This is what is happening today.

So we are applying this blended learning pilot in many universities and high schools around the world, from Tsinghua University in China to the National University of Mongolia in Mongolia to Berkeley in California.

And this kind of technology really helps, and the blended model really helps revolutionize education.

It also solves the business side of the practical problem of MOOCs.

These MOOC courses can also be licensed to other universities, and there is a monetization model for MOOCs where licensed universities, along with professors, can use these online courses like next-generation textbooks.

They can be used as often as they like and it becomes a tool in the teacher's arsenal.

Lastly, I would like to share a little dream with you.

I want you to fundamentally rethink education.

We need to move from lecture halls to electronic spaces.

We need to move from books to tablets like India's Aakash and the $20 Raspberry Pi.

Aakash is $40.

We need to move from physical school buildings to digital dormitories.

Ultimately, though, I think the university will still need one lecture room.

Otherwise, how else would you tell our grandchildren that your grandparents sat in that room, in rows like corn stalks, watching this professor talk about content for the last time, and you know, there wasn't even a rewind button?

thank you.

(Applause.) Thank you. thank you. (applause)

In 2007 I became Attorney General of New Jersey.

Prior to that, I was a criminal prosecutor, first with the Manhattan District Attorney's Office and then with the U.S. Department of Justice.

But when I became Attorney General, two things happened that changed my view of criminal justice.

The first was asking what I thought was a really basic question.

I wanted to understand who we were arresting, who we were prosecuting, who we were putting in prisons and prisons in this country.

I also wanted to understand if we are making decisions in a way that makes us safer.

And I couldn't pull this information out.

It turns out that most large criminal justice agencies like mine don't keep track of what matters.

So, after about a month of incredible frustration, I went to a conference room full of detectives and piles of case files, and detectives sat there with yellow legal pads, taking notes.

They've been trying to get me the information I've been looking for on a case-by-case basis for the past five years.

And as you can imagine, when the final result came, it wasn't a good one.

It turned out that we had a number of low-level drug incidents on the street just down the road from our office in Trenton.

The second thing that happened was that I spent the day at the Camden, New Jersey Police Department.

Well, at that time, Camden, New Jersey was the most dangerous city in America.

That's why I ran the Camden Police Department.

I spent the day at the police station and was taken to a room with a police officer. They were all working hard to reduce crime in Camden.

And when we were discussing ways to reduce crime, what I saw in that room was a series of police officers with lots of little yellow sticky notes.

And then they picked up a yellow sticky note, wrote something on it, and stuck it to the board.

And one of them said, "There was a robbery two weeks ago.

We have no suspects. ”

Another man said: "There was a shooting in this neighborhood last week. No suspects."

I wasn't using data-driven policing.

We were basically trying to fight crime with yellow post-its.

Now, both of these things have made us realize that we are fundamentally failing.

We didn't even know who was involved in the criminal justice system. I didn't have any data on anything that mattered. And they didn't share data or use analytics or tools to make better decisions and reduce crime.

And for the first time, I started thinking about how we made decisions.

When I was an assistant prosecutor, and as a federal prosecutor, I saw the case in front of me and mostly made decisions based on my intuition and experience.

When I became Attorney General, I could see the whole system. And to my surprise, I realized that this is exactly what happened throughout the system: police, public prosecutor's office, courts, prisons.

And what I learned quickly is that we weren't doing a good job.

So I wanted to do something different.

We wanted to introduce data and analytics, rigorous statistical analysis into our work.

In short, I wanted to moneyball criminal justice.

Now, as many of you know, Moneyball is what the Oakland Athletics did, and they went from a system based on scouting in baseball to a system that uses smart data and rigorous statistical analysis, using smart data and statistics to find out how to pick players that will help them win games.

It worked for the Oakland Athletics, and it worked for New Jersey.

We've taken Camden off the top of our list as the most dangerous city in America.

We have reduced homicides there by 41 percent. This means that 37 lives were actually saved.

And it reduced all crime in the city by 26%.

It also changed the method of criminal prosecution.

So we've gone from low-level drug crimes that take place outside buildings to dealing with high-profile cases statewide, from dealing with the most violent offenders to reducing violence, street gangs, gun and drug trafficking, and prosecuting political corruption.

All of this is very important to me because public safety is the most important function of government.

If we are not safe, we will not be educated, we will not be healthy, we will not be able to do anything in life.

And we live in a country today facing serious criminal justice problems.

12 million people are arrested each year.

The majority of arrests are for low-level crimes, such as petty crimes, at 70-80%.

Less than 5 percent of all arrests are for violent crimes.

But we spend $75 billion a year on state and local correctional costs, or $1 billion.

Today, there are 2.3 million people in our prisons and detention centers.

And with two-thirds of the people in prison awaiting trial there, we face an incredible public security challenge.

They have not yet been convicted.

They are just waiting for their court date.

And 67 percent of people come back.

Our recidivism rate is among the highest in the world.

Nearly 7 out of 10 people released from prison are rearrested in a cycle of crimes and imprisonment.

So when I started working at the Arnold Foundation, I was inspired to revisit many of these questions and think about how data and analytics have been used to transform the way New Jersey conducts criminal justice.

And looking at the U.S. criminal justice system today, I feel exactly the same way I felt when I started attending New Jersey. It means we absolutely have to improve, and we know we can do better.

So I decided to focus on using data and analytics to make the most important public safety decisions. The decision is to determine, when someone is arrested, whether the person poses a public safety hazard and should be detained, or whether the person poses no public safety hazard and should be released.

Everything that happens in a criminal case comes from this one decision.

It affects everything.

affect sentencing.

It affects whether someone takes medication.

It affects crime and violence.

And, as I always do now, when I talk to judges across the country, they all say the same thing. That is, we are putting dangerous people in prison and releasing non-dangerous, non-violent people.

they really believe it.

But when we start looking at the data, by the way, the judges don't have the data, but when we start looking at the data, we find again and again that this is not the case.

We found that low-risk offenders, who make up 50% of all criminal justice workers, are in prison.

Take, for example, Leslie Chu, a Texas man who stole four blankets on a cold winter night.

He was arrested and failed to post bail of $3,500, which he was unable to pay.

And he remained in prison for eight months before his trial began, costing taxpayers over $9,000.

And on the other end of the spectrum, we're doing a terrible job as well.

The people we found were the most dangerous criminals, the people most likely to commit new crimes if released, and nationally we find that 50 percent of these people are released.

The reason is the way decisions are made.

Judges have the best intentions when making these risk decisions, but they are subjective.

They're like baseball scouts 20 years ago, who used their intuition and experience to determine what risks someone posed.

They are subjective and we know what happens with our subjective decisions. This means that we are often wrong.

Strong data and analytics are needed in this area.

What I decided to look for was a powerful data and analytical risk assessment tool that would allow judges to really understand, in a scientific and objective way, what the risks posed by someone in front of them were.

Looking around the country, we found that 5-10 percent of all US jurisdictions actually use some type of risk assessment tool. After looking at these tools, it's easy to see why.

Their administration was incredibly expensive, time consuming, and confined to the jurisdictions of the regions in which they were created.

So basically you can't scale it or transfer it elsewhere.

So I assembled an incredible team of data scientists, researchers, and statisticians to build a universal risk assessment tool to help every judge in the United States measure risk objectively and scientifically.

The tool we built collected 1.5 million cases from across the United States, cities, counties, every state, and federal district.

And those 1.5 million cases, the largest dataset of pretrial data in the United States today, essentially turned out to be over 900 risk factors that could be looked at to figure out what matters most.

We found that there are nine specifics that are nationally significant and that most accurately predict risk.

So we built a universal risk assessment tool.

And it looks like this.

As you can see, I have entered some information, most of which is incredibly simple and easy to use, focusing on the defendant's criminal record, whether he has been sentenced to jail, whether he has used violence before, whether he has ever failed to return to court, etc.

With this tool, you can predict three things.

First, whether or not he will commit new crimes if released.

Second, and I think this is very important, for the first time we can predict whether someone will commit violent acts if released.

And those are the most important words to say when speaking to a judge.

And third, you can predict if someone will come back to court.

And because it is built on a universal dataset, it can be used by all judges in the United States.

This is what the judge sees when running the risk assessment tool: the dashboard.

At the top you'll see your new criminal activity score, with 6 being the highest of course, and in the middle of that you'll see 'Increased risk of violence'.

This means that this person is at high risk of violence, and the judge is someone who needs to be reconsidered.

And at the bottom, "Failure to Appear Score" is displayed. This also points to the possibility that someone will return to court.

I want to say something really important here.

I do not believe that the judge's intuition or experience should be excluded from this process.

I don't

In fact, I believe that the problem we are seeing and the reason we are having the incredible system error of imprisoning low-level, non-violent people and releasing high-risk, dangerous people is that we don't have an objective measure of risk.

But what I believe we should do is that we need to take data-driven risk assessment and combine it with the judge's intuition and experience to guide better decision-making.

The tool went live throughout Kentucky on July 1, and will be rolled out in many other US jurisdictions.

Our goal, quite simply, is that within the next five years, every judge in the United States will be using data-driven risk tools.

We are currently working on developing risk tools for prosecutors and police officers to make the systems that operate in America today the same way they did 50 years ago, based on instinct and experience, on data and analytics.

Well, great news about all this. We have a lot of work left to do and a lot of culture to change. But the great news about all of them is that we know it works.

That's why Google is Google, and why all these baseball teams use moneyball to win games.

The great news for us, too, is how it can transform America's criminal justice system.

By doing so, we can make our streets safer, our prisons cheaper, and our system fairer and more just.

Some call it data science.

I call this the criminal justice moneyball.

thank you.

(applause)

Did you know that one of the first fertility drugs was made from a Catholic nun's pee and even the Pope was involved?

So this is completely true.

In the 1950s, scientists knew that as women entered menopause, they began to release high levels of fertility hormones in their urine.

But there was a doctor named Bruno Lunenfeld who wondered if he could actually isolate these hormones from urine and use it to help women struggling to conceive.

Obviously, the problem with this is that testing this idea required a lot of pee from an older woman.

And finding it is no easy task.

There, with special permission from the Pope, he and his colleagues collected gallons of urine from hundreds of elderly Catholic nuns.

In doing so, he actually isolated hormones that are still used today to help women conceive, but now they can be synthesized in the lab and don't require gallons of pee.

So why am I standing here talking to this wonderfully intelligent audience about nun pee?

I'm a science journalist and multimedia producer, but I've always been interested in the grotesque.

So fascinated, in fact, that I started a weekly YouTube series called Gross Science about the slimy, smelly, spooky basements of nature, medicine, and technology.

Now, I think most of us would agree that there is something a little creepy about peeing.

You know, that's something we don't like to talk about very much, and we keep the act of doing it very secretive.

But when Lunefeld peered into the world of pee, he discovered something very useful for mankind.

And a year and a half into making my show, I would say that exploring the gritty side of life so often uncovers insights I never thought I'd find, and even reveals beauty I never thought was there.

There are several reasons why we think it's important to talk about terrible things.

So, first of all, talking about vulgarity is a great tool for education and a great way to stay curious.

To explain what I mean, let me tell you a little bit about my childhood.

I mean, I was what you would call a terrible kid.

In fact, my love of science itself began when my parents bought me a slime chemistry set, and was only reinforced afterwards by doing a big experiment in 6th grade biology class.

We wiped surfaces around the classroom, cultured the bacteria we collected, and dissected owl pellets. Owl pellets are undigested chunks of matter that owls roam about, and they're really disgusting and wonderful and cool.

Now, the fact that I was obsessed with grotesque things as a kid isn't all that revolutionary.

As you know, many children are into vulgar things like playing with dirt, collecting beetles, eating boogers, and so on.

why?

I think really young children are like little explorers.

They just want to experience as much as possible and have no idea if touching ladybugs and stink bugs is relatively acceptable.

They just want to understand how everything works and experience as much of life as possible.

And it's pure curiosity.

But then an adult intervenes and we tell the kids not to pick their noses and not to touch slugs, toads or anything else they find in the backyard. Because they are terrible.

And we do it to keep our children safe too, right?

I don't really think picking your nose might spread germs or that touching the toad might give you warts.

Touch the toad as often as you like.

So when kids get a little older, at some point, tackling the crude becomes not just about curiosity, but about finding out where the limits are and pushing the boundaries of what's okay.

That's why many children of a certain age have burping contests or competitions to see who can make the worst face.

Part of the reason they do it is because it's a bit offensive, right?

But there is another layer to why we define things as gross.

As humans, we have extended the concept of disgust to morality.

So psychologist Paul Rosin would say that much of what we classify as creepy is a reminder that we're just animals.

These include bodily fluids, sex, physical abnormalities, and death.

And the idea that we are just animals can be very disturbing because it can serve as a reminder of our own mortal destiny.

And that can leave many of us in deep existential anxiety.

Rosin would say that avoiding disgust and offense is not just a way to protect our bodies, but a way to protect our souls.

I think that at some point, children really start to internalize this connection between being disgusting and immoral.

I don't have concrete data to support this next idea, but I think for many of us it happens around the time we reach puberty.

And you know, yes, we know.

During puberty, our bodies change, we sweat more, girls get their periods, and it makes us think about sex like never before.

And through human capacity for abstraction, this shame can take root.

So we don't necessarily just think, "Oh my god, something really terrible is happening to my body!"

We think, 'Oh my God, maybe I'm not feeling well'.

And maybe that means there's something wrong or wrong with me. ”

The problem is that you lose most of your curiosity when you effectively associate gross with immorality. Because there are a lot of things in the world that are a little grotesque.

For example, consider going for a walk in the woods.

If you just pay attention to birds and trees and flowers, that's fine, but in my opinion you miss the bigger and better picture of life on this planet.

There is a cycle of decay that fuels the forest's growth, and under its feet is a network of fungi that literally binds all the plants around it.

It's really amazing.

So I think we should talk to young people about bad things early and often. That way, they actually feel allowed to claim a larger picture of life on our planet.

The good news is that for many of us, the fascination with grotesque isn't completely gone, we just pretend it doesn't exist.

But the truth is, we all spend most of our lives trying not to feel bad.

If you think about it, we are like a bag of liquid and a strange tissue surrounded by a thin layer of skin.

And to some extent, many times a day, we need to tell ourselves, consciously or unconsciously, not to fart in public.

(Laughter.) You know, I think a lot of us take this kind of voyeuristic delight in knowing about grotesque stuff because we're always trying so hard to avoid grotesque stuff.

This certainly applies to children as well. The number of middle school teachers showing me videos in their science classes is proof of that.

But I think it applies to adults as well.

You know, I think we all love to hear gory stories. Because it's a socially acceptable way to explore the grotesque side of yourself.

But there is another reason why I think talking about grotesque is so important.

A while ago I made a video about tonsil stones. Sorry everyone. Tonsil stones are clumps of mucus, bacteria, and food that become lodged in the tonsils and smell very bad. It's terrible if you cough occasionally.

And so many people have experienced this.

But a lot of people who have gone through this don't really have a forum to talk about it.

And today this video I made is my most popular video.

It has millions of views.

(Laughter.) And then the comments section of that video became kind of a self-help section of sorts, where people could talk about their experiences with tonsil stones, tips and tricks for getting rid of it, and so on.

And I think it's been a great way for people to talk about things they've been reluctant to talk about publicly.

If it's about something as silly as tonsil stones, that's great, but when it's about something mundane like your period, it's a little sad that a video can have such an effect.

We released a video about menstruation in February of last year, and we still get messages from people all over the world asking about menstruation.

There are many young, and not so young, people who worry that what is happening to their bodies is somehow not normal.

And of course, I'm not a medical professional, so I always tell people to talk to their doctors if possible.

But the truth is, everyone should be comfortable talking to a doctor about their body.

That's why I think it's so important that we start a dialogue about poor things very early on. That way, you can let them know that it's okay to take ownership of their bodies and their health.

There's another reason why it's really, really important to talk to your doctor about your health and anything serious.

Doctors and the scientific community can only deal with problems when they know there is something to do.

One of the really interesting things I learned while making a video about periods was talking to a scientist who told me that there's actually a lot we don't know about periods.

There's a lot of basic research that hasn't been done yet.

That was partly because there weren't many women scientists in the field who could ask about it.

And it's not even a topic women talk about publicly.

So there are gaps in what we know, just because there was no one to ask.

There's one last reason I think talking about grotesque is so important. That's because you never know what you'll find when you peel back all the layers of discomfort.

Let's take the California rabbit as an example.

It's a sea slug that shoots this beautiful bright purple ink at any creature that wants to eat it.

But it's also one of the most kinky creatures in the animal kingdom.

That is, they are hermaphrodites, that is, they have both male and female genitalia.

And when it comes time to mate, up to 20 individuals congregate in a conga line of this species and mate together.

(Laughter) One hare fertilizes the partner in front and receives the sperm from the hare behind. Come to think of it, this is in some ways a great time saver.

(Laughter.) But if scientists had just looked at this and thought, "Okay, let's not touch it with sticks," they would have missed the great thing about sea lice.

These rabbits have a small number of very large neurons, which proved excellent for use in neuroscience research.

And indeed, scientist Eric Kandel used them in his research to understand how memories are stored.

And what do you know?

He won the Nobel Prize for his achievement.

So go outside and pick up beetles, play in the dirt, and ask questions.

And admit your fascination with the grotesque and don't be ashamed of it. Because you never know what you might find.

And, as I say at the end of every video, "Eh."

thank you.

(applause)

My name is McKenna Pope. I was 14, and when I was 13, I persuaded toy maker Hasbro, one of the largest toy companies in the world, to change the way they marketed one of their best-selling products.

So let me tell you about it.

So I have a brother named Gavin.

He was four years old when this series of shebangs happened.

He loved cooking.

He was always taking ingredients out of the fridge and mixing them up to make inedible concoctions, not to mention making invisible mac & cheese.

He really wanted to be a chef.

For kids who want to be chefs, there's no better gift than the Easy-Bake Oven. right?

I mean, we all had them when we were little.

And he wanted it so much.

But then he started to realize something.

In the commercials and box of the Easy-Bake Oven, Hasbro promoted it specifically for girls.

And the way they did this was by featuring only girls on the boxes and commercials, with floral prints all over the oven, bright pinks and purples, very gender-specific colors for women.

So it kind of sent the message that only girls should cook. boys are not.

And this made my brother very discouraged.

He thought that being a chef is something girls do, so why would he want to be one?

The girls cooked. The boys didn't, and neither did the message Hasbro was sending.

And this made me think: God, I wish there was a way to change this, I wish I could take my voice to Hasbro and tell them what's wrong and have them change it.

That got me thinking about a website called Change.org that I learned about a few months ago.

Change.org is an online petition sharing platform. You can create your petition here and share it on Facebook, Twitter, YouTube, Reddit, Tumblr, or any other way you can think of, on all these social media networks.

So I created a petition and the YouTube video I added to the petition basically asked Hasbro to change their marketing practices, including having boys in their commercials and boxes, and most importantly, making them less gender specific.

And so the petition began to move - with astonishing speed, inconceivable.

I was being interviewed by news outlets and media outlets all over the country and it was amazing.

In three weeks, maybe three and a half weeks, the petition has gathered 46,000 signatures.

(Applause.) Thank you.

So, needless to say, it was crazy.

Finally, Hasbro themselves invited me to their headquarters to show me their new Easy Bake Oven range in black, silver and blue.

It was literally one of the best moments of my life.

It was like "Willy Wonka and the Chocolate Factory". That was amazing.

But what I didn't realize at the time was that I had become an activist, that I could change something, that as a child, or even as a child in particular, my voice mattered and so did yours.

I want to tell you it's not easy, and it wasn't easy for me either. Because I faced many obstacles.

I was really disappointed when people told me online and sometimes in real life that they were disrespectful to me and my family and that it was all a waste of time.

Actually I have some examples. For there is no better revenge than exposing their stupidity.

So let's see.

From Username Liquidsore29 -- Here's an interesting username -- "A disgusting liberal mother who makes her son gay." Liquidsore29, really? TRUE? have understood.

How about Whiteboy77AGS's "People always need something about (female dogs)."

From Jeffrey Gutierrez: "Oh shut up. You just want money and attention." So comments like this really discouraged me from wanting to make a change in the future. Because people don't care, they think it's a waste of time, and I thought people would be rude to me and my family.

It hurt me and made me wonder what it meant to change the future.

But I started to notice something.

haters gonna hate.

Come on, say it with me. 1, 2, 3: Haters will hate.

So hate people you don't like and change yourself. Because I know I can.

I looked into this crowd and saw 400 people who had gathered to see how they could make a difference. I know I can do it, and I think you guys watching at home can too. Because there is so much you can do and believe in. And you can exchange it on social media: Facebook, Twitter, YouTube, Reddit, Tumblr, or any other way you can think of.

And you can make that change.

You can change what you believe into a cause.

And about that spark you've been hearing all day today, you can use that spark within you and turn it into fire.

thank you.

(applause)

Science, thanks to science, we have learned a lot about the ends of the universe. The universe is so important and so distant at the same time, yet so much closer and so much more directly related to us that there is so much we don't really understand.

One is the extraordinary social complexity of the animals around us. Today I would like to share some stories about the complexity of animals.

First of all, what is complexity?

What is Complex?

Well, complicated things are not complicated.

Anything complex is made up of many different small parts, each with its own precise role within the machine.

Conversely, a complex system consists of a large number of similar parts whose interactions produce a coherent overall behavior.

Complex systems have many interacting parts that operate according to simple discrete rules, resulting in new properties.

The behavior of the system as a whole cannot be predicted by individual rules alone.

As Aristotle wrote, the whole is greater than the sum of its parts.

But from Aristotle let's move on to a more concrete example of a complex system.

These are Scottish Terriers.

The system is confusing at first.

Then comes the milk perturbation.

Everyone starts going in one direction and this happens.

Windmill is a property that manifests itself during interactions between puppies, whose only rule is to try to maintain access to milk, and thus push in random directions.

So the key is to find simple rules that create complexity.

I call this 'complexity simplification' and it's what we at ETH Zurich in system design do.

We collect data on animal populations, analyze complex patterns, and try to explain them.

It requires physicists working with biologists, mathematicians, and computer scientists, and it is their interplay that creates the transboundary capabilities to solve these problems.

Again, the whole is greater than the sum of the parts.

In some ways, collaboration is also an example of a complex system.

And you may be asking yourself which side I'm on, biology or physics.

It's actually a little different. To explain, I have to tell a short story about myself.

As a child, I loved building things and building complex machines.

So I started studying electrical engineering and robotics. And the project at the end of the research was to build a robot named ER-1 (which it looked like) that would gather information from the environment and follow white lines on the ground.

It was very complicated, but it worked brilliantly in our test room, and on demo day professors gathered to grade the project.

So I took the ER-1 to the evaluation room.

Then I realized that the lighting in that room was a little different.

The robot's vision system got confused.

At the first bend of the line I went off course and hit the wall.

We spent weeks building it, and all it took to destroy it was a subtle shift in the color of the light in the room.

That's when I realized that the more complicated a machine was made, the more likely it was to break down due to something completely unexpected.

And, in fact, I decided that I didn't want to build anything complicated.

I wanted to understand the complexity, the complexity of the world around us, especially the animal kingdom.

So let's talk about bats.

The Bechstein bat is a common species of European bat.

They are very social animals.

Most of the time they roost or sleep together.

And they live in maternal colonies. That means that each spring, females congregate after hibernation and stay together for about six months to raise their young. And all females have very small tips. So every time one of the females enters one of these specially equipped bat boxes, we can know where she is and, more importantly, who she is with.

So I'm researching bat roost relationships, and here's how it looks.

During the day, bats roost in several subgroups of various boxes.

On one day the colony may be split into two boxes, but on another day it may be clustered in one box, or it may be split into three or more boxes, and in fact it all seems pretty shaky.

This is called fission-fusion dynamics, and refers to the tendency of groups of animals to periodically split up and coalesce into different subgroups.

So what we do is take all these data from all these different days, pool them and apply techniques of network analysis to extract long-term relevant patterns and get a complete picture of the colony's social structure.

have understood? So this photo looks like this.

In this network, every circle is a node, an individual bat, and the lines between them are social bonds, connections between individuals.

I found this to be a very interesting picture.

This bat colony consists of two distinct communities that are unpredictable from day-to-day fission-fusion dynamics.

We call them arcane social units.

In fact, what's even more interesting is that around October each year the colony splits and all the bats hibernate separately, but each year when the bats reunite in the spring, the community remains the same.

That's why these bats remember their friends for a really long time.

With brains the size of peanuts, they maintain individualized long-term social bonds. I didn't know that was possible.

We knew primates, elephants, and dolphins could do that, but compared to bats, they have huge brains.

So how do bats maintain this complex and stable social structure with such limited cognitive abilities?

This is where complexity gives the answer.

To understand this system, we built a computer model of the roost based on simple, discrete rules and simulated it for thousands of days in a virtual bat colony.

It's a mathematical model, but it's not complicated.

In a nutshell, what this model has taught us is that each bat perceives a few other members of the colony as friends and is slightly more likely to roost with them in the box.

Simple and unique rules.

This alone explains the social complexity of bats.

But it gets better.

In 2010-2011, the colony lost more than two-thirds of its members, probably due to a very cold winter.

The following spring, the entire colony may have shrunk and died because it did not form two clumps as usual.

Instead, they formed a single, cohesive social unit that allowed the colony to survive the season and thrive again in the next two years.

What we do know is that bats are unaware that their colony is doing this.

All they do is follow simple rules of association, and out of this simplicity comes social complexity that allows colonies to be resilient to dramatic changes in demographics.

And I think this is unbelievable.

Now, I would like to tell you another story, but for that you have to travel from Europe to the Kalahari Desert in South Africa.

This is where the meerkats live.

You probably know the meerkat.

they are fascinating creatures.

They live in groups with very strict social hierarchies.

There is one dominant pair and many subordinates. Some act as guards, some act as babysitters, some teach puppies, and so on.

What we're doing is putting very small GPS collars on these animals and studying how they behave together and what this has to do with their social structure.

And there are some very interesting examples of meerkat collective behavior.

There is a road in the middle of the reserve where they live.

This road is dangerous because there are cars on it.

However, meerkats must cross it to move from one feeding station to another.

So we asked how they specifically do this.

We have found that the dominant female, who primarily leads the group to the road, gives way to her subordinates when crossing the road, as if to say, "Please tell me if it is safe."

In fact, what I didn't know was what rules of their behavior the meerkats followed for this change to occur at the edge of the herd, and whether a simple rule would suffice to explain it.

So I built a model of a simulated meerkat crossing a simulated road.

It's a simple model.

A moving meerkat is like a random particle, whose unique rule is one of alignment.

they just move together.

When these particles reach the road, they sense some obstacle and bounce off it.

The only difference between the dominant female, shown here in red, and the other individuals is that in her case the perceived danger from the obstacle height, or indeed the road, is only slightly higher. And this small difference in locomotion rules of this individual is sufficient to explain our observation that the dominant female leads the group to the road and then gives way to other individuals to cross first.

British statistician George Box once wrote, "All models are wrong, but some are useful."

And indeed, meerkats are not random particles, so this model is clearly false.

But it is also beneficial. Because it teaches us that extreme simplification of travel rules at the individual level can be very complicated at the group level.

Again, this simplifies complexity.

I would like to draw conclusions about what this means for the species as a whole.

It is not impolite for a dominant woman to give way to her subordinates.

In fact, dominant females are very important to group cohesion.

If she dies in the street, the whole group is in danger.

Therefore, this risk-averse behavior is a very old evolutionary response.

These meerkats are replicating tactics that have evolved thousands of generations ago, adapting them to modern-day risks, in this case, human-built roads.

They have adapted very simple rules, and the resulting complex behavior allows them to resist human encroachment on their natural habitat.

After all, it may be bats, meerkats, or some other species that adapt to human ways to change social structures in response to declining populations.

My message here is not complicated, but simple of surprise and hope. My message here is that animals exhibit extraordinary social complexity, which allows them to adapt and respond to changes in their environment.

In three words, in the animal kingdom, simplicity brings complexity, which brings resilience.

thank you.

(Applause) Dania Gerhardt: Thank you, Nicola, for a great start. Are you a little nervous?

Nicholas Peyronie: All right, thank you.

DG: Okay, great. Many in the audience must have tried to make some connection between the bats, meerkats, and other animals you were talking about and humans.

You brought some examples. Women are social and women are dominant. I don't know how anyone thinks.

But is it okay to make such associations?

Are there any stereotypes in this regard that you can confirm apply to all species?

NP: Well, I think there are counterexamples to these stereotypes.

In seahorses and koalas, for example, it is actually always the male who looks after the young.

And the lesson to be learned from this is that drawing parallels between humans and animals is often difficult, and sometimes a little dangerous.

That's it.

Director: Okay. Thank you so much for giving us this wonderful start.

Thank you Nicola Perony.

Server: May I help you?

Customer: Well, let's see.

Servers: Baked registry errors sprinkled with top-notch corrupted data, binary brioches, RAM sandwiches, Conficker fitters, scripted salads with or without polymorphic dressings, and grilled coding kebabs.

Customer: A RAM sandwich and a pint of Code 39, please.

Server: Would you like some dessert?

Our special feature is tracking cookies.

Customer: I would like some zombie tracking cookies, thank you.

Server: Coming soon, sir.

Food will be served shortly.

(Applause) Maya Penn: I've been drawing ever since I could hold crayons, and I've been making animated flipbooks since I was three years old.

I also learned at that age what it means to be an animator.

There was a TV show about jobs that most kids didn't know about.

When I found out that the manga I saw on TV was being made by an animator, I immediately thought, "That's what I want to be."

I don't know if I said it in my heart or out loud, but it was a very defining moment in my life.

Animation and art will always be my first love.

It was my love of technology that gave rise to the idea for Malicious Dishes.

I had a virus on my computer and I was trying to get rid of it, and suddenly I wondered what would happen if the virus had its own little world inside the computer.

Maybe a restaurant where they get together and do viral things?

Thus, "malicious cuisine" was born.

When I was 4, my father taught me how to take a computer apart and put it back together.

That was the beginning of my love for technology.

I'm building my first website in HTML and learning JavaScript and Python.

I'm also working on an animated series called 'The Pollinators'.

About bees and other pollinators in our environment and why they are so important.

If plants were not pollinated by pollinators, all living things that depended on these plants would starve, including us.

So I decided to create a superhero team with these cool creatures.

(applause) (stomping) (music) (roar) Pollinator: Deforestosaurus! I should have known!

We have to call out the rest of the pollinators!

(music) Thank you. (Applause) All my animations start with an idea, but what is an idea?

Ideas can provoke movement.

Ideas are opportunities and innovations.

Ideas are exactly what makes the world go round.

Without ideas, technology, medicine, art, culture, and even the way we live, we wouldn't be where we are today.

At age 8, I took my ideas and started my own business, Maya's Ideas, and a non-profit, Maya's Ideas for the Planet.

(Laughter) And I make eco-friendly clothing and accessories.

I'm 13 now and started my business in 2008, but my artistic journey began long before that.

Art has had a huge influence on me and I wanted to incorporate it into everything I do and even my business.

I found different fabrics around the house and said, "This could be a scarf or a hat." I had all the ideas for the design.

I've noticed people stop me when I'm wearing my pieces and say, "Wow, that's really cute. Where can I buy it?"

And I thought I could start my own business.

Well, I was only 8 years old and didn't have a business plan.

I just wanted to make beautiful, environmentally safe work and give back.

My mom taught me to sew, so I sat in the backyard and made little headbands out of ribbon and wrote down the name and price of each item.

I started making items such as hats, scarves and bags.

Soon my products started selling all over the world and I had customers in Denmark, Italy, Australia and Canada.

Well, I had a lot to learn about my business, including branding and marketing, staying engaged with customers, and seeing what sold best and what didn't.

Soon, my business took off in earnest.

One day, when I was 10 years old, Forbes contacted me.

(Laughter) They wanted to write about me and my company.

Many people ask me now, why is your business environmentally friendly?

Ever since I was little, I have had a passion for preserving the environment and its creatures.

From an early age my parents taught me to give back and to be a good steward of the environment.

I heard that the dyes in the clothes and even the process of making the products are harmful to people and the planet, so I started researching on my own and found out that even after the dyeing was completed, there was a waste problem that had a negative impact on the environment.

For example, crushing materials or dumping dry powder materials.

These practices pollute the air and can be harmful to people and objects that breathe it.

So when I started my business, I knew two things. One, all products must be eco-friendly, and 10-20% of the profits I make go to local and global charities and environmental organizations.

(Applause.) I feel like I'm part of a new wave of entrepreneurs who want a sustainable future, not just a successful business.

We feel we can meet the needs of our customers without compromising the ability of future generations to live a greener tomorrow.

We live in a big, diverse and beautiful world. That made my passion to save this world even stronger.

But it is never enough to have a mental understanding of what is happening in our world.

It needs to get through to your heart. Because when it reaches your heart, it ignites movement.

Opportunities and innovations are born there, and ideas come to life.

Thank you and peace and blessings.

(Applause.) Thank you. (Applause) Pat Mitchell: So you heard Maya talking about the amazing parents behind this amazing woman. where are they?

Please, Mr. and Mrs. Penn. Please -- Oh!

(applause)

Many of us will experience some form of trauma in our lifetime.

In some cases, they even escape without long-term consequences.

But for millions of people, the experience lingers, causing flashbacks, nightmares, negative thoughts and other symptoms that interfere with daily life.

This phenomenon, called post-traumatic stress disorder (PTSD), is not an individual defect. Rather, it is a treatable malfunction of specific biological mechanisms that enable us to cope with dangerous experiences.

To understand PTSD, we first need to understand how the brain processes many different trials, such as the death of a loved one, domestic violence, injury or illness, abuse, rape, war, car accidents, and natural disasters.

These events can trigger feelings of danger and helplessness, triggering the brain's alarm system known as the "fight-or-flight-freeze" response.

When this alarm goes off, the hypothalamus, pituitary gland, and adrenal gland system known as the HPA axis work together to send a signal to the parasympathetic nervous system.

This is the network that communicates with the adrenal glands and internal organs and helps regulate functions such as heart rate, digestion and breathing.

These signals initiate a chemical cascade that pumps several different stress hormones into the body, causing physiological changes that prime the body to defend itself.

Your heart rate increases, your breathing quickens, and your muscles tense.

Even after the crisis is over, elevated levels of stress hormones can persist for days, causing irritability, nightmares, and other symptoms.

For most people, these experiences go away within a few days to two weeks as hormone levels stabilize.

However, a small percentage of people who have experienced trauma have persistent problems that may disappear temporarily but reappear months later.

We don't fully understand what's going on in the brain, but one theory is that the stress hormone cortisol continuously activates the "fight-or-flight-freeze" response, slowing down overall brain function and causing many of the negative symptoms.

These symptoms often fall into four categories: intrusive thoughts such as dreams and flashbacks; avoidance reminders of the trauma; negative thoughts and feelings such as fear, anger and guilt; and "reactive" symptoms such as irritability and difficulty sleeping.

Not everyone experiences all of these symptoms, or experience them to the same degree and intensity.

PTSD is often diagnosed when the problem persists for more than a month.

A number of risk factors, including genetics, ongoing overwhelming stress, and pre-existing mental illness and lack of emotional support, may play a role in determining who will experience PTSD.

But the underlying cause remains a medical mystery.

A major challenge in dealing with PTSD is the triggers that the brain associates with the original trauma: sensitivity to physical and emotional stimuli.

These can be everyday sensations that are not inherently dangerous, but that provoke strong physical and emotional reactions.

For example, the smell of a campfire can evoke memories of being trapped in a burning house.

For those with PTSD, the memory activates the same neurochemical cascades as the original event.

Then it triggers the same panic and helplessness, as if you were experiencing the trauma all over again.

Trying to avoid these triggers can lead to isolation because they are sometimes unpredictable.

So people can feel invalid, ignored, or misunderstood, as if a pause button has been pressed on their lives while the rest of the world goes on around them.

However, you also have options.

If you think you may be suffering from PTSD, the first step is an evaluation by a mental health professional who can direct you to the many resources available.

Psychotherapy is very effective for PTSD and helps patients better understand their triggers.

Certain medications can also help manage symptoms, as can self-care practices such as mindfulness and regular exercise.

What would you do if you noticed signs of PTSD in a friend or family member?

Social support, acceptance and empathy are key to support and recovery.

Tell them that you believe their explanation of what they are going through, and that you don't blame them for their reaction.

If they can afford it, encourage them to seek evaluation and treatment.

PTSD is called a “hidden wound” because it occurs without any apparent physical symptoms.

But even if it's an invisible obstacle, it doesn't have to be a silent obstacle.

Dutch artist Piet Mondrian's abstract rectangular paintings inspired mathematicians to create two problems.

First, we need to completely cover the square canvas with non-overlapping rectangles.

Everything has to be unique, so if you use 1x4, you can't use 4x1 elsewhere, but a 2x2 rectangle is fine.

Let's try it.

Let's say you have a 4x4 canvas.

It cannot be cut in half directly. Because then you'll get identical 2x4 rectangles.

However, the next closest options, 3x4 and 1x4, do work.

It was easy, but we're not done yet.

Then take the area of ​​the largest rectangle and subtract the area of ​​the smallest rectangle.

The result is our score, and the goal is to get the lowest possible score.

Here the maximum area is 12 and the minimum area is 4, giving a score of 8.

I wasn't aiming for a low score this time, so maybe I can do more.

Leave 1x4 alone and split 3x4 into 3x3 and 3x1.

Now the score is 9 minus 3, which is 6.

Still not optimal, but better.

With a canvas this small, you have only a few options.

But let's see what happens when the canvas gets bigger.

Try 8x8. What is the lowest score you can get?

Pause here if you want to figure it out yourself.

Answers: 3 Answers: 2 Answers: 1 To understand direction, divide the canvas roughly in two, as before.

This gives a 5x8 rectangle in region 40 and a 3x8 rectangle in region 24, giving a score of 16.

That's pretty bad.

Dividing that 5x8 into 5x5 and 5x3 gives a score of 10.

Better, but still not great.

You can also keep dividing the largest rectangle.

But doing so leaves me with smaller and smaller rectangles, with a wider range between max and min.

What we really want is for all rectangles to fit within a narrow range of area values.

The total area of ​​the canvas is 64, so we need to sum the areas.

Let's create a list of possible rectangles and regions.

To improve on your previous score, try choosing values ​​that range from 9 or less to a total of 64.

You can see that some values ​​are omitted because rectangles like 1x13 and 2x9 don't fit on the canvas.

You may also find that if you use one of the rectangles with odd areas such as 5, 9, 15, you need to use another odd value rectangle to get an even sum.

With all that in mind, let's see what works.

If you start from area 20 or above, you will quickly go over the limit.

However, you can use a rectangle ranging from 14 to 18 and omit 15 to get to 64.

Unfortunately there is no way to make them fit.

Using 2x7 leaves a gap that can only be filled with a rectangle of width 1.

Going down, the next range that works is 8 to 14, excluding the 3x3 square.

This time the pieces fit together.

That's 6 points.

Could we do better?

no.

You could drop the 2x7 and 1x8 and replace them with 3x3, 1x7, 1x6 and still get the same score.

But as we go down the list, the numbers are so small that we need a wider range of sizes to cover the canvas, increasing the score.

There are no tricks or formulas here. Just a little intuition.

It's more art than science.

And for larger grids, even expert mathematicians don't know if they've found the lowest possible score.

So how do you divide a 4x4, 10x10, or 32x32 canvas?

Try it out and post your results in the comments.

About 40 muscles in the human face can be activated in different combinations to create thousands of facial expressions.

But do these expressions look the same and convey the same meaning around the world, regardless of culture?

Is one person's smile the other's frown?

Charles Darwin theorized that emotional expression is a common human trait.

But he was in the minority.

Until the mid-20th century, many researchers believed that the specific ways in which we show emotions were learned behaviors that varied across cultures.

Personality theorist Sylvain Tomkins was one of the few who argued otherwise.

Tomkins argued that certain emotions—emotional states and the facial expressions that accompany them—are universal.

In the 1960s, psychologist Paul Ekman set out to test this theory by examining hundreds of hours of film footage of remote tribes isolated from the modern world.

Ekman found the expressions of the natives not only familiar, but occurring exactly in the circumstances he expected.

Conversely, he ran tests against tribes who had never been exposed to Western culture before.

They were able to accurately match photos of different facial expressions to stories designed to evoke specific emotions.

Further research over the next few decades confirmed Darwin's idea that some of our most important emotional expressions are in fact universal.

However, the degree of expression appropriate for a particular situation varies greatly between cultures.

For example, researchers studied the facial expressions of people who were born blind and hypothesized that if expressions were universal, they would be represented in the same way as sighted people.

In one study, blind and sighted athletes displayed the same emotional expressions when they won and lost a game.

Further evidence comes from our evolutionary relatives.

Comparing the facial expressions of humans and non-human mammals, we found that facial muscle structure and movements are similar.

Chimpanzee laughter looks different than ours, but uses some of the same muscle movements.

Back in the '60s, Ekman identified six core expressions.

Anger is accompanied by clustered eyebrows, strained narrowed eyes and tight lips. The lips are pulled up and the nose is wrinkled in disgust.

Fear raises the eyebrows and opens the mouth wide to expose the upper whites of the eyes, while surprise is similar, but with rounded eyebrows and relaxed lips.

Sadness is represented by the eyebrows being pulled inward and upward, the eyes drooping, and the mouth drooping.

And of course happiness. The lips are pulled up, the cheeks are lifted and wrinkles are formed around the eyes.

More recently, researchers have suggested additional terms such as contempt, shame, and disapproval, but opinions are divided on how clear boundaries can be drawn between these categories.

So, if Ekman and others are correct, what makes certain expressions universal?

And why is it expressed in such a particular way?

Scientists have many theories rooted in our evolutionary history.

One is that certain expressions are important for survival.

Fear and surprise can alert others of impending danger.

Studies in humans and other primates show that we pay more attention to threatening faces than to dead faces, especially when they are already on high alert.

Expression also helps improve group fitness by communicating our inner state to those around us.

For example, grief lets the group know something is wrong.

There is some evidence that expression may be even more directly tied to our physiology.

For example, expressions of fear may directly improve survival in potentially dangerous situations, with eyes absorbing more light and lungs taking in more air, preparing them to fight or flee.

Much research is still needed to understand emotional expressions, especially as we need to learn more about the inner workings of the brain.

But if you find yourself in a strange land among strangers, a friendly smile can go a long way.

"How long have you been taking painkillers?"

It was a very mundane question that changed my life.

It was July 2015, about two months after I almost lost my leg in a serious motorcycle accident.

So I went back to the orthopedic surgeon's office for yet another follow-up appointment.

I saw my wife Sadie. we did some calculations.

"About 115 milligrams of oxycodone," I replied.

"Probably more."

I have given this information many times to many doctors and I am fine with it, but this time it was different.

My doctor got a serious look and looked at me and said, 'Travis, that's too much opioids.

You should think about quitting the drug now. ”

It was the first time anyone had voiced concern in two months of escalating prescriptions.

In fact, this was my first real conversation about opioid therapy.

I was given no warning, no counseling, no plan...

Just a lot of prescriptions.

What happened next would define my entire medical trauma experience.

I was given a tapering plan that was now too aggressive. Accordingly, the drug was divided into 4 doses and reduced to 1 dose each week for 1 month.

As a result, I went into acute opioid withdrawal.

The result was, in other words, hell.

The early stages of withdrawal are much like the symptoms of a bad flu.

I was nauseous, had no appetite, had aches all over the place and was getting more and more sore in my leg which was pretty messed up. I had trouble sleeping because I felt restless all over.

At the time, I thought this was very tragic.

Because I didn't know what was going to happen.

At the beginning of the second week, my life got even worse.

As the symptoms intensified, my internal thermostat seemed to go haywire.

You'll sweat profusely most of the time, but if you still manage to get out in the hot August sun, you might find yourself looking down and getting goosebumps.

The restlessness that kept me awake for the first week has now turned into a feeling of withdrawal.

It was a deep trembling sensation that kept me jerking.

It made sleep almost impossible.

But perhaps the most disturbing was the crying.

When I came to my senses, for no reason, without warning, tears began to flow.

At the time, it felt like a nerve misfire that gave me goosebumps.

Sadie got worried and called the prescribing doctor. The doctor very kindly advised me to drink plenty of fluids for the nausea.

She pushed him away and said, "He's pretty sick, you know."

"So what?" I wondered.

"Try again later," he replied.

Well, I wasn't going back to my previous dosage unless I had a better plan to get through the next withdrawal.

So we stuck with this symptom and reduced the dosage even more.

At the beginning of my third week, my world got very dark.

I basically stopped eating and barely slept because of the shaking that kept me writhing all night.

But the worst was the recession.

The tears that had felt unexploded until then now seemed meaningful.

Several times a day, I could feel my heart pounding and I could feel my tears welling up, but I couldn't stop it, and it was accompanied by hopelessness and hopelessness.

I began to believe that I would never recover from either the accident or the withdrawal.

Sadie called the prescribing doctor again, this time recommending that she contact the pain management team from her previous admission.

I thought it was a great idea, so I did it immediately, but I was shocked when no one told us.

The receptionist who answered the phone told me that the pain management team provided inpatient services. They prescribe opioids to control pain, but do not oversee dose reduction or discontinuation.

Infuriated, we called the prescribing doctor back to ask for anything he could do to help, but he apologized instead saying he was out of his control.

“Look, my first piece of advice to you was clearly wrong, so until Travis finds someone more competent to get him off, I'm officially recommending that Travis get back on his meds,” he told us.

Of course I wanted to put the medicine back on.

I suffered.

But I believed that if I protected myself from withdrawal symptoms with drugs, I would never be drug free, so we tied ourselves up and pulled off the last dose.

When my brain experienced life without prescription opioids for the first time in months, I thought I was going to die.

I thought I was going to die -- (crying) I'm sorry.

(crying) If the symptoms didn't completely kill me, I would kill myself.

And I know it sounds dramatic. Because it sounds dramatic to me, standing here years later, full and healthy.

But I believed it with all my heart. Because I had no hope of ever getting back to normal.

The insomnia became excruciating, and after two days with barely any sleep, I spent the night on the basement bathroom floor.

I alternated between cooling my feverish head against a ceramic tile and vomiting violently, even though I hadn't eaten in days.

When Sadie found me at the end of the night, she was taken aback and called me again.

I called everyone.

We called surgeons, pain specialists, general practitioners, anyone you could find on the internet, and none of them helped me.

The few people I could talk to on the phone advised me to start taking my medication again.

Independent pain management clinics said they prescribe opioids but do not oversee dose reduction or discontinuation.

Just like now, when my desperation was clearly evident in my voice, the receptionist took a deep breath and said: “Mr Reader, it sounds like you probably need a rehab facility or a methadone clinic.”

I didn't know much more at the time, so I followed her advice.

I hung up and started calling those places, and it didn't take long to learn that many of these facilities were for people battling long-term substance use disorders.

For opioids, maintenance therapy often involves transitioning patients to the safer, longer-acting opioids methadone or buprenorphine, rather than taking the patient off medication.

Plus, everywhere I called there was a huge waiting list.

I simply wasn't the kind of patient they were designed to treat.

After being turned down from rehab, I finally admitted defeat.

I was hurt, beaten, and there was nothing I could do.

So I told Sadie that I was going to take the medicine again.

I start with the lowest dose possible and take only what is absolutely necessary to escape the most devastating effects of withdrawal.

So that night she helped me up the stairs and for the first time in weeks I actually slept.

I picked up a little orange prescription bottle and put it on my nightstand...

Then I didn't touch it.

I fell asleep, slept through the night, and when I woke up, the most severe symptoms were dramatically reduced.

i have done it.

(Applause) Thank you.

(laughter) So -- I'm sorry, I have to pick myself up a little bit.

I think this story is important.

It's not because you think you're special.

This story is important because I'm not special. Because what happened to me wasn't that unique.

My opioid dependence was completely predictable given the amount prescribed and duration of prescription.

Since addiction is simply the brain's natural response to an opioid-rich environment, there was good reason to believe that a monitored and well-thought-out plan was needed from the start, but our healthcare system doesn't seem to decide who is responsible for patients like me.

The prescribing doctor saw me as a complicated patient who probably needed professional treatment with pain medication.

Pain doctors thought it was their job to control pain and saw me for addiction treatment when I couldn't get off my meds.

However, addiction medicine is overemphasized and focused on people suffering from long-term substance use disorders.

In short, I was prescribed a drug that required long-term control, but I was not given that control, and it was not even clear whose job it was to control it.

This is the culprit of disasters, and any such disaster is interesting and worth talking about, and perhaps worthy of a TED Talk. However, failure to taper opioids is of particular concern in the United States at this time, as it is in the midst of an epidemic that killed 33,000 overdoses in 2015.

Nearly half of those deaths were related to prescribed opioids.

In fact, the medical community is starting to react to this crisis, and much of the response will be to try to cut prescription drugs, and that will no doubt be important.

For example, in the case of opioids, there is growing evidence that American doctors often prescribe drugs even when they are not needed.

And even when opioids are needed, they are often prescribed in higher doses than necessary.

Such considerations help explain why the United States consumes nearly 70 percent of the world's total opioid supply, despite having only 5 percent of the world's population.

But if we focus only on prescription rates, we risk overlooking two very important points.

First, opioids are, and will continue to be, an important pain treatment.

As someone who has suffered from severe and real long-term pain, I can assure you that these medications make life worth living.

And second, by requiring doctors to properly manage the drugs they prescribe, we can wisely prescribe opioids to those who really need them and still fight the epidemic.

For example, go back to the taper therapy that was given to me.

Is it reasonable to assume that doctors who prescribe opioids know that they are too aggressive?

Well, after I first published my story in a scientific journal, someone at the CDC sent me a pocket guide to tapering opioids.

This is a 4 page document, mostly photos.

In it, they teach doctors how to taper off opioids in easier cases, and one of their recommendations is not to begin tapering more than 10 percent per week.

If my doctor had given me that plan, my weight loss would have taken months instead of weeks.

It certainly wasn't easy.

It was probably pretty nasty, but maybe it wasn't hell.

And that seems like information that anyone prescribing this drug should know.

Finally, it must be said that proper management of prescribed opioids alone will not solve the crisis.

America's epidemics are much larger, but when drugs are responsible for tens of thousands of deaths annually, their reckless management is indefensible.

Helping opioid-treated patients get off their prescribed medications may not be a complete solution to the epidemic, but it would certainly be a step forward.

thank you.

(applause)

Imagine what a milestone this was for women who were victims of violence in the 1980s.

They came to the emergency room in what police described as a "lover's argument" and saw a woman beaten, with a broken nose and wrist, and a swollen eye.

And as activists, we took a Polaroid camera, took a picture of her, waited 90 seconds, and gave her the photo.

And she will have the evidence she needs to go to court.

We were making the invisible visible.

I have been doing this for 30 years.

I have been involved in social movements that have worked to end violence against women and children.

And over the years, I have held a very passionate and sometimes unpopular belief that this violence is not inevitable, but is learned, and if it is learned, it can be stopped and prevented.

(Applause.) Why do I believe this?

Because it's true.

That is absolutely true.

Between 1993 and 2010, domestic violence among adult women in the United States decreased by 64 percent. This is great news.

(Applause) Sixty-four percent. So how did we get there?

Our eyes were wide open.

Thirty years ago women were beaten, stalked and raped, but no one talked about it.

there was no justice.

And as an activist, it wasn't enough.

And as a first step in this journey, we have created an extraordinary underground network of amazing women who have organized and set up shelters. Even if the women did not open shelters, they opened their homes to keep women and children safe.

And do you know what else we did?

We sold bread, we washed cars, we did all we could to raise money, but at some point we said it was time to go to the federal government and ask them to pay for these extraordinary services that are saving lives.

right? (Applause.) So for step two, we knew we needed to change the law.

So we went to Washington and lobbied for the enactment of the first bill.

And I remember walking through the halls of the Capitol. I'm in my thirties, my life has a purpose, and I couldn't imagine anyone challenging this important bill.

I was probably 30 and naive.

But I've heard from lawmakers with a very different point of view.

Do you know what he called this important bill?

He named it "The Law of Taking the Fun of Marriage Out".

A method that removes the enjoyment of marriage.

Folks, it was the United States in 1984. I wish I had Twitter.

(Laughter) After 10 years and a lot of hard work, we finally passed the Violence Against Women Act. This is life-saving and life-changing legislation. (Applause.) Thank you.

I was proud to participate in that activity. And it changed the law and poured millions of dollars into local communities.

Do you know what else you did? We collected data.

Let me tell you, I am passionate about data.

Actually, I'm a data geek.

I think there are a lot of data geeks here.

I'm a data geek because I want to see if a program works if I spend $1, and if it doesn't, I need to change my plans.

And one more thing I would like to say is that we are not going to solve this problem by creating more prisons or more shelters.

It's about women's economic empowerment, it's about healing wounded children, it's about prevention with a capital P.

And here is step 3 of this journey. We know that to continue this progress, we need volume, visibility, and public engagement.

Knowing that, we went to the Advertising Council and asked them to help us build a public education campaign.

And we looked all over the world, including Canada, Australia, Brazil and parts of Africa, and used this knowledge to build the first nationwide public education campaign called "No Excuses for Domestic Violence."

Visit one of our spots.

(Video) Man: Where's dinner?

Woman: Well, I thought she'd be home a few hours ago, so I put everything away, and then— Man: What's this? Pizza. Woman: If you had just called me, I would have known— Man: Dinner? Is pizza ready for dinner? Woman: Honey, don't be so loud.

Please stop--let me go!

Man: Go to the kitchen! Woman: No! Help!

Man: Do you want to know what hurts? (slaps woman) It hurts! It hurts! (breaks the glass) Woman: Help me!

["The kids have to sit by and watch. What's your excuse?"] Esta Soler: When we were in the process of releasing this campaign, O.J. Simpson was arrested for murdering his wife and her friend.

We learned he had a long history of domestic violence.

The media are fixed.

The story of domestic violence ran from the back page, in fact from no page to the front page.

Our ads covered the airwaves and for the first time women started telling their stories.

Movement involves a moment, and we captured this moment.

Let's put this into context.

Do you know how many articles about domestic violence were in the New York Times before 1980?

Say 158.

In the 2000s, the number exceeded 7,000.

We were clearly making a difference.

But there was still an important element missing.

Therefore, Step 4: Engaging Men was required.

We couldn't solve this problem with 50 percent of the population sitting on the sidelines.

And I already said I'm a data geek.

A national poll found that men were indicted and felt uninvited to the conversation.

So we thought, how can we get men to participate?

How can we get men to talk about violence against women and girls?

Then a male friend pulled me aside and said, "You want men to talk about violence against women and girls. Men don't talk."

(laughs) I'm sorry, men in the audience.

I think so.

But he said, "Do you know what they are doing?

They often talk to children.

As parents, they speak to their children as coaches. ”

And that's what we did.

We met where men are and built a program.

And then there was an event that will forever remain in my heart. A basketball coach was speaking in a room full of male athletes and men of all walks of life.

And he was talking about the importance of mentoring boys as guys, changing locker room culture, and giving men the tools to build healthy relationships.

And suddenly he looked behind the room and saw his daughter, called his daughter's name, Michaela, and said, "Michaela, come here."

She was nine years old and was a little shy, so I stood up and he said, "Sit next to me."

She sat right next to him.

He gave her a big hug and said, "People ask me why I do this job.

I do this job because I am her father and I don't want anyone to hurt her. ”

And as a parent, I get it.

We know that so many sexual assaults are prevalent and underreported on college campuses, so we get it.

I've done a lot of things for grown women.

We have to do a better job for our children.

Just do it. we have to. (Applause.) We've come a long way since the Polaroid days.

Technology is our friend.

Mobile phones are a global game changer for female empowerment, and Facebook, Twitter, Google, YouTube and all other social media help us organize and tell our stories in powerful ways.

Therefore, as the organizer, I would like to express my sincere gratitude to those in this audience who have contributed to the construction of these applications and platforms.

TRUE. I applaud for you

(Applause.) I'm the daughter of a man who has been in one club in his life, the Optimist Club.

You can't make it up.

And his spirit and optimism are in my DNA.

After more than 30 years in the business, I am more convinced than ever that humans are capable of change.

We believe we can bend the arc of human history towards compassion and equality. I also fundamentally and passionately believe that this violence need not be part of the human condition.

And please. Stand with us to create a future without violence for women, girls, men and boys around the world.

thank you very much.

(applause)

Five years ago, I was completing my Ph.D. A student who lives two lives.

One was using NASA's supercomputers to design next-generation spacecraft, and the other was a data scientist looking for potential smugglers in classified nuclear technology.

As a data scientist, I have performed many analyzes around facilities and industrial facilities around the world.

And I was always looking for a better canvas to tie all this together.

And then one day, as I was thinking about how all the data is located, I realized the answer was staring at me.

I was a satellite engineer, but I never thought of using satellite images in my work.

Well, like most of us, I was looking at my home online and thought I'd pop in and start looking into some of these properties.

And what I found really surprised me.

The photo I found was many years old and therefore not very relevant to the work I was doing today.

But I was intrigued.

So satellite imagery is pretty cool.

With millions of sensors all around us today, there's still a lot we don't know on a daily basis.

How much oil is stored in all of China?

How much corn is produced?

How many ships are there in every port in our world?

Well, in theory all these questions can be answered by images, but not if the images are old.

And if this data is so valuable, why couldn't I get a more recent photo?

So the story begins more than 50 years ago with the launch of the US government's first generation of photoreconnaissance satellites.

And today there are several great-grandchildren of the early Cold War machines, now operated by private companies, from which most of the satellite images you and I see every day come from.

During this period, rockets alone to launch satellites cost hundreds of millions of dollars each to launch things into space. This created a lot of pressure to launch things infrequently and to pack as much functionality into the launch as possible.

All of this has resulted in satellites getting bigger, bigger, and more expensive, and now costing nearly $1 billion per copy.

They are very expensive, so there aren't many of them.

Due to the small number of photos, the photos we see on a daily basis tend to be old.

In fact, as many of you have taken as an example, to visualize how sparsely collected our planet is, some friends and I created a dataset of 30 million photographs collected by these satellites between 2000 and 2010.

Large areas of our world, shown in blue, are rarely seen, less than once a year, and even the most frequent areas in red are seen at most once a quarter.

As a graduate student in aerospace engineering, this chart screamed at us as a challenge.

Why should these things be so expensive?

Does one satellite really cost the equivalent of three 747 jumbo jets?

Couldn't there have been a way to build a new satellite design that was smaller and simpler that would allow for more timely imagery?

It might sound a little crazy for us to start designing satellites, but luckily we got help.

In the late 1990s, several professors proposed concepts for radically lowering the cost of putting things in space.

This was to hitchhike a small satellite alongside a much larger satellite.

This made placing objects 100 times cheaper, and suddenly you could experiment, take a little risk, and innovate a lot.

And a new generation of engineers and scientists, mostly from universities, began launching very small, breadbox-sized satellites called CubeSats.

And they were built with electronics from Radio Shack, not Lockheed Martin.

Now, using the lessons learned from these early missions, a friend and I began a series of sketches of our own satellite design.

I can't remember the specific day I made the conscious decision to actually build these things, but once I had the idea that I could have the world in my head as a dataset, and get millions of data points every day that describe the global economy, and discover billions of previously undiscovered connections between them, it seemed boring to work on anything else.

So we moved into a small, windowless office in Palo Alto and began moving designs from the drawing board into the lab.

The first big question we had to tackle was how big to build this.

In space, size dictates cost, and we had worked with these very small breadbox-sized satellites in school, but once we started to understand the laws of physics better, we found that the quality of pictures those satellites could take was very limited. Because the laws of physics dictate that the best picture you can take through a telescope is a function of the telescope's diameter, and these satellites were very small and very constrained in volume.

And it turns out the best pictures we were able to get were something like this:

It was a low-cost option, but frankly it didn't look too blurry to add value to the satellite imagery.

So, about three or four weeks later, I randomly met with a group of engineers involved in the development of the first-ever private imaging satellite. He then told me that in the 1970s, the US government found a strong, optimal trade-off: taking pictures at a resolution of about 1 meter, and being able to see objects as large as 1 meter, not only could you get very high-quality images, but you could also get a lot of them at an affordable price.

From our own computer simulations, we can't see individuals, but we can count the ships, cars, shipping containers and trucks that move around the world every day.

We found a middle ground.

You'll need to build something like a mini-fridge that's bigger than the original breadbox, but you don't have to build a pickup truck.

Now you have a constraint.

The laws of physics dictate the absolute minimum size telescopes we can build.

The next step was to make the rest of the satellite as small and simple as possible. It's basically a flying telescope with four walls and a set of electronics smaller than a phone book that draws less power than a 100-watt light bulb.

The big challenge was actually taking pictures through the telescope.

Traditional imaging satellites use line scanners, similar to Xerox machines, to take pictures as they traverse the globe, scanning line by line to build a complete image.

People are using these now because they give you more light and therefore less noise that you see in images from lower priced cell phones.

The problem with them is that they require a very high degree of pointing.

You have to stay focused on a target 50 centimeters from over 600 miles away while traveling at over 7 kilometers per second, which is a very complex task.

So instead, we turned to a new generation of video sensors originally created for use in night vision goggles.

Instead of acquiring a single high-quality image, a video stream of individually noisy frames can be acquired, but then all those frames can be recombined into a very high-quality image using advanced pixel processing techniques on the ground at 100 times the cost of conventional systems.

And we have applied this technology to many other systems on the satellite as our designs have evolved daily from CAD to prototypes to production units.

A few weeks ago we packed up Skysat 1, signed and said our final goodbyes to Earth.

It is now in final launch configuration and ready to be launched in the next few weeks.

And soon, we will focus on launching a constellation of 24 or more of these satellites to begin building scalable analytics that can gain insights from the petabytes of data we collect.

So why do we do this? Why build these satellites?

Well, it turns out that imaging satellites have the unique ability to provide global transparency. Providing that transparency in a timely manner is simply an idea whose time has come.

We see ourselves as trailblazers on new frontiers, transcending economic data and unlocking the human story moment by moment.

For a data scientist who happened to be in a space camp as a kid, nothing could be better.

thank you.

(applause)

You have probably seen many articles about climate change. And just like any other article you've seen so far, here's another New York Times article.

Everything else you've seen so far says the same thing.

It even has the same amount of headlines as every other headline we've ever seen.

The unusual thing about this piece is that it probably dates from 1953.

The reason I say this is because you might have the idea that this issue is relatively recent.

People are starting to sort of understand about it, and now Kyoto and the governor and the people are actually starting to do something, so maybe we're on the road to a solution.

The fact is- uh, uh.

Depending on how you count, we've known about this problem for 50 years.

We've talked endlessly about it over the past decade or so.

And achieved a goal close to zip.

This is the rate of increase of CO2 in the atmosphere.

You've seen this in many forms, but you may not have seen this.

What this indicates is that the rate of increase in our emissions is accelerating.

And it's accelerating even faster than what we thought was the worst case just a few years ago.

So there was something about that red line that many skeptics argued was that environmentalists were just putting this forecast in to make it look as bad as possible, and that emissions would never increase as fast as that red line.

But in reality they are growing faster.

This is actually just 10 days old and shows that this year's Arctic sea ice is the lowest ever.

And the rate at which Arctic sea ice is disappearing is much faster than models suggest.

So you could argue that the net effect of all this is negative, since all sorts of pundits like me are flying around the planet, burning jet fuel, and politicians signing treaties, but in fact just consuming tons of jet fuel. (laughs) No, no! We're still barely starting in terms of what really needs to be done to put the brakes on this very inertial thing, our big economy.

Really, that's basically what you're doing. Not that many, really.

I don't want to bring you down too much.

This problem is completely solvable, and even fairly cheap.

By cheap, I mean something like military expenses, not medical expenses.

Cheap means a few percent of GDP.

No, this sense of scale is really important.

So the problem is solvable and the way we should take to solve it is to deal with electricity production which, for example, causes about 43% more CO2 emissions.

And we can do that by doing things that make perfect sense: nature conservation, wind power, nuclear power, and carbon capture through coal. They are all ready for mass deployment and work.

All we lack is the action of actually spending money to implement them.

Instead, we spend time talking.

But, nevertheless, that's not what I'm talking about tonight.

What I will tell you tonight is what we might be able to do if we did nothing.

And this is what's in the middle of this, what happens if you don't stop the ejection early enough.

And we need to somehow break the link between climate-altering human actions and climate change itself. And this is especially important. Because while, of course, we can adapt to climate change, and it's important to be honest here, climate change has some advantages.

Oh yeah, I don't think so. I have spent my life trying to stop it.

But one of the reasons it's politically difficult is that there are winners and losers, and not everyone is a loser.

But of course in nature, polar bears.

I spent weeks at a time skiing over sea ice in the high Arctic.

They lose out completely.

And there are no adaptations.

So this issue can be completely resolved.

This geoengineering idea in its simplest form is basically:

Signed particles, such as sulfuric acid particles (sulfates), can be injected into the upper atmosphere, into the stratosphere, where they can reflect sunlight and cool the Earth.

And I'm sure it will work.

It's not without side effects, but it certainly works.

The reason is that it has already been done.

And it was done not by us or by me, but by nature.

This is Mount Pinatubo in the early 90's. As a result, a large amount of sulfur fell in the stratosphere with clouds like atomic bombs.

The results were quite dramatic.

Since then, and some volcanoes that have ever existed, there has been a rather dramatic cooling of the atmosphere.

So this lower bar is the upper atmosphere, the stratosphere, which heats up after these volcanoes.

However, you can see that the lower atmosphere and the upper bar, which is the surface of the earth, are cooler because they shielded the atmosphere a little.

No big mystery about it.

There are many mysteries in the details and some bad side effects such as partially depleting the ozone layer, but we'll get to that in a minute.

But it cools down, obviously.

And one more thing, it's fast.

It really matters what you say. A lot of the other things we do, like reducing emissions, are inherently time-consuming because it takes time to build all the hardware needed to reduce emissions.

That's not all. Reducing emissions does not reduce concentrations. This is because concentration, or the amount of CO2 in the atmosphere, is the sum of emissions over time.

Therefore, you cannot step on the brake suddenly.

But it's faster if you do this.

And sometimes you want to do something right away.

Another question you might ask is, will it work?

Can we block some of the sun's rays, effectively compensate for the added carbon dioxide, and restore the climate to its original state?

And the answer seems to be yes.

Here is a graph that we have seen many times before.

From the perspective of one particular climate model, this is what a world with twice the amount of CO2 in the air would look like.

In the graph below, the amount of carbon dioxide has doubled and the sunlight has decreased by 1.8%, returning to the original climate.

And this graph is by Ken Caldeira. This is important. Because Ken - I think Marty Hoffert was there in the mid-1990s - was at a conference where Ken and I stood at the back of the conference and said, "Geoengineering is not going to work."

And I said to the person who was promoting it, "The atmosphere is more complicated."

I've given a lot of physical reasons why compensation isn't very good.

Ken ran the model and found it to be true.

This topic is old.

The report that arrived on President Johnson's desk when I was two years old - 1965.

In fact, that report had all of modern climate science on it, and all they said they were going to do was geoengineering.

There was also no mention of reducing emissions, which is an incredible shift in how we think about this issue.

I'm not saying we shouldn't cut emissions.

It should, but you're making exactly this point.

So, in a way, there's not much new.

One thing new is this essay.

I mean, I think people have been talking about this idea all the time since the time of President Johnson's first report and various US National Academy reports (1977, 1982, 1990).

Not as a foolproof idea, but as an idea to think about.

But as climate has become a hot political topic over the past 15 years, joking, it's become too PC-like for us to talk about it.

It just sank under the water. We weren't allowed to talk about it.

But last year Paul Crutzen published an essay outlining what has been said. So, given the very slow progress and uncertain impact of solving this problem, we should probably consider:

He said roughly what had been said.

The important thing is that he happened to win the Nobel Prize for ozone chemistry.

So when he said we should think about this, even if it has some impact on ozone, people took him seriously.

And he actually had some ideas for getting rid of them.

There was all sorts of coverage all over the world, right down to The Economist's 'Doctor Strangelove Saves the Earth'.

That made me think. I've been working on this subject intermittently, but technically not much. And then one night I was actually lying in bed thinking.

And I thought about this kid's toy - that's the title of my talk - and wondered if I could use the same physics that spins that toy in a kid's radiometer to make particles float in the upper atmosphere and stay there.

One of the problems with sulfates is that they slough off very quickly.

Another problem is that they are right in the ozone layer, but I would like them to be above the ozone layer.

And eventually I woke up the next morning and started calculating this.

It was very difficult to calculate from first principles. I was baffled.

But then I found out that all sorts of papers dealing with this subject had already been published. Because it already happens in the natural atmosphere.

So it seems that there are already particles suspended up to about 100 kilometers in the sky, the so-called mesosphere, and they already have this effect.

Briefly explain how the effect works.

There are so many fun and complicated problems that I'd love to spend all night, but I can't.

But suppose sunlight hits some particle and heats it unevenly.

Therefore, the side facing the sun will be warmer. Away from the side, cool.

Gas molecules that bounce off the warm side bounce with extra velocity because they are warmer.

And we see the net force moving away from the sun.

This is called photophoretic force.

There are also many other versions that I and some collaborators have figured out how to abuse it.

And of course we could be wrong. All of this has not been peer-reviewed and is under consideration. But for now it seems like a good thing.

However, because the atmosphere is floating, it seems that we can achieve a long atmospheric lifetime, much longer than before.

It can move things from the stratosphere to the mesosphere, in principle solving the ozone problem.

I'm sure there will be other issues as well.

Finally, we were able to move the particles above the poles and adjust the climate engineering to focus on the poles.

It would minimize the negative impact on the middle of the planet we live in, and maximize what we have to do to cool the poles during a global emergency.

It's a new idea that's been creeping in, and it may be essentially a smarter idea than adding sulfate.

Regardless of whether this idea is correct or the others, I think it's almost certain that in the end you'll come up with smarter ways to do it than just adding sulfur.

If engineers and scientists really set their minds on this, it's amazing how we can affect the planet.

One thing about this is that it gives us extraordinary influence.

This improved science and engineering, whether we like it or not, will give us more and more influence to influence, control it, and control the weather and climate. Not because we plan it, or because we want it, but simply because science provides us, piece by piece, with better knowledge of how the system works and better engineering tools to influence it.

Well, let's say aliens come.

Perhaps they're going to land at the United Nations Headquarters down the road, or maybe they've chosen a smarter location, but let's say they arrive and hand you a box.

And the box has two knobs.

One knob is for controlling the temperature of the earth.

Another knob is probably the one for controlling the CO2 concentration.

You might imagine a war over that box.

Because there is no way to agree on where to set the knobs.

We have no global governance.

And the place where you want to install it is different depending on the person.

Now I don't think that will happen. Not very likely.

But we are building that box.

Scientists and engineers around the world build it piece by piece in their labs.

Even if you are doing so for other reasons.

Even if we think we're just trying to protect the environment.

They are not interested in crazy ideas like engineering the entire planet.

They develop the science to make it easier to do.

So I think my take on this is not that I want to do it, I don't want to do it, but that we should move this out of the shadows and have a serious discussion about it.

Because sooner or later you will have to make a decision about this. Because even if you want to think about why you shouldn't do it, it's better to think about it.

As a starting point for my thoughts on how to think about this problem, I'd like to introduce two different ways of thinking about it.

But what we need is not a few freaks like me to think about this.

We need a broader discussion.

Musicians, scientists, philosophers, and writers will come together to grapple with this issue of climate engineering and what its implications are.

So there's one way to think about this. It's not about reducing emissions just because it's cheap, it's just doing this.

What I haven't said about this yet is that it's incredibly cheap.

For example, using the sulphate method or this method I devised, I think we could create an ice age at a cost of 0.001% of GDP.

Very cheap. we have a lot of influence.

Not a good idea, but an important one. (Laughter) Tell me how big the lever is. The lever is that big.

And there is no big objection to that calculation.

There may be debate as to whether it is sane, but its impact is real. (Laughter) So we can address the problem by simply stopping emissions reductions, and increasing the amount of geoengineering as concentrations rise.

I don't think anyone takes that seriously.

Because under this scenario we would be further and further away from our current climate.

Anyway, there are all sorts of other problems, such as ocean acidification caused by atmospheric carbon dioxide.

No one really suggests this except maybe one or two very weird people.

But there are cases here that are difficult to refuse.

Let's say we're not doing geoengineering, we're doing what we have to do, which is to get serious about reducing emissions.

But I don't really know how quickly I have to cut.

There are many uncertainties about how severe climate change will be.

So let's say we worked hard and didn't just hit the brakes, but hit the brakes hard to actually reduce emissions and ultimately reduce concentrations.

And perhaps someday – like October 23, 2075 – we'll finally have that glorious day when concentrations peak and roll back down the other side.

And we're having a global celebration and we're really starting to do that - you know, we've seen the worst.

But perhaps that day we may also find out that the Greenland ice sheet is actually melting unacceptably fast, and that over the next 100 years sea levels will rise by many meters and fast enough to wipe several large cities off the map.

It's an absolutely possible scenario.

At that point, we may decide that even if geoengineering is uncertain and morally unhappy, it is far better than not doing it.

And it's a completely different look at the problem.

This is used as risk management, not as a substitute for action.

This means geoengineering for a while to survive the worst of the heat, not substituting it for action.

However, there is a problem with that view.

And the problem is that the knowledge that geoengineering is possible has made climate impacts less scary and undermined efforts to reduce emissions today.

This is what economists call moral hazard.

I think that's one of the fundamental reasons why this issue is so hard to talk about, and why it's politically unacceptable to talk about it in general.

But you can't make a good policy if you keep stuff in a drawer.

I'll ask you three questions and give you one last quote.

Should I do some serious research on this subject?

Should there be a national research program investigating this?

We consider all the risks and downsides, as well as how we can do better.

Several enthusiasts are now talking about it, some positive, some negative. But I have very little in-depth knowledge on the subject, so it's dangerous to be in this state.

If you have very little money, you will get some.

Many of us, maybe I am now, think it should be.

But I have many reservations.

My concerns are mostly about moral hazard issues and I'm not sure how best to avoid moral hazard.

I think you have a serious problem. When you talk about this, people start to think that they don't have to work so hard to cut emissions.

The other is that perhaps we need a treaty.

A treaty that determines who does this.

Now we might think that a big, rich country like the US is doing this.

But in fact, even if China wakes up in 2030 and realizes that its climate impacts are downright unacceptable, it might be less interested in our moral conversations about what to do with this and decide it really prefers a geoengineered world to a non-geoengineered one.

And there will be no international mechanism for figuring out who makes the decisions.

So let's consider one last thing. This was a US National Academy report 25 years ago that said much better than I can say today.

And I think that really sums up where we are here.

Not only is the CO2 problem, the climate problem we hear about, driving many things, such as innovation in energy technologies to reduce emissions, but I think it inevitably drives us to think about climate and weather control, whether we like it or not.

And it's time to start thinking about it, even if the reason to start thinking about it is to build an argument for why you shouldn't do it.

thank you very much.

The urban explosion in the last few years of the economic boom has also resulted in dramatic marginalization, resulting in an explosion of slums in many parts of the world.

This polarization between the poor and the super-rich surrounded by the socio-economic inequalities it creates is precisely at the heart of today's urban crisis.

But I would like to start tonight by suggesting that this urban crisis is not just an economic or environmental problem.

It is in particular a cultural crisis, a crisis of institutions unable to rethink the stupid ways we have grown, unable to counteract the oil-starved, selfish urbanization that has perpetuated cities from Southern California to New York to Dubai based on consumption.

So what I really want to share with you is that the future of today's cities does not depend so much on buildings as it does on the fundamental restructuring of socio-economic relations, that the best ideas for shaping the cities of the future really do not come from enclaves of economic power and affluence, but from areas of conflict and scarcity, from which the urgent imagination can really prompt us to rethink the growth of today's cities.

And with a brief introduction to the Tijuana-San Diego border region, which has become a laboratory for rethinking my practice as an architect, I will explain what it means to understand and engage conflict zones as creative havens.

This is the wall that separates San Diego from Tijuana, Latin America from the United States, the border wall, a physical symbol of exclusive planning policies that have perpetuated the division of communities, jurisdictions and resources around the world.

In this border region you'll find some of the richest real estate, just 20 minutes away from some of Latin America's poorest enclaves, like I once found on the edge of San Diego.

And while these two cities have the same population, San Diego has grown to be six times the size of Tijuana in recent decades, and we are forced to quickly confront the tensions and conflicts between sprawl and density that are at the center of today's debates about environmental sustainability.

So I've been arguing for the last few years that, indeed, the slums of Tijuana can teach San Diego's sprawl a lot when it comes to socioeconomic sustainability, and that we should pay attention to the many immigrant communities on both sides of this border wall so that their informal urbanization process can be translated.

What does informal in this case mean?

All I am really talking about is an overview of the social practices of adaptation that allow many of these immigrant communities to break with the political and economic prescriptions of urbanization that have been imposed on them.

I'm simply talking about bottom-up creative intelligence, whether it's manifesting itself in the slums of Tijuana, which actually build themselves out of San Diego's waste, or the many immigrant neighborhoods in Southern California that have begun to transform and renovate in recent decades.

That is why, as an artist, I have been interested in measuring and observing the many informal transnational flows across this border—one-way south-to-north immigration flows into the United States and north-to-south waste flows from Southern California to Tijuana.

What I'm referring to is the recycling of these old post-war bungalows brought to the border by Mexican contractors as American developers dispose of them in the process of building more inflated suburban versions in recent decades.

So these homes are waiting to cross the border.

Not only do people cross borders here, but whole blocks of one city move to the next, and when these houses are placed on steel frames, the ground floor is separated into two floors, more houses are built, and small businesses are run.

It is very interesting to note that space and economics are stratified in this way.

But it wasn't just houses, there was also a small piece of rubble from one city, from San Diego to Tijuana.

Many of you have probably seen rubber tires used to build retaining walls in slums.

But look what people have done here amidst the socio-economic emergency.

They figured out how to peel off the tires and connect them through the tires to build a more efficient retaining wall.

Or garage doors trucked in from San Diego become the new skin for emergency housing in many of the shantytowns surrounding the edge of Tijuana.

So as an architect, it's very fascinating to witness this creative intelligence, but I also like to restrain myself.

I don't want to glorify poverty.

What I mean is that this informal urbanization is not just an image of instability, the informal here is actually a series of socio-economic and political procedures that can be translated as artists, and this is about bottom-up urbanization taking place.

Look here, a building isn't just about how it looks, it's about what it actually does.

They change over time and truly perform as communities negotiate space, boundaries and resources.

So while waste flows south, people head north for dollars. Most of my research has concerned the impact of immigration in changing homogeneity in many parts of the United States, particularly San Diego.

And what I'm talking about is how this began to suggest that the future of Southern California would hinge on the retrofitting of large-scale urbanization with small social and economic programs: the use of steroids.

What I am talking about is how as immigrants come to these areas they begin to change the unidimensionality of land and real estate into a socially and economically more complex system as they begin to connect the informal economy to garages or build illegal granny apartments to feed their extended families.

Socio-economic entrepreneurship within these regions is really starting to suggest ways to translate it into new, inclusive and more equitable land use policies.

"Unofficial Buddha", "Unofficial Buddha", so many stories are born from the dynamics of spatial change. It tells the story of a small house that saved itself. Although not transported to Mexico, it was eventually converted into a Buddhist temple, and in doing so, this tiny house transforms or mutates from a single dwelling into a neighborhood of small, or micro, socio-economic and cultural infrastructure.

These districts of action, as I call them, are therefore actually inspirations for imagining alternative interpretations of citizenship that have less to do with belonging to the nation-state, but rather with upholding the concept of citizenship as a creative act of reorganizing institutional protocols in the urban space.

In fact, as an artist, I have been interested in visualizing citizenship, collecting many anecdotes and stories of cities in order to narrativeize the relationship between social processes and spaces.

This is the story of a group of teenagers who decided to break into this space under the highway one night a few months ago and start building their own skateboard park.

Shovels in hand, they began digging.

Two weeks later the police stopped them.

They barricaded the place and the teenagers were evicted. And teenagers decided to fight back not by bank cards and slogans, but by building important processes.

The first thing they did was recognize the peculiarities of political jurisdiction carved into that empty space.

They realized they were lucky because they hadn't started drilling under Caltrans territory.

Since Caltrans is the state agency that manages highways, it would have been very difficult to negotiate.

They said they were lucky because they started drilling under the side of a highway owned by a local municipality.

They also said they were lucky because they started digging a kind of Bermuda Triangle jurisdiction between the Port Authority, the Airport Authority, two city districts and the review board.

All those red lines are invisible political institutions carved into the empty space left.

With this knowledge, these teenagers took to the streets as skaters.

They came to the city public prosecutor's office.

The city attorney told them they had to become an NGO in order to continue negotiations, but of course they didn't know what an NGO was.

They had to speak to a friend in Seattle who had the same experience.

And they began to recognize the need to organize themselves even more deeply, and began raising funds and budgeting to really recognize all the knowledge embedded in San Diego's City Code. In doing so, we can begin to redefine the very meaning of urban public space and extend it to other categories.

In the end, the teenagers won the case with the evidence and were able to build a skateboard park under the highway.

Now, to many, this story may seem trivial or naive.

For me as an architect, this is the basic story. Because it will tell us that this micro-community has not only designed another category of public space, but also the socio-economic protocols that need to be inscribed in that space for its long-term sustainability.

They also told me that they were working with conflict itself as a creative tool, as they needed to create a process that could reorganize the city's resources and politics, just like immigrant communities on both sides of the border.

In that act, that informal, bottom-up transgression really dripped and began to transform top-down policy.

This journey from bottom-up to top-down transformation is where I find hope today.

And I ponder how modest shifts in space and policy in many of the world's cities are indeed central to the new shaping of urban democratic politics, largely due to the collective imaginative urgency of these communities as they rethink their own forms of governance, social organization and infrastructure.

In fact, this could be the framework that creates a new social and economic justice for the city.

I say and stress this because I believe it is the only way today that allows us to move from urbanization of consumption to neighborhoods of production.

thank you.

Hi. So today, I would like to introduce some of the works that are currently in progress.

We are still in the process of manifesting these tasks, so we are still working primarily within the realms of intuition and mystery.

So I'll try to explain some of the experiences we're looking for through each piece.

So the first work is called "Imperial Monochrome".

The viewer enters the room unsuspectingly and catches a glimpse of these panels, which are randomly placed on the walls.

Within seconds, it seems as if the panel has become aware of the viewer's presence, panicking and entering some kind of rigid symmetry.

(Laughter) Here's a map of the two states.

One is complete confusion. The other is absolute order.

And we were interested in seeing how much change would be required to go from one state to another.

This also reminded us of two very different painting traditions.

One is a 15th-century altarpiece and the other is Malevich's abstract work from about 100 years ago.

So here is the video.

To give you a sense of scale, the largest panel is about 2 meters high.

That's about it. And the smallest is A4.

Therefore, when the viewer enters the space, it immediately grabs their attention.

After a while, if the viewer continues to stay in the space, the panel becomes somewhat unaffected by the viewer's presence, becomes slow and autonomous again, senses some kind of presence or movement in the room, and once again attracts attention.

(Laughs) Here, it seems as if the viewer is the one who fuels the sense of order among the panels, but it is also possible that the panel is too obsessed with the behavior of the prerequisites and imposes the role of the tyrant on the viewer.

So let me introduce you to a quieter, smaller piece called Handheld.

The viewer sees the paper pasted across the wall, but upon closer inspection, it is a blank piece of A4 or letter-sized paper, held on either side by two tiny hands that appear to have been meticulously carved out of small blocks of wood.

The viewer also sees the entire sculpture moving very slightly. It's as if these hands are trying to keep the paper still for a long time, but somehow it doesn't seem to be able to do so.

This motion instability therefore closely resembles the unstable nature of images viewed through a hand-held camera.

So here are two tandem clips.

One is from a still camera and the other is from a handheld camera.

And we quickly see how the erratic nature of the video suggests the presence and subjective point of view of the observer.

So I removed the camera and transferred its movement to the panel.

Here is a video.

You have to imagine the other hand. it's not there yet.

But to us, it looks like it's trying to evoke a modest gesture, as if there's a little person with outstretched hands behind this giant piece of paper.

It can be compared to the amount of strain in serving the observer and presenting this paper to the observer in front of him so delicately.

The next piece is a decoy.

It's a cardboard model, so it's about my height.

It has a round body, two arms, and very high head-like antennae whose sole purpose is to draw attention to itself.

So when an observer passes by, it leans left and right, moving its arms more and more frantically as the person approaches.

Here is the first test scenario.

The two movements are integrated, and the object seems to use its entire existence in its expression of despair.

But the idea is that once you get someone's attention, you're no longer interested in them, and you look for the next person to get your attention.

(Laughs) This is the final fabrication of the decoy.

They look mass-produced, like they came out of the factory, just like vacuum cleaners and washing machines.

We always work in very personal spaces, so we love how this consumer aesthetic depersonalizes objects and at least gives them a little distance in their appearance.

So for us, this is a kind of evil entity trying to distract you from things that actually need your attention, but it can also be someone who needs a lot of help.

The next work is an object, which is also a kind of acoustic instrument.

Amphitheater shape scaled to match the size of the audience as seen from the stage.

So from where I'm standing, each and every one of you looks so big, it's like the audience occupies my entire field of vision.

996 small puppets are seated in this auditorium.

They are mechanically able to clap of their own free will.

This means that each person can decide if they clap, when, how hard and for how long they clap, how they want to influence the people and others around them, and whether they want to contribute to innovation.

That is, when the viewer steps in front of the audience, a reaction occurs.

If you clap a few times or give a strong clap, nothing happens until the audience leaves the stage, and the audience responds again.

It can be a few soft clapping by members of the audience or a very loud clapping.

So for us, I think we see the audience as an object in itself, a unique organism that also has a certain musical quality, an instrument.

Thus, while the viewer can elicit and play with very complex and varied, subtle musical and sound patterns, it cannot actually induce the audience into any particular kind of reaction.

That means judgment, capriciousness, and anxiety.

It also has a charming and trapping quality.

Here you can see that I am very excited about the image of the head splitting to form two hands.

Here's a small visual animation to help you understand duality and tension, as if two sides of your brain were colliding.

And here is the prototype.

So I can't wait to be swallowed up by those in 996.

Now this is the final task. It's called Framerunner.

It was born from the idea of ​​windows.

This is the actual window in our studio, but as you can see it's made up of three wooden pieces of different thicknesses.

So, using the same window vocabulary, I built my own frame or grid that hangs in the room and can be seen from both sides.

This grid is populated by tribes of small figures.

They also consist of three different sizes, as if suggesting a kind of perspective or landscape on a single plain.

Each of these figures can also run back and forth on the track, or hide behind two adjacent tracks.

So, in contrast to this very tight grid, I wanted to give these figures a very comical and slapstick quality, as if the puppeteer had physically moved them and moved the path.

So we like the idea of ​​these figures skipping as if they were thoughtless, carefree, happy and content, until they sense movement from the viewer and hide behind the fastest wall.

For us, therefore, the work also presents its own contradiction.

These people are kind of trapped in this very powerful grid. It's like a prison, but it's also a fortress. Because it allows them to be completely oblivious to the outside world, naive and carefree.

Therefore, all of these real-life properties that I am talking about have been translated into a very specific technical configuration, and we were very lucky to work with ETH Zurich to develop the first prototypes.

So you can see that I extracted the gears of motion from the animation and created a wiggle motion that integrated the bobbing motion and the back and forth motion.

So it's actually pretty small.

You can see that it fits in the palm of your hand.

So imagine our excitement when we saw it in action in the studio, and here it is.

(laughs) Thank you.

(applause)

Intelligence -- what is it?

Looking back at the history of how intelligence has been viewed, one influential example is Edgar Dijkstra's famous quote: "The question of whether machines can think is as interesting as whether submarines can swim."

Well, Edgar Dykstra, when he wrote this, intended a critique of early pioneers in computer science like Alan Turing.

But when we look back and consider what were the most powerful innovations that made it possible to build artificial machines that swim and fly, we realize that these machines could only be built by understanding the underlying physical mechanisms of swimming and flight.

So, a few years ago, I worked on a program that tried to understand the fundamental physical mechanisms underlying intelligence.

Let's take a step back.

Let's start with a thought experiment.

Suppose you are an alien race who knows nothing about Earth biology or Earth neuroscience or Earth intelligence. But you have a wonderful telescope, you can observe the Earth, and you are incredibly long-lived, so you can observe the Earth for millions, even billions of years.

A really strange effect is then observed.

Over the millennia, the Earth has been continuously bombarded by asteroids, up to a point, roughly corresponding to the year 2000 AD, when an asteroid on a collision course with the Earth that was supposed to hit the Earth has been observed to be mysteriously redirected or even explode before hitting the Earth.

Of course, we Earthlings know that the reason is that we are trying to save ourselves.

We try to prevent impact.

But if you know nothing of this, and you are an alien race with no concept of Earth Intelligence, then you will need to put together a physical theory that explains how an asteroid that would have destroyed the planet's surface until some point mysteriously stopped doing so.

So I would argue that this is the same question as understanding the physical nature of intelligence.

So in this program I worked on a few years ago, I looked at different threads across science, across different disciplines. I believe these threads point to a single mechanism underlying intelligence.

In cosmology, for example, there is a wide range of evidence that our universe appears to be finely tuned for the development of intelligence, especially for the development of universal states that maximize the diversity of possible futures.

In terms of gameplay, for example, Go — everyone remembers IBM's Deep Blue beating Garry Kasparov at chess in 1997 — few people know that over the past decade or so, Go, a much more branching and therefore more challenging game, has begun to succumb to computer game players for the same reason. The best technique for computers playing Go at the moment is one that tries to maximize future options during game play.

Finally, in robot motion planning, there are various recent techniques that attempt to harness the capabilities of robots to maximize future freedom of action to accomplish complex tasks.

So by taking all these different threads and putting them together, I asked for several years if there was an underlying mechanism of intelligence that could take all these different threads into account.

Is there a single equation for intelligence?

I believe the answer is yes. ["F = T ∇ Sτ"] What you're seeing is probably the closest thing I've ever seen to E = mc² in intelligence.

So what we are looking at here is the corresponding statement that intelligence is a force F acting to maximize future freedom of action.

It works to maximize future freedom of action or to keep options open, with some strength T, with a variety S of accessible futures, up to some future time axis tau.

In short, intelligence does not like to be confined.

Intelligence agencies seek to maximize future freedom of action and keep options open.

Given this one equation, it's natural to wonder what it can do.

How predictable is it?

Can we predict human-level intelligence?

Do you predict artificial intelligence?

So here's a video showing some amazing applications of this one equation.

(Video) Narrator: Recent research in cosmology suggests that universes that produce more disorder, or "entropy," over a lifetime tend to be more favorable conditions for the existence of intelligent beings like us.

But what if the tentative cosmological link between entropy and intelligence suggests a deeper connection?

What if intelligent behavior is not only correlated with long-term entropy generation, but actually emerges directly from it?

To figure it out, we developed a software engine called Entropica. This engine is designed to maximize the long-term entropy production of any system in existence.

Amazingly, Entropica was able to pass multiple animal intelligence tests, play human games, and even make money trading stocks without being instructed to do anything.

Here are some real world examples of Entropica.

You can see Entropica using carts to automatically balance the poles, just like humans stay upright without tipping over.

This behavior is notable as we did not give Entropica a goal.

I just decided the balance of the pole myself.

This balance ability will find application in humanoid robotics and human assistive technology.

Just as some animals can use objects in the environment as tools to reach into confined spaces, here we see that Entropica was once again able to spontaneously move the large disk representing the animal to bring the smaller disc representing the tool into the narrow space holding the third disc, freeing the third disc from its initial fixed position.

The ability to use this tool will have applications in smart manufacturing and agriculture.

Moreover, just as other animals can cooperate by simultaneously pulling on opposite ends of a rope to release food, we find here that entropica can accomplish a model version of that task.

This ability to cooperate has interesting implications for economic planning and many other areas.

Entropica is broadly applicable to different domains.

For example, here we see a successful game of Pong against itself, demonstrating its potential as a game.

Here we see Entropica succeeding in reconciling new connections and maintaining good network connections on social networks where friends are constantly lost.

This same network orchestration capability can also be applied to healthcare, energy, and intelligence.

Here we see Entropica directing the course of the fleet, successfully discovering and exploiting the Panama Canal, and extending its reach globally from the Atlantic to the Pacific.

Similarly, Entropica is broadly applicable to autonomous defense, logistics, and transportation problems.

Finally, we can see how Entropica was able to spontaneously discover and implement a buy low, sell high strategy in simulated range-traded stocks, resulting in exponential growth in assets under management.

This risk management ability will have wide application in the fields of finance and insurance.

Alex Wissner-Gross: What we've seen so far is that a variety of characteristic human intellectual cognitive behaviors, such as tool use, upright walking, and social cooperation, all derive from a single equation that drives the system to maximize freedom of action in the future.

Now, there is a deep irony here.

Going back to the play "RUR", when the term robot began to be used, there was always the notion that the development of machine intelligence would lead to a cybernetic rebellion.

Machines will rise against us.

One of the main findings of this research is that perhaps for decades we have turned the whole concept of cybernetic rebellion upside down.

It's not like machines will be intelligent first and then become megalomaniacal and try to take over the world.

Quite the opposite, the urge to control all possible futures is a more fundamental principle than the principle of intelligence, and that general intelligence can actually emerge directly from the acquisition of this kind of control, rather than the other way around.

Another important result is the pursuit of goals.

The question is often asked, how do you get the ability to seek goals from this kind of framework?

The answer is that the ability to seek goals derives directly from this, in the following sense. Just as we cut through short-term liquidity and invest in financial securities to increase our long-term wealth, our ability to seek goals stems directly from our long-term motivation for increasing freedom of action in the future, in order to achieve many other diverse objectives later on.

Finally, the famous physicist Richard Feynman wrote that once human civilization was destroyed, if we were to be able to pass on a single concept to our descendants to help rebuild it, that concept would have to be that all matter around us is made up of tiny elements that attract each other when they are apart, but repel each other when they come closer.

To help build artificial intelligence, or to help understand human intelligence, the equivalent of this statement of mine to pass on to descendants is: Intelligence should be viewed as a physical process that seeks to maximize freedom of action in the future and avoid constraints in its own future.

thank you very much.

(applause)

If possible, I would like to start with the story of the Paisley snail.

On the night of August 26, 1928, May Donahue took a train from Glasgow to the town of Paisley, 11 miles east of the city, where she ate at the Wellmeadow Cafe a Scottish ice cream float, a mixture of ice cream and ginger beer, bought by a friend.

The ginger beer came in a brown opaque bottle labeled "D. Stevenson, Glen Lane, Paisley."

She drank a few ice cream floats, but when she poured the rest of the ginger beer into her tumbler, rotten snails floated to the top of her glass.

Three days later she was admitted to the Glasgow Royal Infirmary and diagnosed with severe gastroenteritis and shock.

The Donahue v. Stevenson case that followed set a very important legal precedent. It was determined that Stevenson, the maker of Ginger Beer, had a clear duty of care to May Donahue, even though there was no contract between the two and, in fact, she had not even bought the drink.

Lord Atkin, one of the judges, explained this as follows: Care must be taken to avoid acts or omissions that are reasonably foreseeable as being likely to harm neighbors.

In fact, one wonders how many people would have had to suffer from gastroenteritis before Stevenson's eventual closure, had it not been for the duty of care.

Now, the Paisley snail story is an important principle, so hang on.

Last year, the Hansard Society, a bipartisan charity that seeks to strengthen parliamentary democracy and promote public engagement in politics, unveiled an additional section devoted entirely to politics and the media, alongside its annual audit of political engagement.

Here are some rather depressing observations from that survey.

Tabloids do not appear to enhance the political citizenship of their readers, even compared to those who do not read newspapers at all.

Readers of tabloids only are twice as likely to agree with a negative view of politics as readers without newspapers.

Not only are they less involved in politics.

They consume media that reinforce negative perceptions of politics, thereby fostering a fatalistic and cynical attitude towards democracy and their role within it.

In this regard, it is not surprising that the report concludes that the press, especially the tabloids, appear to be failing to play an important role in our democracy.

Now, I wonder if anyone in this room would seriously dispute that view.

But if Hansard is right, and they usually are, then we have a very serious problem and I want to focus the next ten minutes on this problem.

Since the Paisley snail, a lot of thought has evolved around the concept of duty of care as it relates to different aspects of civil society, especially over the past decade or so.

In general, a duty of care occurs when an individual or group of individuals engages in activities that may physically, mentally, or financially harm another person.

This primarily focuses on obvious areas such as empathetic responses to children and youth, service personnel, and the elderly and infirm.

It rarely, if ever, extends to the equally important discussion of the fragility of our current system of government, or the notion that honesty, accuracy and fairness are fundamental to the process of building and anchoring an informed and participatory democracy.

And the more I think about it, the stranger it is.

A few years ago I had the pleasure of opening a new school in the North East of England.

Its name was changed to Academy 360 by the students.

As I walked through the impressive glass atrium, I saw Marcus Aurelius' famous injunction written in fire letters on the wall in front of me. If it's not right, don't do it.

The principal saw me staring at it and said, "Oh, that's the motto of our school."

I couldn't get it out of my head on the train back to London.

I've been wondering, did it really take us over 2,000 years to agree on the simple notion that we were the bare minimum expectations of each other?

Isn't it time for us to develop this notion of duty of care and extend it to include consideration of shared but increasingly endangered democratic values?

After all, the lack of duty of care in many professions can all too easily lead to accusations of negligence, and if that is the case, can we really rest assured that we are effectively at fault for the health of our society and the values ​​that necessarily underpin it?

Can anyone honestly suggest, based on evidence, that the same media that Hansard so thoroughly condemned were careful enough to avoid actions that could reasonably have been foreseen to undermine and even damage our inherently fragile democratic solutions?

Now, some would argue that even though this is self-censorship, it could very easily drift into a form of censorship, but I disagree.

It must be possible to balance freedom of expression with broader moral and social responsibility.

Let me use my own career as a filmmaker to illustrate why.

Throughout my career, I never accepted that a filmmaker should place his work outside or beyond what he believed to be the appropriate values ​​for his life, his family, and the future of the society in which we all live.

I would like to go further.

Responsible filmmakers should not devalue their work until it is no longer true to the world they want to live in.

In my view, filmmakers, journalists, and even bloggers are being called upon to meet society's expectations that come from combining the inherent power of media with honed professional skills.

Obviously, this is not an obligatory obligation, but I feel that for talented filmmakers and responsible journalists, even bloggers, this is completely unavoidable.

We must always remember that the concept of individual liberty and its partner, creative liberty, is relatively new in the history of Western thought, and as such is often underestimated and can quickly be undermined.

It's an easily lost prize, and once lost and abandoned, it can be very difficult to get back.

And that first line of defense must be our own standards, our own standards, and our own integrity, not those enforced by censorship or law.

Honesty in dealing with the people I work with and standards for myself in my conduct in society.

And all these criteria of ours need to be in line with the social agenda of sustainability.

They are part of a collective responsibility, the responsibility of artists and journalists to deal with the world as it is, and this in turn must go hand in hand with the responsibility of those who govern society to face that world and not be tempted to exploit the causes of its disease.

But as has become conspicuously clear in the last few years, such responsibility has been largely ignored by most of the media.

As a result, across the West, the overly simplistic policies of protesting parties, appeals primarily to disenchanted older populations, and the indifference and obsession with trifles typical of at least some young people, combine to make these and other equally contemporary anomalies a threat to crowd out lively, informed discussion and participation, and I would like to emphasize positively.

The most ardent liberals might argue that Donahue v. Stevenson should be thrown out of court, and that if Stevenson had continued to sell ginger beer with snails, he would have eventually gone out of business.

But I think most of us accept the state's small role in enforcing a duty of care. And the key word here is rational.

Judges must ask whether they exercised reasonable care and could reasonably foresee the consequences of their actions.

Far from representing tyranny of state power, this is, after all, a small common sense test of rationality that we would like the media people who determine the tone and content of much of our democratic discourse to apply.

For democracy to work, it requires that rational men and women take the time to understand and debate difficult and sometimes complex issues, and do so in an atmosphere that seeks understanding that, if not consensus, at least leads to productive and feasible compromises.

Politics is about choices, and priorities within those choices matter.

It's all about reconciling conflicting preferences based on facts anytime, anywhere.

But if the facts themselves are distorted, this resolution will only create more conflict and will inevitably create all sorts of stresses and tensions in society.

The media must make a decision: do they see their role as that of fanning or that of providing information?

Because in the end it comes down to a combination of trust and leadership.

Fifty years ago this week, President John F. Kennedy delivered two landmark speeches. The first was about disarmament and the second was about civil rights.

The first quickly led to the Nuclear Test Ban Treaty and the second to the Civil Rights Act of 1964, both representing major advances.

Democracy, when well-directed and well-informed, can achieve very good results, but there are prerequisites.

We must believe that those who make such decisions are acting in the best interest of the nation as a whole, not in their own interests.

We need clearly articulated, fact-based choices. We need accurate, unbiased information to make our own decisions, not the choices of a few powerful and potentially manipulative firms that often pursue narrow ends.

If we want to provide our children and their children with decent and fulfilling lives, we need to exercise our duty of care to a vibrant and hopefully enduring democracy to the greatest extent possible.

Thank you for your attention.

(applause)

what is love?

It's a difficult term to define because it has such a wide range of uses.

You will love jogging.

I can love books and movies.

I can love Escalope.

i can love my wife

(Laughter) But there is a big difference between, say, Escalope and my wife.

In other words, if I value escalope, escalope, escalope will not appreciate me.

My wife, on the other hand, calls me the star of my life.

(Laughter.) Therefore, only another desirable conscience can envision me as desirable.

i know this That is why love can be defined more precisely as a sought-after desire.

The eternal challenge of love, therefore, is how to become and maintain an attractive presence.

This person once found the answer to this problem by following community rules for his life.

You had a specific role to play depending on your gender, age, and social status, and you had to play your part in order to be valued and loved by the entire community.

Consider a young woman who must remain chaste before marriage.

Think of the youngest son who must obey the eldest son. And the eldest son also has to obey the patriarch.

But a phenomenon that began in the 13th century, primarily in the Renaissance West, triggered the greatest identity crisis in human history.

This phenomenon is modern.

It basically boils down to going through three processes.

First, the process of streamlining scientific research, which has accelerated technological progress.

Second is the process of political democratization that fosters individual rights.

And finally, the process of streamlining economic production and liberalizing trade.

These three intertwined processes have utterly obliterated all traditional ways of being in Western society and have had a fundamental effect on the individual.

Individuals are now free to appreciate or disparage any attitude, any choice, any object.

But as a result, they also face the same freedom that others have to value or disrespect them.

So my worth was once secured by submission to traditional authority.

It is now listed on the stock exchange.

In the free market of individual desires, I negotiate my worth every day.

That is the anxiety of modern man.

He's obsessed with, "Am I a desirable person? How desirable?"

how many people love me ”

And how will he respond to this anxiety?

Well, by hysterically collecting symbols of desire.

(Laughter) I call this act seduction capital along with others.

In fact, our consumer society is largely based on seduction capital.

It is said that our age is materialistic about this consumption.

But it's not true! We only accumulate objects to communicate with other minds.

We do it to make them love us, to seduce them.

There is nothing more materialistic and sentimental than a teenager buying new jeans and tearing them at the knees just to please Jennifer.

(Laughter) Consumerism is not materialism.

Rather, it is swallowed up and sacrificed in the name of the god of love, or rather in the name of the capital of temptation.

Given this observation about modern love, how can we think about love in the years to come?

We can consider two hypotheses. The first is betting that the process of narcissistic capitalization will intensify.

It is difficult to say what form this intensification will take. Because it relies largely on social and technological innovation, it is inherently unpredictable.

But I can imagine, for example, that a dating site a bit like a loyalty points program would use different temptation capital points depending on my age, height-to-weight ratio, degree, salary, or number of profile clicks.

You can also imagine chemo for a breakup that weakens attachment.

By the way, there's already a show on MTV where The Seduction Teacher treats heartache as a disease.

These teachers call themselves "Pick Up Artists".

"Artist" simply means "artist" in French.

To "pick up" is to pick someone up, but picking up a chick, not just a pick-up.

So they are chick-picking artists.

(Laughter.) And they call heartache 'wantis'.

The English "itis" is a suffix that means infectious disease.

One-itis can be translated as "infection from one person".

I don't like it. Indeed, for a pick-up artist, falling in love with someone is a waste of time and a waste of seduction funds, so it must be eliminated like a disease or infection.

You can also imagine romantic uses for the genome.

Everyone carries it around and presents it like a business card to see if the temptation goes on to procreation.

(Laughter) Of course, this competition of temptations, like any cutthroat competition, can make a big difference in the narcissist's satisfaction, and therefore a lot of loneliness and frustration.

Therefore, it is expected that modernity itself, the origin of seduction capital, will be questioned.

I am thinking especially of the reaction of neo-fascists and religious communes.

But it doesn't have to have such a future.

Another way of thinking about love may be possible.

But how?

How can I let go of the hysterical desire to be cherished?

Well, by recognizing my own helplessness.

(laughs) Yes, I'm no good.

But rest assured. So are you.

(Laughter.) (Applause.) We are all useless.

This uselessness is easily proven. Because in order for me to be appreciated, others need to want me. This shows me that I am not worthy of myself.

I have no intrinsic value.

We all pretend to have idols. We all pretend to be someone's idol, but in reality we're all cheaters, a bit like guys on the street who seem completely cool and indifferent but actually predict and calculate to keep all eyes on them.

I think it will make your relationship easier if you become aware of this common scam that affects us all.

Seduction hysteria exists because you want to be loved from head to toe and be justified in every choice you make.

Therefore, I want to seem perfect so that other people can love me.

I want you to be perfect so that you can feel secure about your worth.

It leads to couples obsessed with performance and breaking up after just a few shortfalls.

In contrast to this attitude, I seek kindness, love as tenderness.

What is kindness?

Being kind means accepting your loved one's weaknesses.

It's not about being a sad orderly couple.

(Laughter) That's pretty bad.

On the contrary, there is a lot of charm and happiness in kindness.

What I am specifically referring to is a kind of humor that unfortunately is underutilized.

It's a kind of poetry that expresses deliberate awkwardness.

I mean self-mocking.

I believe that self-mockery is one of the best ways to sustain a relationship for couples no longer sustained by the constraints of tradition.

For example, when you are shopping for groceries at the supermarket, you have a choice between plastic shopping bags and paper shopping bags.

Which one would you choose if you wanted to do the right thing depending on your environment?

Most people choose paper.

Well, let's see why.

Brown from the beginning.

Therefore, it must be environmentally friendly.

Biodegradable. Reusable.

In some cases it is recyclable.

So when people see plastic bags, they are probably thinking something like this. We all know this is absolutely terrible. And we need to avoid this kind of environmental destruction at all costs.

But people often don't think about things like this at the other end of the spectrum.

When we produce materials, we have to extract them from the environment, which requires different environmental impacts.

When we have to make a complicated choice, we humans like very simple solutions, so we often go for simple solutions.

And I work in design.

I advise designers and innovators about sustainability, and they always say to me, 'Oh, Layla, I just want eco materials.'

And I say, ``It's very complicated and you have to spend four hours on exactly what eco-materials mean because everything comes from nature at some point and how you use that material determines the impact on the environment.''

This means that you should rely on some sort of intuitive framework when making decisions.

So I like to call that intuitive framework environmental folklore.

It's either the little voice in the back of your head or the intuition you get when you do the right thing, like choosing a paper bag or buying a fuel-efficient car.

Environmental folklore is very important because we are trying to do the right thing.

But how do we know if our actions as individuals, professionals and as a society are actually reducing the net environmental impact we have on the natural environment?

This means that environmental folklore tends to be based on our experiences and what we hear from others.

It is not based on a scientific framework.

This is really difficult because we live in incredibly complex systems.

We have human systems of how we communicate, interact, and structure our entire society, and we have industrial systems that are essentially entire economies, all of which must operate within what I would argue is the largest system, and most importantly, the ecosystem.

As you know, not only the choices we make as individuals, but the choices we make in all the jobs we have, whether high or low, affect all these systems.

And the problem is, we have to find a way if we are going to really work on sustainability to make better choices that bring these complex systems together and have a net return on the environment.

All we have to do is learn to do more with less.

The population is growing and everyone prefers mobile phones, especially in the situation here.

Therefore, we need to find innovative ways to solve some of these problems we face.

This is where a process called lifecycle thinking comes into play.

So basically everything that is created goes through a series of lifecycle stages. We use this scientific process, called life cycle assessment, to get a clearer picture of how everything we do in the technical part of these systems impacts the natural environment. In the United States, it is called Life Cycle Analysis.

So we can trace back to the extraction of raw materials, look at manufacturing, packaging and transportation, use, and end of life, and at every step of these steps, what we do is interacting with our natural environment, and we can monitor how that interaction actually impacts the systems and services that enable life on Earth.

By doing this, we learned some very interesting things.

And we have broken many myths.

First, there are words that are often used.

It's a term that's used a lot in marketing, and I think you'll hear a lot in conversations when talking about sustainability, and that's the term biodegradability.

Currently, biodegradability is a material property. That's not the definition of environmental benefits.

Please let me explain.

Anything natural, such as anything made from cellulose fibers like bread, food waste, or even scraps of paper, usually decomposes when left in the natural environment.

The small carbon molecules it stores as it grows are naturally released into the atmosphere as carbon dioxide, which is a net situation.

Most of the things in nature don't actually exist in nature.

Most of the waste we produce ends up in landfills.

Landfills are different environments.

Landfills are anaerobic, so the same carbon molecule breaks down in a different way.

I have no oxygen. It's jam packed and hot.

These same molecules become methane. Methane is a greenhouse gas 25 times more powerful than carbon dioxide.

So when the old lettuce we throw away and products made from biodegradable materials end up in landfills, we contribute to climate change.

As you know, there are now facilities that can actually capture methane and generate electricity, replacing the need for fossil fuel power, but we need to be smart about this.

We need to identify how we can start taking advantage of this sort of thing that's already happening to start designing systems and services that mitigate these problems.

Because what people are doing now is turning around and saying, ``Let's ban the plastic bags.

But if you're throwing it in the trash and your local landfill is a regular facility, you're going to have a so-called double negative.

I am a product designer by profession.

Then I did social science.

That is why I am so fascinated by consumer goods and how certain unaffected consumer goods that fill our lives impact the natural environment.

And they're kind of serial criminals, and I'm pretty sure everyone in this room has a refrigerator.

America now has an amazing ability to keep growing its refrigerators.

Over the past few years, the standard refrigerator size has increased by an average of 1 cubic foot.

And the problem is that they're now so big that it's easy to buy more food that we can't eat or find.

In other words, there are things that have been left in the back of the refrigerator for years.

And what happens is you end up wasting even more food.

And as I explained earlier, food loss is a problem.

In fact, here in the United States, 40 percent of the food we buy for our homes is wasted.

Half of the food produced in the world is wasted.

Here are the latest UN statistics. Half a meal.

Not insane. That's 1.3 billion tons of food a year.

And I blame it on the refrigerator, especially in Western culture, because it makes it easier.

So there are a lot of complex systems going on here.

I don't want to oversimplify it.

But the refrigerator contributes a lot to this and one of its features is the drawer in the vegetable compartment.

Are you guys cleaning your drawers better?

What drawer do you keep your lettuce in?

Lettuce has a habit of becoming soggy in the drawer of the vegetable compartment.

yes? Soggy lettuce?

This has become such a problem in the UK that a few years ago there was a government report stating that soggy lettuce was the second largest cause of food waste in the UK.

It was called a "soggy lettuce report."

have understood? This is a problem, folks.

These poor little lettuce dumps left, right and center because the drawers in the vegetable compartment aren't really designed to keep things crisp.

have understood. A tight environment is required.

For example, an air-free environment is required to prevent natural degradation.

But the crisper drawers are those with only slightly better sealing.

Anyway, I'm clearly hooked.

Never invite me to your house because I will start looking into your refrigerator and things like that.

But in essence, this is a big problem.

Because when we lost something like lettuce from the system, not only did it affect me in the way I described at the end of my life, but I actually had to grow that lettuce.

Its impact on the lettuce life cycle is astronomical.

The land had to be cleared.

We had to plant seeds, phosphorus, fertilizer, nutrients, water and sunlight.

Any impact embodied in the lettuce is lost from the system, resulting in a far greater environmental impact than the loss of energy from the refrigerator.

So things like this need to be better designed if we're going to start tackling serious environmental issues.

Let's start with the drawer and size of the vegetable compartment.

For those of you doing refrigerator design, that would be great.

The question is, imagine if we started rethinking how we actually designed things.

So while I think of refrigerators as a symbol of modernity, the reality is that refrigerator design hasn't changed much since the 1950s.

A little bit, but it's still essentially a big box, a cold box in which we store things.

So imagine what would happen if we actually started identifying these problems and using that as a foundation for finding innovative and elegant design solutions that solve them.

This is a design-driven system change, where design decides how to make the system more sustainable.

40% food waste is a big problem.

Imagine if we designed a refrigerator that does half that.

Another thing I find attractive is the electric kettle. I looked it up and found that kettles are not made in this country.

But it's a really big deal in England.

97% of households in the UK own an electric kettle.

That's why it's so popular.

So, if I were to work with a design company or a designer and they were doing these designs and they wanted to make it eco-friendly, they would usually ask me two things.

“Layla, how can we be technically efficient?” they would say.

Because there is clearly an energy problem with this product.

Or, "How can we make it an eco-friendly material?"

How can I make the material green in manufacturing?”

Could you ask me that question?

Sounds logical, right? yes.

Well, I would say "you're looking at the wrong problem".

Because the problem is how to use it.

It's how people use the product.

65% of Britons admit to filling the kettle with too much water when they only need one cup of tea.

Boiling all this extra water takes energy, and it has been calculated that one day's use of the extra energy in boiling a kettle is enough to light all the street lamps in England for one night.

But this is the problem.

This is what I call product person failure.

But there are product system failures in these little people, and they're so ubiquitous that you don't even realize they're there.

But this guy here, he does. His name is Simon.

Simon works for the UK National Electricity Company.

He has the very important job of monitoring all the power going into the system to make sure there is enough power to power all the homes.

he is watching tv too

The reason is that there is a unique phenomenon that happens in England.

The moment when a popular TV show ends.

As soon as there is an advertising break, this guy has to hurry up and buy nuclear power from France. Because everyone switches on the kettle at the same time.

(Laughter) 1.5 million kettles, a serious problem.

Imagine you designed a kettle. Let's say you actually found a way to fix these system failures. This is because it puts a lot of load on the system. Because they don't think about the problems that will arise when the product exists in the world.

Well, after looking at some kettles available on the market, I found a minimum filling line. So the little bit of information you needed to put in there was between two and five and a half cups to brew a cup of tea.

This kettle is an example that actually has two reservoirs.

One is the boiling chamber and the other is the water holder.

The user has to press that button to actually boil the water. I mean, we're all lazy, so we end up pouring exactly the amount we need.

This is what I call behavior-changing products, products, systems or services that intervene and proactively solve these problems.

We're in the technology space, so naturally these products are very popular, but if we continue to design, buy, use, and dispose of these types of products at the current rate, I think that's astronomical speed, and there are 7 billion people in the world right now.

As of last year, there were 6 billion mobile phone subscriptions.

Every year, 1.5 billion mobile phones leave the production line, and some companies report that their production rate exceeds the human birth rate.

Last year, 152 million mobile phones were discarded in the United States. Only 11% was recycled.

I'm from Australia. We have a population of 22 million, but don't laugh. There are reportedly 22 million mobile phones lying in people's drawers.

These problems are so complicated that we need to find a way to solve them.

They keep a lot of things inside themselves.

Money! Did you know that it's actually cheaper now to extract gold from a ton of old mobile phones than it is to extract gold from a ton of gold ore?

These objects contain a lot of very complex and valuable materials, so we need to find a way to accelerate their decomposition. Otherwise, something like this will happen.

This is a community in Ghana that has reported e-waste or has e-waste reported by the United Nations.

Up to 50 million tons are said to be traded.

This is how they extract gold and other valuable materials.

They burn e-waste in open space.

These are communities and this is happening all over the world.

And because we don't understand the impact of our choices as designers, businessmen, and consumers, these kinds of externalities happen and that's how people live.

Therefore, we need to find smarter, more systems-based, and innovative solutions to these problems if we are to start living sustainably in this world.

For example, imagine if when you bought a cell phone, it turned into a new cell phone because you replaced your old cell phone. By the way, on average people replace their phones after 15-18 months. If we are to continue to replace such opportunistic mobile phones, we should consider closing the loop on these systems.

The people that make these phones, and I think some of them are in this room right now, could potentially look at what we call closed loop systems, or product system services. So there's a market demand, and you design your product to solve a problem, recognizing that that market demand isn't going anywhere.

Disassembled design, lightweight design.

I heard some of such strategies are used in Tesla Motors cars today.

This kind of approach is not difficult, but by understanding the system and looking for viable, market-driven alternatives to consumer demand, we can begin to fundamentally change the sustainability agenda. Because I hate explaining it to you. Consumption is the biggest issue.

But design is one of the best solutions.

Products of this kind are everywhere.

You can really start innovating by identifying alternative ways of doing things. I think it really starts to innovate.

I think everyone in this room is very innovative.

But when it comes to using sustainability as a parameter and a criterion fueled by systems-based solutions, as we demonstrated earlier with these simple products, these products are involved in these critical issues.

Therefore, we need to look at the entire lifetime of what we are doing.

If you had only paper or plastic -- obviously reusable would be much more beneficial -- paper would be worse, and even worse because paper weighs 4-10 times more than plastic. If you actually compare 1kg of plastic to 1kg of paper from a lifecycle perspective, paper is far superior, but the function of a plastic or paper bag to bring groceries home is not complete with 1kg of each material.

Made with very little plastic and quite a lot of paper.

Because function defines environmental impact, and I said earlier that designers are always looking for eco-friendly materials.

There are only a few substances that should be completely avoided.

The rest is all about applications, and after all, everything we design or produce in our economy, or buy as consumers, is done to function.

We want something, so we buy it.

So by breaking things down and providing smart, elegant and sophisticated solutions that consider the whole system and the life of the thing, everything from extraction to end of life, we can really start to find truly innovative solutions.

And I'll just leave you with one very simple word that a designer I work with, a senior designer, recently told me.

I said, 'Why aren't you working on sustainability? I think you know that.'

And he said, "I recently pitched a client a sustainability project, and I turned around and he said, 'We know it will cost less, we know we'll sell more, but we're not pioneers, because pioneers have arrows on their backs.'" Because we need to solve these problems.

thank you.

(applause)

The world is changing in some very profound ways, but I worry that investors are not paying enough attention to some of the biggest drivers of change, especially when it comes to sustainability.

And sustainability means really interesting things like environmental and social issues and corporate governance.

I think it would be reckless to ignore these things. Ignoring it could threaten your future long-term earnings.

And here's something that might surprise you. The balance of power to make a real impact on sustainability rests with large investors such as institutional investors, pension funds, foundations and endowments.

I believe sustainable investing is less complicated than you might think, it will perform better than you think, and it's more important than we imagine.

Let me remind you what we already know.

Our population is growing and aging. We have 7 billion souls today and will reach 10 billion by the end of this century. We consume natural resources faster than we can replenish them. And emissions, the main contributor to climate change, continue to rise.

These are obviously environmental and social issues, but they are not the only ones.

These are economic issues, which relate to risk and return.

And they can seem really complicated and far-fetched. You may be tempted to do so. Bury your head in the sand and don't think about it.

Resist this if you can. don't do this at home.

(Laughter) But I wonder if today's investment rules are fit for tomorrow's purposes.

We know that investors look at metrics like financial data, sales growth, cash flow, market share and valuations when they consider a company and decide whether to invest in it – something that is very attractive.

Of course, these are the basics, but they are not enough.

Investors should also look at so-called ESG performance indicators such as environmental, social and governance.

The environment includes energy consumption, water availability, waste, pollution, but simply the efficient use of resources.

Social includes human capital such as employee engagement and innovation capacity, as well as supply chain management, labor rights and human rights.

Governance concerns the oversight of a company by the board of directors and investors.

See, I told you this was really delicious.

However, ESG is a measure of sustainability and sustainable investing incorporates ESG factors into the investment process alongside financial factors.

It means limiting future risks by minimizing harm to people and the planet, and it means providing capital to users who deploy for productive and sustainable outcomes.

So if sustainability is financially important today and all signs point to more tomorrow, is the private sector paying attention?

Well, what's really cool is that most CEOs are.

They have come to believe that sustainability is not only important, but vital to their business success.

Nearly 80% of global CEOs believe sustainability is at the root of innovation growth and will lead to competitive advantage in their industry.

However, 93% believe ESG is future-oriented or important to the future of their business.

So the CEO's view is clear.

There is a huge opportunity in sustainability.

So how are companies actually using ESG to improve their performance?

One example is close to our hearts.

In 2012, State Street migrated 54 applications to the cloud environment and retired 85 more.

We have virtualized our operating system environment and completed a number of automation projects.

Today, these efforts enable a more mobile workplace, reduce our real estate footprint, save $23 million in operating costs annually, and avoid 100,000 tons of carbon emissions.

This is equivalent to removing 21,000 cars from the road.

So great, right?

Another example is Pentair.

Pentair is an American conglomerate that sold its core power tools business about a decade ago and reinvested the proceeds into its water business.

That's a really big bet. why did they do that?

Now, sorry home improvement fans, but with more growth in the water space than in power tools, this company has its sights set on what they call a "new new world."

It's the 4 billion middle-class people in need of food, energy and water.

Now, you may be asking yourself, are these just isolated cases?

I mean, come on, really?

Are companies that consider sustainability really doing well financially?

The answer, which may surprise you, is yes.

The data shows that stocks with better ESG performance perform in line with others.

Shown in blue is MSCI World.

This is an index of large companies in developed markets around the world.

And in Gold, we see some of the companies rated as having the best ESG performance.

Over 3 years, no performance trade-offs.

That's okay, right? I want more i want more

In some cases, ESG may outperform.

Blue represents the performance of the world's 500 largest companies, while gold represents some of the companies with best practices in climate change strategy and risk management.

Now, in almost eight years, they are outperforming about two-thirds of the time.

Yes this is a correlation. It's not causality.

But this shows that environmental leadership goes hand in hand with good profit.

So if returns are the same or better and benefit the planet, isn't this the norm?

Are investors, especially institutional investors, interested?

Well, there are people like that, and there are people who are really leading the way.

horse.

Hesta is a retirement fund for Australian health and community service employees with [$22 billion] in assets.

They believe that ESG can influence risk and return, so incorporating ESG into the investment process is at the heart of their mandate and of their mandate to act in the best interests of their fund members.

You have to love Australians, right?

CalPERS is another example.

CalPERS is a California government employee pension fund with assets of $244 billion, the second largest in the United States.

and the sixth largest in the world.

We are now aiming for 100% sustainable investing with ESG systematically integrated across the fund.

why? They believe a full stop is essential for good long-term returns.

In their own words, “Long-term value creation requires effective management of three forms of capital: financial, human and physical.

This is why we care about ESG. ”

Now, as part of my job, I talk to a lot of investors, and not all of them think that way.

We often hear people say, "We're looking to maximize returns, so we're not going to do that here," or "We don't want to use portfolios as policy statements."

What really sticks out for me is, "If you want to do something about it, just make some money and donate the profits to charity."

My eyes are spinning, my eyes are spinning

So let me be clear here.

Corporations and investors are not alone responsible for the fate of the planet.

They have no indefinite social obligations, no smart investment or financial theory subordinated to sustainability.

Compatible.

So I'm not talking about tradeoffs here.

However, institutional investors are an important factor in sustainability.

Why do they hold the key?

The short answer is because they have money.

(Laughter) There are many.

I mean, really a lot.

The world stock market is worth $55 trillion.

The global bond market is 78 trillion.

133 trillion in total.

This is equivalent to 8.5 times the US GDP.

It is the world's largest economy.

That's pretty terrifying firepower.

Therefore, if institutional investors integrate ESG into their investments, they can rethink some of these pressing issues such as fresh water, clean air and feeding the mouths of 10 billion people.

What if they used that firepower to allocate more capital to the companies most committed to solving these challenges, or at least not exacerbating them?

What if we worked, saved and invested, but realized that the post-retirement world would be more stressful and less safe than it is now?

What if there is not enough clean air and fresh water?

Now, a fair question might be, what if all these sustainability risks are exaggerated, overrated, not urgent, and for good consumer and lifestyle choices?

President John F. Kennedy has quite apt words for this. “There are risks and costs associated with action plans, but they are far less than the long-term risks and costs of comfortable inaction.”

I can understand the risk of extrapolation to this, but this is based on widespread scientific agreement, so the chances of you not being completely wrong are better than the chances of your house burning down or getting in a car accident.

Well, maybe not if you live in Boston. (Laughter) But what I'm saying is that we take out insurance to protect ourselves financially in case something like that happens, right?

So by making sustainable investments, we are doing two things.

We create insurance and reduce risk to the planet and the economy, but at the same time without sacrificing performance in the short term.

[Man in cartoon: "What if it's a big hoax and we make a better world for free?"] Nice, you like it. I also like it.

(Laughter) I like this piece because it teases both sides of the climate change issue.

I don't think you know which side I'm on.

But what I really like about this piece is that it reminds me of the words of Mark Twain. It says, "Plan for the future because that's where you'll spend the rest of your life."

thank you.

(applause)

Today I want to talk to you about a powerful and fundamental aspect of who we are – our voice.

Each of us has a unique voiceprint that reflects our age, build, and even lifestyle and personality.

In the words of the poet Longfellow, "The human voice is the organ of the soul."

As a speech scientist, I am interested in how speech is produced and have ideas about how speech can be manipulated.

I would like to share it with you.

First, play a sample of an audio you should be familiar with.

(Recording) Dr. Stephen Hawking: "You would have thought that what I meant was pretty clear."

Rupal Patel: It was the voice of Dr. Stephen Hawking.

What you may not know is that this girl, who cannot speak due to a neurological disorder, may have the same voice.

In fact, these individuals may all be using the same voice, but that's because there are fewer options available.

In the United States alone, 2.5 million Americans cannot speak, many of whom use computerized devices to communicate.

Today, millions of people around the world use common voices, including Dr. Hawking, who uses a voice with an American accent.

This lack of personality in synthesized speech was pretty shocking when I attended an assistive technology conference a few years ago. I remember walking into the exhibit hall and seeing a little girl and a grown man conversing with the same voice using different devices.

And looking around, I saw this happening all around me. There are literally hundreds of people using a handful of voices that don't fit their bodies or personalities.

We would never dream of having a little girl fitted with adult male prostheses.

So why use the same artificial voice?

It was really shocking and made me want to do something about this.

I'm going to have you act out a sample of someone with a severe speech impediment. There are actually two.

Please listen to what kind of sound they play.

they are saying the same thing.

(first voice) (second voice) I may not have understood what they were saying, but I hope you hear their unique vocal identity.

So what I wanted to do next was figure out how to take advantage of these remaining vocal abilities and build a technology that was customizable to them, a voice that was customizable to them.

So I reached out to my collaborator, Tim Bunnell.

Dr. Bunnell was an expert in speech synthesis, building personalized voices for people by combining pre-recorded voice samples to reconstruct speech.

They are people who lost their voices in later life.

We couldn't afford pre-recorded audio samples for someone born with a speech impediment.

But I figured I needed a way to reverse engineer audio from what little was left.

So we decided to do just that.

With modest funding from the National Science Foundation, we set out to create custom voices that capture their unique vocal identities.

We call this project VocaliD (or Vocal I.D.) for vocal identity.

Now, before I go into detail about how voices are made and have them listen to it, I need to give them a quick lesson in phonetic science. have understood?

First, we know that voices have changed dramatically over the course of development.

Children's voices are different than adults, unlike teenagers.

We have all experienced this.

Fact number two is that speech is a combination of sound sources, vibrations produced by the vocal tract and pushed out to the rest of the vocal tract.

These are vibrating head and neck chambers that actually filter sound sources to produce consonants and vowels.

Therefore, the combination of sources and filters produces the sound.

And it happens within an individual.

Now, as I've said before, I've spent most of my career understanding and studying the characteristics of sound sources in people with severe speech impediments. And what I discovered was that even though their filters were compromised, I was still able to adjust the sound source: pitch, volume, and tempo.

These are called prosody, and I have documented over the years that these individuals' prosody abilities are preserved.

So when I realized that the same cues are also important for a speaker's identity, I came up with this idea.

Since the source is preserved, why not take the source from someone who wants that voice, borrow a filter from someone of about the same age and size who can speak the language clearly, and mix them together?

Because when you mix them, you get a voice as clear as a proxy speaker (a person borrowing a filter) and with similar identity to the target speaker.

It's that simple.

That's the science behind what we do.

With that in mind, how do we build this voice?

Well, you have to find someone to be your surrogate mother.

It's not that creepy.

A few hundred to a few thousand utterances are all it takes to become a surrogate donor.

The process looks like this:

(Video) Audio: Things happen in pairs.

i like to sleep

The sky is cloudless and blue.

RP: Well, she's going to go on like this for about three or four hours. And while the aim is not for her to say everything the target wants to say, the aim is to cover all the different combinations of sounds that occur within the language.

The more you speak, the better your voice.

Once we have these recordings, all we have to do is parse these recordings into small snippets of speech, combinations of one or two sounds, and possibly whole words to start populating a dataset or database.

Let's call this database a voice bank.

The strength of the voice bank is that you can say new utterances such as "I love chocolate" from this voice bank. everyone should be able to say that. Search that database and find all the segments you need to say that utterance.

(Video) Voice: I love chocolate.

RP: That's speech synthesis.

This is called concatenative composition, and that's what we use.

That's not the new part.

What's novel is how to make it sound like this young lady.

I'm Samantha.

I met her when she was 9 years old and ever since then my team and I have tried to build her individual voice.

First I had to find a surrogate provider, then I had to get Samantha to make some utterances.

The sounds she can make are mainly vowel-like sounds, but that alone is enough to extract the characteristics of her source.

What happens next is best illustrated by the parable of the daughter. she is 6 years old

That's what she calls mixing colors and drawing voices.

beautiful. That's exactly right.

Samantha's voice is like a concentrated sample of red food dye, which you inject into her agent's recording to get a pink voice like this.

(video) Samantha: Oh yeah.

RP: So now Samantha can say this.

(Video) Samantha: This voice is mine.

I can't wait to use my new voice with my friends.

RP: Thank you. (Applause.) I will never forget the sweet smile that spread across her face when I first heard that voice.

There are millions of people like Samantha in the world today, but we're just beginning to scratch the surface.

What we've done so far is gather a few surrogate speakers from all over the United States.

Thanks to those who donated their voices, and we've used them to build our first few personalized voices.

However, there is still much work to be done.

For Samantha, her surrogate was a stranger from somewhere in the Midwest who gave her the gift of voice.

And as a scientist, I'm so excited to finally be able to take this research out of the lab and into the real world, and make an impact in the real world.

The next thing I want to share with you is that I envision ways to take this effort to the next level.

I envision a whole world where surrogate donors of all walks of life, all sizes, all ages come together in this voice act, offering voices as colorful as their personalities.

As a first step, we launched this website, VocaliD.org, as a way to bring together those who want to join us as voice and expertise providers to make this vision a reality.

They say donating blood saves lives.

Yes, your voice can change lives.

All you need is a few hours of speech from a surrogate speaker and a few vowels from your target speaker to create your own unique vocal identity.

That's the science behind what we do.

Finally, I would like to end by returning to the real inspiration for this work: the human side.

About five years ago we created our first audio for a little boy named William.

When his mother first heard the voice, she said, "If William could talk, this would sound like it."

And then I saw William typing a message on his device.

I wondered what he was thinking.

Imagine carrying someone else's voice around for nine years and finally finding your own.

Imagine.

William said, "I've never heard of it before."

thank you.

(applause)

Thirteen years ago we set the goal of ending poverty.

After achieving some success, I hit a big hurdle.

The aftermath of the financial crisis is starting to hit aid, which has fallen for the second year in a row.

My question is whether we can use the lessons from saving the financial system to overcome that hurdle and help millions of people.

Can you simply print money for assistance?

"Certainly not."

It's a common reaction.

(Laughs) It's a quick story.

Some channel John McEnroe.

"You must be joking!"

I don't speak an accent right now, but these two kids are taking it seriously. As you can see, they are the center of my story.

There is a pier on the left.

she lives in england

She had two loving parents, one of whom was standing here.

Dorothy (right) lives in rural Kenya.

She is one of 13,000 orphaned and vulnerable children who are supported by the charities I support.

I do so because I believe Dorothy, like Pia, deserves the best chance at life we ​​can give her.

I am sure you will agree.

The United Nations agrees.

Their overriding objective in international assistance is to strive for a life of dignity for all.

But with the hurdle here, can we afford to fulfill our desire to help?

History suggests otherwise.

In 1970, governments set a goal of increasing foreign aid payments to 0.7% of national income.

As you can see, there is a huge gap between actual aid and its goals.

But then came the Millennium Development Goals, eight ambitious goals to be achieved by 2015.

You can feel the ambition when I say that one of its goals is to end extreme hunger and poverty.

There have been some successes.

The number of people living on less than $1.25 a day has halved.

But we still have a lot to do in two years.

One in eight is still hungry.

In this auditorium situation, there is no food in the front two rows.

We cannot be satisfied with that, and that is why we are very concerned about the 8th goal that I mentioned at the beginning, which is related to financial resources, and that it is declining.

So what can we do?

Well, I work in financial markets, not development.

I study investor behavior, how they react to policies and the economy.

You can look at the aid issue from a different angle.

But it took an innocent question from my then-four-year-old daughter to come to appreciate it.

Pia and I were on our way to a local cafe when we passed a man raising money for charity.

She was disappointed because I didn't have change to give him.

Once inside the cafe, Pia takes out a coloring book and starts doodling.

After a while I asked her what she was doing and she showed me a picture of a £5 note to give to the man outside.

It's so sweet and more generous than Dad.

But of course I explained to her, "You can't do that, it's not allowed."

To this, I got the classic four-year-old reaction. "Why not?"

I am very excited now because I think I will be able to answer this time.

So I begin to explain how an unlimited supply of money chasing a limited number of commodities sends prices to the moon.

Something about that exchange stuck with me not because of Peer's look of relief when I finally finished, but because it was about the sanctity of the money supply, a sanctity that has been challenged and questioned by central bank responses to the financial crisis.

To reassure investors, central banks have begun asset purchases and tried to encourage investors to do the same.

They funded these purchases with money they made themselves.

Money is not actually physically printed.

It still remains trapped within the banking system.

But the amount produced was unprecedented.

Together, the central banks of the United States, the United Kingdom, and Japan have increased the stock of money in their economies by $3.7 trillion.

That's three times the physical inventory of dollar bills in circulation, in fact more than three times.

3 times!

Before the crisis, this was completely unthinkable, but surprisingly quickly it was accepted.

The price of gold, an asset thought to protect against inflation, did rise, but investors bought other assets that offered little protection from inflation.

They bought bonds and bonds.

They also bought shares.

All the horror stories were there, but what investors actually did was a testament to their rapid acceptance and confidence.

That confidence rested on two pillars.

First, after years of keeping inflation under control, the central bank was trusted to stop printing money if inflation threatened.

Second, inflation was never a threat.

As you can see, inflation remained below average in the United States for most of this period.

It was the same elsewhere.

So what does all this have to do with aid?

Now, this is where Dorothy and her supportive Mango Tree Charity come in.

I was at the company's fundraising event earlier this year and was inspired to make a one-time donation when I was reminded that my company matches employee charitable contributions.

please think about it. Not only was I able to help Dorothy and four of my classmates get through secondary school for a few years, but I was able to double my contribution.

wonderful.

So, after a conversation with my daughter, finding that inflation was non-existent despite the printing of money, and that international aid payments were declining just at the wrong time, I wondered: can't we match that, even on a much larger scale?

Let's call this scheme "Print Aid".

And here's how it works.

If doing so is deemed to pose little inflation risk, the central bank would be obliged to match the government's foreign aid payments up to a certain limit.

The government has been aiming for an aid rate of 0.7% for years, so let's cap it at half that, or 0.35% of income.

So it works like this: If a government donates 0.2 percent of its income to foreign aid in a year, the central bank simply adds another 0.2 percent.

So far, so good.

How dangerous is this?

Well, this involves creating money to buy goods, not assets.

That already sounds like inflation, doesn't it?

But there are two important mitigating factors here.

The first is that, by definition, this money that is printed will be spent abroad.

So it's not clear how that would lead to inflation in the country that actually prints, unless it leads to a depreciation of the currency of that country.

It is unlikely for the second reason, the size of the money printed under this system.

So let's consider an example where Print Aid is being implemented in the US, UK, and Japan.

Matching the aid paid by these governments over the past four years, Print Aid generated $200 billion worth of additional aid.

What would that be in the context of the money stock increase that was already happening in those countries to save the financial system?

are you reading this?

The gap is so small that you may have trouble seeing it in the back.

What we are saying here is that we bet $3.7 trillion to save the financial system and it has paid off.

There was no inflation.

Are we really saying it's not worth the risk of printing an additional $200 billion for aid?

Are the risks really that different?

For me it's not so clear.

What is clear is the impact on aid.

Global aid provided by just three central banks increased by almost 40% over the period.

Aid as a share of national income suddenly hit a 40-year high.

Well, it doesn't reach 0.7 percent.

Governments are still encouraged to donate.

But you know, that's the point of the matching scheme.

So, I think what we have learned is that the risks from this currency creation scheme are very small, but the potential gains are very large.

Imagine what you could do with 40 percent more funding.

You may be able to feed the front row.

My fear is that, other than the fact that I'm running out of time, I have a short window of opportunity to bring this idea to life.

Today, the creation of money by central banks is an accepted policy tool.

Not always.

Today, international aid has globally agreed goals.

Not always.

Today may be the only day when these two things happen together and we can provide the help we have always craved.

So can money be printed for international aid?

I seriously believe that the question should be asked why not.

thank you very much.

(applause)

What is bioenergy? Bioenergy is not ethanol.

Bioenergy is not global warming. Bioenergy seems counterintuitive. Bioenergy is oil. It's gas. It's coal. And part of building a bridge to that future will depend on how we understand and manage bioenergy until we can actually see the ocean in a rational way, or set geospatial orbits that rotate, transmit microwaves, etc. To do that, we first need to look at agriculture.

So we've been planting plants for 11,000 years. And on the scale that we plant plants, what we learn from agriculture is that we have to deal with pests, we have to deal with all sorts of horrible things, and we have to grow things. If you learn how to grow with water, you can spread beyond the Nile.

Irrigation makes a difference as it will be able to deliver power.

Thanks to irrigation, you will be able to plant your plants wherever you want, rather than where rivers flood. You start this organic farming. Start attaching machines to it. Machinery leads to very large-scale farming along with large amounts of water.

Combining machinery and water, you get a landscape like this. And you get sales like this. It's brute force. So what you've been doing in farming is starting with a system that's pretty natural. You start taming that natural system. You put a lot of power behind that natural system. When you put a lot of pesticides and herbicides behind a natural system (laughter), you end up with a system like this.

And it's all pushy. That's how we've approached energy. So the lesson in agriculture is that once you start integrating that system, learning that system, and actually applying biology, you can actually change a system based on brute force. And then you move from the engineering field to the chemistry field to the biology field. And perhaps one of the most important humans on earth is this guy behind me.

A man named Norman Borlaug. He won the Nobel Prize. He has been awarded the Congressional Medal of Honor. He deserves all these things. And he's probably fed more people than any other living human being because he's studied how to put biology behind the seed, so he deserves something like this. He did this in Mexico. India and China no longer had such massive hunger because Norman Borlaug taught them how to grow grain in a more efficient way and started the Green Revolution. That's what many people criticize. But of course, those people are unaware that China and India are exporting grain instead of having mass starving people.

And the irony of this particular system is that the place where he did his research was Mexico, he didn't adopt this technology, he ignored this technology, he talked about why he should think of this technology, but it didn't really apply.

And Mexico remains one of the largest importers of grain on the planet because it has not applied the technology found in Mexico. And in fact, we don't recognize this man so much that there are no statues of him all over Mexico. Also in China and India. And the research institute that this man ran has now moved to India. That's the difference between adopting technology and discussing it.

Now, it's not just that this man fed a huge number of people around the world. If you understand biology, this is the final effect in terms of how technology works.

What Happened in Agriculture? Well, if you think about agriculture over a century, agriculture around 1900 would have been recognizable to someone who planted it 1000 years ago. Well, the plow looks different. The machine wasn't a mule, it was a tractor or something, but the farmer would have understood, this is what this guy was doing, this was why he was doing it, this was where he was going. The real change in agriculture is when we start moving from this heavy-handed engineering and chemistry to biology, and from there productivity increases. You'll see what happens to your productivity when you do these things.

Basically, it takes 250 hours to produce 100 bushels, 40 bushels, 15 bushels, 5 bushels. Agricultural labor productivity increased 7-fold from 1950 to 2000, while the rest of the economy increased about 2.5-fold. This is a significant increase in absolute per capita output.

Of course, the effect is that it's not just a wave of amber grains, it's like a pile.

And 50 percent of the EU budget will be subsidized to agriculture from the mountain of agricultural products people overproduce.

This will have good results for energy. And of course, by now you're probably thinking, "I thought I was going to talk about energy, but he's talking about biology."

So where is the connection between these two things?

One of the ironies of this whole system is that we're discussing what to do with a system we don't understand. We don't even know what oil is. I don't know where the oil comes from. So literally what this river of black matter is and where it came from is still a matter of debate. One of the best assumptions, and one of the best guesses, about this substance is that it originates from this substance, and that these substances absorb sunlight and under millions of years of pressure decay, forming black rivers.

Now, the interesting thing about that hypothesis is that if it turns out to be true, oil and all hydrocarbons would turn out to be sunlight concentrated. And if you think about bioenergy, bioenergy is not ethanol. Bioenergy captures the sun, collects it in amoebas, and collects it in plants. And maybe that's why rainbows like this appear.

And looking at this system, if hydrocarbons are concentrated sunlight, then bioenergy works in a different way. And we have to start thinking about petroleum and other hydrocarbons as part of these solar panels.

Perhaps that's one reason why the types of wells you see when you fly over West Texas don't look like pictures of Kansas or irrigated areas.

This is how oil is farmed. And when we think about oil cultivation and oil evolution, we started with this heavy-handed approach. And what have we learned? Then we learned we had to go bigger. So what have we learned? Then it needs to get even bigger. And as we go out and farm this bioenergy, it's becoming really disruptive.

These are Athabasca tar sands and they come in huge quantities. Mining began first, and the world's largest trucks work here. Then you have to pull out this black sludge. This is basically non-flowing oil. It sticks to the sand. And you'd have to use a lot of steam to separate it, but that would only work with today's oil prices.

coal. Coal turned out to be practically the same thing. It's probably a plant, except that it's pressure baked and crushed.

If you take something like this out, burn it, and pressurize it, you'll probably get this instead. But again, we don't know.

This is interesting when we're discussing this. But when you think of coal, it's like grains of wheat on fire. It is not at all different from coal.

And, of course, coal mines are very dangerous places because some of the gas is mined there. People die when the gas explodes. This means that some mines produce biogas from coal, while others do not.

There are some interesting questions about where the differential appears. I have some doubts about what to do with this stuff. But it's also coal. Probably the same thing, the same system, maybe bioenergy, and the exact same technology.

This is the brute force approach. Once you get past the brute force approach, all that's left is to rip off the entire top of the mountain. And in the end, the single largest source of carbon emissions will be coal-fired gas plants. That's probably not the best use of bioenergy.

When considering what the alternatives to this system are, it is important to find alternatives as it turns out that US oil reserves are declining but coal reserves are not, and China is no different. There are huge coal reserves lying dormant and we have to start thinking of them as bioenergy. Because if we continue to treat them as chemical or engineering energy, we will be in serious trouble.

Gas is a similar issue. Gas is also a biological product. When we think about gas, we know a lot about gas. And this is another way to mine coal.

This is called coalbed methane. Why is this picture interesting? Because if coal turns out to be a concentrate of plant life, the reason there is a difference in gas production from one mine to another, that one mine may explode and another mine may not, may be that there is a substance that eats that substance and produces gas.

This is a well-known phenomenon. (Laughter) Eating certain things creates a lot of gas. The biological process in coal mines may turn out to be the same process. If that's true, one way to extract energy from coal might not be to cut off an entire mountaintop, or burn coal. Coal may be treated biologically, as we have done in agriculture.

That is bioenergy. not ethanol. It is not a subsidy for some companies. Just because we built so many ethanol plants doesn't mean we're importing corn into Iowa. We are beginning to understand the shift from violent to biological forces that has occurred in agriculture. And being able to do that means you can clean some stuff, and you can clean it pretty quickly.

There are already some indicators of productivity in this regard. Putting steam into a coal or oil field that's been running for decades can produce a very large increase, say eight times. This is just the beginning of this effort.

And when you think of biomaterials, this guy has just doubled the database of genes and proteins known on Earth by doing part of the sequencing of the human genome and circumnavigating the globe. He's been thinking about how to structure this. And there are smart people thinking about this. And they're setting up companies like Synthetic Genomics, Cambria, Codon, and what those companies are trying to do is figure out how to apply biological principles to avoid brute force.

Think about it in the following terms. Think of it as starting to program for a specific purpose.

Think of cells as hardware. Think of genes as software. And when we begin to think of life as an exchangeable code, it can be energy, it can be food, it can be fiber, it can be human, it can be a whole series of things, and we need to change our approach to how we structure, treat and think about energy in a completely different way.

What are the first principles of this thing? And where are we going? This is one of the gentle giants on earth. He is one of the nicest humans you have ever met. His name is Hamilton Smith. He won the Nobel Prize for discovering how to cut genes (called restriction enzymes).

He was at Hopkins University when he did this. He is so humble that on the day he won the award his mother called him and said, "I didn't know there was another Ham Smith at Hopkins University. Did you know he just won a Nobel Prize?" (Laughter) I mean, it was the mom, but anyway, this guy is just a class act. He can be found on the bench every day working with pipettes and building things. And one of the things this guy just made is these things.

What is this? This is the first transplant of naked DNA, taking the entire DNA operating system from one cell, inserting it into another cell, and launching that cell as a different species. It's 1 month old. We'll see something just as important next month.

And when you think about this and what this means, we're not just converting ethanol from corn with very expensive subsidies. We start thinking about biology entering energy. Processing this material is very expensive, both economically and energetically.

This is what accumulates in Alberta's tar sands. These are sulfur blocks. Because separating the oil from the sand and using a huge amount of energy in that steam (steam to separate this), the sulfur also needs to be separated. The difference between light and heavy crude is about $14 per barrel. That's why we're building a pyramid of sulfur blocks. By the way, these scales are quite large.

Now, if we can take some of the energy component out by doing this, the system will be reduced and we will actually start applying biological principles to energy. This should be the bridge to wind power, solar power and nuclear power. I hope you don't build your next nuclear power plant on a beautiful beach next to an earthquake fault. (Laughter) Just an idea.

But in the meantime, for at least the next decade, the name of the game is hydrocarbons. Whether it's oil, gas or coal, this is what we're dealing with. Before we get into the long story, let me explain what is happening in our current energy system.

86 percent of the energy we consume is hydrocarbons. That means 86 percent of what we consume is probably processed plants, amoebas, and leftovers. And here comes the role of conservation. Alternate elements have a role to play here, but other parts need to get right as well.

How we deal with the rest will be the bridge to the future. And when you think about this bridge to the future, one of the things to think about is that about two-thirds of the oil is left in these wells today. So we spend huge amounts of money and leave most of our energy there. Of course, you need more energy to go out and get energy. By the time you get to ethanol, the ratio gets ridiculous. There may also be a one-to-one ratio of energy input to energy output. That's a stupid way to manage this system.

Last point, last graph. One of the things we have to do is stabilize oil prices. Oil prices are like this, you know?

This is a very bad system. Because the hurdle rate is set very low. People come up with really clever ideas about solar panels, wind power, or whatever, but what happens next?

Oil prices are bottoming out. Even if the company goes bankrupt, the price of oil can be restored.

So, if I could make one last modest suggestion, it would be to set stable oil prices in Europe and the United States. How do you do that? Well, let's put a non-revenue tax on oil. Basically, it doesn't matter if the price of oil is $35 or $40 over the next 20 years. If the OPEC price falls below that, tax it. If OPEC prices go above that, the tax will go away.

What does it mean for entrepreneurs? What does that mean for companies? It tells people that if they can produce energy for less than $35 a barrel, or less than $40 a barrel, or less than $50 a barrel, let's discuss, it's a business. But let's not let people fall into a cycle of research with no reward because OPEC promotes alternative energies and blocks bioenergy generation and companies go out of business. thank you.

What makes a great leader today?

Many of us have an image of this all-knowing superhero who stands, commands, and protects his followers.

But it is, in a way, an image of another era, and what is obsolete is not the world as it is now or the world to come, but leadership development programs based on the successful models of the world of yesteryear.

We surveyed 4,000 companies and asked them to see the effectiveness of their leadership development programs.

58% of companies said they have a significant talent shortage in key leadership roles.

This means that despite corporate training programs, offsites, assessments, and coaching, more than half of the companies still fail to develop good enough leaders.

you may be asking yourself. Is my company helping me prepare to be a great 21st century leader?

Probably not.

Well, I've spent 25 years of my professional life observing what makes a great leader.

I've worked within Fortune 500 companies, advised over 200 CEOs, and built more leadership pipelines than you can imagine.

But a few years ago, I noticed a disturbing trend in leadership preparation.

Despite all my efforts, I've noticed that familiar stories about individuals keep popping up.

One story involved Chris, a high-potential superstar leader who failed to transfer to a new unit, destroying irreparable value.

We also heard that CEO Sydney was very frustrated that only one of the top 50 leaders had the ability to lead important initiatives, even though his company was listed as the best company for leaders.

There were also stories of senior executive teams at once-thriving companies being so taken aback by market shifts that they were forced to cut their companies in half or go out of business.

Now, listening to this repeated story, I have two questions.

With so much investment in leadership development, why is the leadership gap widening?

And do great leaders do something distinctly different to succeed and grow?

One of the things I did was get so engrossed in these questions and so frustrated by them that I quit my job so I could study full time and spent a year traveling around the world learning about effective and ineffective leadership practices in companies, countries and non-profits.

So I took a trip to South Africa and more, where I had the opportunity to understand how Nelson Mandela predicted and was ahead of his time in the political, social and economic context.

I also met the leaders of non-profit organizations that, despite their very limited resources, are making a huge impact in the world by rallying people who are often seen as adversaries.

And I spent countless hours in the presidential library trying to understand how the environment shaped the leaders, the moves they made, and what impact those moves had beyond their tenure.

And when I returned to work full-time and assumed this role, I was joined by wonderful colleagues who were equally interested in these questions.

Now, from all of this, I have extracted the characteristics of successful leaders, the differences in how leaders behave, and also the preparation practices that enable people to reach their full potential.

Now I would like to share some of them with you.

(“What are the criteria for a great 21st century leader?”) In a 21st century world that is more global, more digital and more transparent, more information flowing and innovation speeding up, nothing great can be accomplished without some sort of complex matrix. Relying on traditional development practices hinders your growth as a leader.

In fact, traditional assessments, such as narrow 360-degree surveys and outdated performance criteria, produce false positives that make you think you're better prepared than you really are.

21st century leadership is defined and evidenced by three questions.

Where do you foresee the next change in business models and life?

The answer to this question is in your calendar.

Who do you spend your time with? About what topic?

where are you traveling to? what are you reading

And how do you distill this to understand potential discontinuities and make decisions to do something now to be prepared?

I have a leadership team that brings each member together to practice, the trends that influence me are here, the trends that influence other team members are here, and these are shared to make decisions and anticipate strategic course corrections and new moves.

Great leaders don't bow.

Instead of just reacting to it, they look around the corner and shape their future.

The second question is what is the measure of diversity in your personal and professional stakeholder network?

You know, we hear a lot about good old-fashioned networks, and they're certainly alive and well in many institutions.

But to some extent, we all have a network of people who make us feel comfortable.

So this question is about your ability to form relationships with people who are very different from you.

And those differences can be biological, physical, functional, political, cultural and socioeconomic.

Yet, despite all these differences, they trust you enough to connect with you and work with you to achieve a common goal.

Great leaders understand that having a more diverse network allows them to identify patterns and source solutions at a higher level. Because there are people who think differently than you.

Third question: Are you brave enough to let go of the habits that have brought you success in the past?

There is an expression, "Let's get along."

However, if you follow this advice, you will continue to do what you are comfortable doing as a leader.

Great leaders dare to do things differently.

They don't just talk about taking risks, they actually do them.

And one of our leaders reminded me of the fact that the most impactful developments come when you can develop the mental stamina to withstand being called naive, reckless, or just plain stupid for your new ideas.

Interestingly, the people who join you are not the usual suspects in your network.

They are often the ones willing to take the leap with you because they think differently.

And it's a leap, not a step.

More than traditional leadership programs, answering these three questions will determine your effectiveness as a 21st century leader.

So what makes a great 21st century leader?

I've met a lot of people and they stand out.

They are the women and men who are preparing themselves not only for the pleasant predictability of yesterday, but for all of the realities of today and the unknown possibilities of tomorrow.

thank you.

(applause)

I'm going to try to make Chris quite nervous by going off script and making it participatory.

have understood. are you with me yes. yes. have understood.

So what I'd like to do is raise your hand if you've ever heard a heterosexual couple having sex.

It could be your neighbor, your hotel room, your parents. sorry.

have understood. Almost everyone.

Raise your hand if men are making more noise than women.

I can see a man there.

It doesn't matter if it's you, sir.

(Laughter) I mean, his hands are down. and one woman. have understood.

Sitting next to a noisy man.

So what does this tell us?

It tells us that humans make noise when they have sex, and that women generally make more noise.

This is known as the female mating vocalization to the clipboard crowd.

I didn't even mean to mention this, but someone told me that Meg Ryan might be here. She is the most famous female copulatory vocalist in the world.

So I thought I should talk about it.

We'll talk about this a little later.

First of all, as you may have heard, humans are not descended from apes. we are monkeys

As Jared Diamond pointed out in an early book, we are more closely related to chimpanzees and bonobos than to Indian elephants.

We are more closely related to chimpanzees and bonobos than they are to other primates, such as gorillas and orangutans.

So we have a very close relationship with them, and a certain amount of relationship as you can see by their actions.

So the question I want to ask today, and I want to explore with you today, is what kind of monkeys are we in terms of our sexuality?

Now, since the days of Darwin, there has been what Casilda and I call the canonical story of human sexual evolution, and even if you haven't read this content, you know it all too well.

The idea is that, as part of human nature, since the dawn of humanity, men have kind of leased women's fertility by offering them certain goods and services.

Generally we talk about meat, housing, status, protection, things like that.

And in return, women offer or at least promise chastity.

Now, this puts men and women in conflict.

According to this vision, the war between men and women is in our DNA. right?

What Casilda and I have argued is, no, that this economic relationship, this rivalry, is really the product of agriculture, and that it arose only about 10,000 years ago at the earliest.

Anatomically modern humans have been around for about 200,000 years, which means that no more than 5% of them exist as separate modern species.

Therefore, it is important to understand that before the advent of agriculture, before the Agricultural Revolution, humans lived in hunter-gatherer groups that, everywhere in the world, were characterized by what anthropologists call ferocious egalitarianism.

They don't just share things, they demand to share things. All these things that were allegedly exchanged with women for meat, housing, protection, and sexual chastity turned out to be widely shared in these societies.

Now, I am not saying that our ancestors were noble barbarians, nor that modern hunter-gatherers are noble barbarians.

My point is that this is the best way to reduce risk in foraging situations.

And among anthropologists there is absolutely no debate about this.

All Casilda and I have done is extend this shared behavior to sexuality.

So we have argued that human sexuality, down to agriculture, evolved essentially as a way of establishing and maintaining the complex and flexible social systems, networks that our ancestors excelled at, and that is why our species has survived so well.

Now, this makes some people uncomfortable, so I always have to take a moment in these talks to say, listen, our ancestors said they had orgies, but I'm not saying they had sex with strangers.

There were no strangers. right?

Bands of hunter-gatherers are no strangers.

You have known these people for life.

So what I'm saying is, yes, there were overlapping sexual relationships, and our ancestors probably had several different sexual relationships at any point in their adult lives.

But I'm not saying they were having sex with strangers.

That's not to say they didn't love the person they had sex with.

And I'm not saying the pair's bond wasn't happening.

I'm just saying it wasn't sexually exclusive.

And those of us who have chosen to be monogamous, my parents, for example, have been monogamously married for 52 years. If it wasn't for monogamy, Mom, Dad, I don't want to hear about it, but I'm not criticizing it, and I'm not saying there's anything wrong with it.

My point is that to claim that our ancestors were sexual omnivores is no more a criticism of monogamy than to claim that our ancestors were sexual omnivores is a criticism of vegetarianism.

You can choose to go vegetarian, but don't expect that decision to suddenly stop smelling of bacon.

have understood? This is my point.

(Laughter) It took me a minute to figure it out.

Well, Charles Darwin, in addition to being a great genius, a great human being, a great husband, and a great father, was also a world-class Victorian sage.

have understood? He was perplexed by sexual swelling in certain primates such as chimpanzees and bonobos. Because these sexual swellings tend to force many males to mate with females.

I mean, he couldn't understand why females would do this when they were supposed to just form a pair bond, right?

Chimpanzees and bonobos, Darwin didn't know much about this, but chimpanzees and bonobos mate with up to 12 males a day, one to four times an hour when they have sexual swelling.

Interestingly, chimpanzees have sexual bloating about 40 percent of their menstrual cycle, bonobos 90 percent, and humans are the only species on earth where females can have sex throughout their menstrual cycle, regardless of whether they are menstruating, post-menopausal, or already pregnant.

This is rare in mammals.

So this is a very interesting aspect of human sexuality.

Well, as scientists sometimes tend to do, Darwin ignored the sexual prominence reflections of his time.

So what we're talking about is sperm competition.

There are currently about 300 million sperm cells in the average human ejaculate, making it a competitive environment already.

The question is, are these sperm competing with other men's sperm or just their own sperm?

This graph has a lot to say.

Note immediately the female chimpanzee, the bonobo, and the little musical note above the human.

This indicates female mating vocalizations.

Look at the numbers.

The average human has sex about 1,000 times per birth.

While this number may seem high to some, we guarantee that it will seem low to others in the same room.

The ratio is the same as that of chimpanzees and bonobos.

It has nothing in common with the other three apes: gorillas, orangutans, and gibbons. These apes are more typical mammals, having sex only about 12 times per birth.

Humans and bonobos are the only animals that have face-to-face sex while alive.

(Laughter) And you'll find that humans, chimpanzees, and bonobos all have external testicles, which in our book is the equivalent of a special beer-only refrigerator in your garage.

If you're the type of person who has a beer fridge in your garage, you expect parties to happen all the time, and you should be prepared.

That's the outer testicle.

It keeps the sperm cells cool so you can ejaculate more often.

sorry. That's true.

Some may be pleased to hear that humans have the largest and thickest penises of any primate.

Now, this evidence goes far beyond anatomy.

It also extends to anthropology.

The historical record is replete with accounts of people around the world engaging in sexual acts that would be improbable given our assumptions about human sexual evolution.

These women are of the Mosuo tribe in southwestern China.

In their society, everyone is fully sexually independent, both men and women.

Never be ashamed of your sexuality.

Women have hundreds of partners.

it doesn't matter. who cares. No one gossips. it doesn't matter.

When a woman becomes pregnant, the child is cared for by her, her sisters and brothers.

The biological father is not the problem.

On the other side of the world, in the Amazon, there are many tribes that practice what anthropologists call "discretionary paternity."

These people actually believe - there is no contact between them, no common language, nothing. So this is not a widespread idea, but an idea that originated all over the world - they believe that the fetus is literally made of accumulated semen.

So a woman who wants a smart, funny and strong child will have lots of sex with smart guys, funny guys and strong guys to get the essence of each man into her baby. Then when a child is born, various men will come forward and admit to being the child's father.

So in this society, being a father is really a team effort.

So there are all sorts of examples like this that we cover in this book.

Now, why is this important?

Edward Wilson said that we need to understand that human sexuality is primarily a means of bonding, and only secondarily a means of producing offspring.

I think it's true. This is important because our evolved sexuality is in direct conflict with many aspects of the modern world.

The contradiction between what we are told we should feel and what we actually feel creates a great deal of needless suffering.

My hope is that we will have a more accurate and up-to-date understanding of human sexuality, that we will be more tolerant of ourselves and each other, that we will be more respectful of unconventional forms of relationship such as same-sex marriage and polyamory unions, and that we will finally put an end to the idea that men have an innate and instinctive right to monitor and control women's sexual behavior.

(Applause.) Thank you.

And it turns out gays aren't the only ones who have to come out of the closet.

We all have closets that we have to get out of. right?

And when we come out of those closets, we'll find that we're not fighting each other, but an outdated Victorian sense of human sexuality that confuses desire with property rights, creating shame and confusion instead of understanding and empathy.

The truth is, men are from Africa and women are from Africa, so it's time we cross Mars and Venus.

thank you.

(Applause) Chris Anderson: Thank you. Christopher Ryan: Thank you.

CA: So that's the question.

It is very perplexing to take a discussion of evolutionary history and try to translate it into what we do today.

Someone might give a lecture and say, "Look at us, we have very sharp teeth and muscles, we have very good brains for throwing weapons, and if you look at many societies around the world, you see very high rates of violence."

Non-violence is a choice like vegetarianism, but it's not you.

How is that different from the talk you gave?

CR: First of all, the evidence for high levels of prehistoric violence is highly controversial.

But that's just one example.

Indeed, many people tell me that just because you lived a certain way in the past doesn't mean you should live that way now, and I agree.

Everyone has to cope with the modern world.

But the body has its own evolutionary trajectory.

So you might be able to live off McDonald's and milkshakes, but your body will fight against it. we have an appetite

I think it was Schopenhauer who said that people can do what they want, but they can't do what they want.

And what I am against is the shame that comes with desire.

The idea is that if you love your husband or wife and you still find yourself attracted to other people, there is something wrong with you, something wrong with your marriage, something wrong with your partner.

I believe that many families are torn apart by unrealistic expectations based on erroneous views of human sexuality.

That's what I'm aiming for.

K: Thank you. We communicated strongly. Thank you very much.

CR: Thank you Chris. (applause)

Tonight we're talking about coming out of the closet in the traditional sense, not just the gay closet.

I think everyone has a closet.

Your closet may contain the first time you tell someone you love them, tell someone you're pregnant, tell someone you have cancer, or any other difficult conversation we have throughout our lives.

All about closets is a difficult conversation, and while our topics can vary wildly, the experience of walking in and out of closets is universal.

It's horrible and we hate it and it needs to be done.

A few years ago, I worked at Southside Walnut Cafe, a local diner in town, and while working there, I experienced a phase of militant lesbian intensity. I didn't shave my armpits and I quoted Ani DiFranco's lyrics as gospel.

And the baggyness of my cargo shorts and how recently I shaved my head had the question posed to me, usually by a small child, "Uh, are you a boy or a girl?"

And there will be an awkward silence at the table.

I would squeeze my jaw a little tighter and grip the coffee pot a little tighter.

The father clumsily shuffled the papers, and the mother cast a horrifying glance at her child.

But I said nothing and looked inside.

And every time I went to a table with kids ages 3 to 10, I got to the point where I was ready to fight.

(Laughter) And it feels terrible.

So I promised myself that I would say something next time.

I would have such a difficult conversation.

Then within a few weeks the same thing will happen again.

"Are you a boy or a girl?"

It's the usual silence, but this time I'm ready, and I'm going to do all of Women's Studies 101 at this table. (Laughter) Here's a quote from Betty Friedan.

A collection of Gloria Steinem quotes.

It's also borrowed a bit from the "Vagina Monologues" I'm about to do.

So I take a deep breath, look down, and stare back at me is a four-year-old girl in a pink dress, not challenging a feminist duel, just a kid wondering, “Are you a boy or a girl?”

So I took another deep breath and crouched down next to her and said, "I know you're a little confused.

My hair is short like a boy's and I wear boy's clothes but I'm a girl. Sometimes you want to wear a pink dress and other times you want to wear a comfy jammy, right?

Well, I'm more of an easy-going Jammy kind of girl. ”

And this child, without resting for a moment, looked me in the eye and said, "My favorite pajamas are purple and have fish on them.

Can I eat pancakes? ”

(Laughter) That's it. I just said, 'Oh, okay, you're a girl.

How about those pancakes? ”

It was the easiest difficult conversation I have ever had.

why? Because Pancake Girl and I were real with each other.

Like many of us, I've lived in a few closets in my life, and most of the time my walls just happened to be iridescent.

But indoors, in the dark, you can't tell what color the walls are.

You know what it feels like to live in a closet.

So, really, my closet is no different than yours.

Of course, here are 100 reasons why getting out of my closet is harder than getting out of yours. But the point here is that difficult is not relative.

Difficult things are difficult.

Who says it's harder to explain to someone who just declared bankruptcy than to someone who just cheated on you?

Who says his coming out story is harder than telling a 5-year-old that he's getting a divorce?

It doesn't get any harder, it just gets harder.

To feel good or bad about our closets, we need to stop ranking our hardships against other people's hardships and just empathize with the fact that we all have hard times.

At some point in our lives, we all live in closets and may feel safer there, or at least safer than what's behind the door.

But what I'm trying to say here is that no matter what the walls are made of, the closet is not a place for people to live.

thank you. (Applause.) Now imagine yourself 20 years ago.

I wore ponytails, strapless dresses and high heels.

I was not a combative lesbian ready to fight a 4 year old who walked into a cafe.

I was frozen in terror, curled up in the corner of my pitch-black closet clutching a gay grenade, and exercising my muscles was the scariest thing I'd ever done.

Family, friends, complete strangers, I've spent my life trying not to let these people down, and now I'm intentionally turning the world upside down.

We were burning pages of the script that we had all followed for so long, but if you don't throw that grenade, it will kill you.

One of my most memorable grenade throws was at my sister's wedding.

(Laughter.) It was the first time many of the people in attendance knew I was gay, so I walked around the table in a black dress and heels while fulfilling my maid of honor duties, and ended up at the table of my parents' friends, people who had known me for years.

And after some small talk, one of the women exclaimed, "I love Nathan Lane!"

And so began the battle over gay relationships.

"Have you been to Castro, Ash?"

"Well, I actually have a friend in San Francisco."

"Well, we haven't been there, but we hear it's a great place."

"Ash, do you know my hairdresser Antonio?

He's a really nice guy and he's never talked about his girlfriend. ”

"Ash, what's your favorite TV show?

What is our favorite TV show? Favorite: Will & Grace.

And do you know who we love? Jack.

Jack is our favourite. ”

And one woman, puzzled and desperate to show me her support to let me know she was on my side, finally blurted out: "Well, my husband wears pink shirts sometimes."

(Laughter) And like all grenade throwers, I had a choice in that moment.

I could go back to the gay-loving table with my girlfriends and mock their reaction, blaming them for their impracticality and inability to jump the politically correct gay hoop I brought with me, or even empathizing with them and recognizing that it was probably one of the hardest things they had ever done and that starting and having that conversation was for them to come out of the closet.

Sure, it would have been easy to point out where they felt lacking.

Seeing them where they are and acknowledging the fact that they were trying is much harder.

And what can you get someone to do other than try?

If you're going to get serious with someone, you have to be prepared to get serious in return.

Difficult conversations are still not my forte.

Ask anyone you've ever dated.

But I've gotten better and am following what I call the Pancake Girl 3 Principles.

Now look at this through a gay colored lens. But know that what it takes to get out of any closet is essentially the same.

Part 1: Be authentic.

Please take off your armor. be yourself.

The girl in the cafe wasn't wearing armor, but I was ready for battle.

If you want someone to take you seriously, they need to know that you're bleeding too.

Number two: Be candid. just say Peel off the Band-Aid.

If you know you're gay, say so.

If you tell your parents that you may be gay, they will hope that this situation will change.

Don't give them false hope.

(Laughter) And the third and most important -- (Laughter) be unapologetic.

you are speaking your truth

Never apologize for it.

And some people might get hurt along the way, so, sure, apologize for what you did, but never for who you are.

Well, some people might be disappointed, but that's their fault, not yours.

It's their expectations of you, not yours.

It's their story, not yours.

All that matters is the story you want to write.

So next time you find yourself in a pitch-black closet with a grenade in hand, know that we've all been there before.

And while you may be feeling very alone, you are not.

And I know it's hard, but I need you to get out of here no matter what the walls are made of. Because I assure you there are other people looking for the next brave soul to pry the door through the closet keyhole. So be that person and show the world that we are bigger than closets and that closets are not where people really live.

Thank you Boulder. Have a good night. (applause)

i love airplanes

Oh, I love planes.

So when I went to college in the late '90s, it was clear that I was going to study aerospace.

And you won't believe how many people have said to me, "No, it's not aerospace."

Aerospace is going to be boring, everything in aerospace is already over. ”

Well, they were a little off the mark.

And indeed, I believe the next decade will be a new golden age for aviation.

First, and this is where I get excited, flights are about to become more personal.

So let's do a little comparison.

Over the past century, large commercial aircraft have connected cities around the world.

And 100 years ago, it was unthinkable that we would all fly here from all over the world for a five-day conference.

But we did, and most of us probably did so without a second thought.

And it is an amazing achievement for mankind.

However, we still spend a lot of time in the car on a daily basis.

Or try to avoid it.

Some of my best friends live in San Francisco, but I live in Mountain View, about 60 miles away.

we are all busy

After all, a couple of hours of traffic would drive us away.

To be honest, we haven't seen each other in months.

Right now, I work in downtown San Jose, near the airport.

In fact, some days I can get off work and get on a plane to Los Angeles faster than I can drive to San Francisco.

The population of the city is increasing, the roads are congested and it is very difficult to widen them.

As such, in many places there aren't many good solutions to avoiding traffic jams.

But what if you could fly over it?

I think the sky is underutilized and never gets as crowded as the roads.

First of all, there is a whole other dimension, but safety considerations and air traffic management alone will not allow bumper-to-bumper traffic in the air.

So, in many cases, flying can be an attractive long-term alternative to ground travel.

Imagine there. Call an Uber and it will take you to a nearby landing point (we call it Bertiport). There's a plane waiting for you, flying you over a traffic jam in the middle, and another Uber on the other side taking you to a friend's house.

And when I said Uber, I really think Lyft's branding team needs to be commended for their forward-thinking in choosing their brand.

(Laughter) So in this example, OK, I'll admit there are some extra steps.

But you can get on the plane in 30 minutes instead of 2 hours and for about $60.

We're not there yet, but we're much closer than you think.

So one of the first things we need is an aircraft that can take off and land in tight spaces and get us where we want to go quickly.

Helicopters can do that today, but in the past they were a little too expensive, a little difficult to fly, and too noisy for everyday transportation in urban areas.

Well, electric flight and autonomous driving are changing that.

Electric flight, in particular, unlocks new possibilities for vehicle configurations that have never been explored before.

If you use electric motors, you can have many electric motors around the aircraft without adding extra weight.

This gives you redundancy and safety.

They are also cleaner, cheaper and quieter than internal combustion engines.

I believe that autonomy will allow for expansion of the transportation network and, in fact, make aircraft safer.

Commercial flights are already automated for most of the flight time, and I think the day will come when even airplanes that had to be piloted by humans will become unreliable.

So one of the A3 teams wanted to know how close this future really was.

So they built and flew a prototype of such a vehicle.

And they emphasized using only mature, commercially available technology today.

We call it Vahana.

It is fully electric.

It takes off and lands vertically, but flies forward like a normal airplane.

It's completely autopilot.

Take off, fly and land all automatically at the push of a button.

The prototype here is designed to carry one passenger and luggage.

And you can go about 20 miles in 15 minutes.

And although we estimate that such a trip would cost about $40, you can build your business around this.

It has multiple redundant motors and batteries, so if you lose one, it will still fly and land successfully.

Very quiet.

It's quieter than a Prius on the highway when it's flying overhead.

Intelligent and equipped with cameras, lidar and radar, it can detect and avoid unexpected obstacles.

And the team's focus on efficiency means the battery is smaller, lighter, and longer lasting.

For reference, the Vahana battery is less than half the size of the Tesla Model S battery.

About 40 kilowatt hours.

And batteries can be hot-swapped in just a few minutes.

And I think in a few years people will be comfortable riding alone in self-piloted electric VTOL air taxis.

But the team is busy developing the next version, which will carry at least two passengers and will fly much further.

But more importantly, there are now more than 20 companies working on such vehicles around the world.

My guess is that within the next five years, some cities will have beltiports and a little airplane icon in rideshare apps.

You might start out with a dozen or so, but eventually you could have hundreds flying around the city.

And it will fundamentally change our relationship with local travel.

In the past century, aviation has connected our planet, and in the next century, aviation will reconnect local communities. And we hope it brings us together again.

thank you.

(Applause) Chris Anderson: Okay. So when these things first roll out, at the moment, it's a single-seat aircraft, right?

Rodin Lyasov: Yes, ours is.

CA: It's yours.

So someone gets out of the car, the door opens, they get in, and there's no one else there.

this will move.

Can I take a survey here?

Because they were early adopters of this room.

I would like to know if anyone is excited about the idea of ​​being picked up by an autonomous flight alone -- yes go ahead!

RL: Pretty good.

CA: That's pretty cool, half of TED is completely red-hot and silly people.

(Laughter) RL: So one of the things that we're really focused on is actually cost.

So you can build your business around it.

That's why some features are really driven by price.

And the $40 price tag is exactly what we're aiming for.

This makes it accessible to more people than this.

CA: Probably the biggest obstacle to when this will roll out is regulation, not technology at the moment, right?

RL: That's probably true, yes I agree with that.

To reach the safety levels expected of aircraft, the technology needs to mature in terms of safety.

But I don't think there is any obstacle there. it just needs to get the job done.

CA: So first, this is ridesharing.

Is it so far away that many people leave these in their garage and go straight to a friend's house?

RL: My personal view is that ridesharing allows the whole business to run more efficiently.

There are millennials who say they don't want to own a car.

I think my love for airplanes will probably grow stronger.

So -- (laughter) I really think this network is much more scalable and operational as a ridesharing platform. Also, integration with air traffic management works much better when handled centrally.

CA: Cool. Thank you.

RL: Thank you. CA: That was amazing.

Talk about hackers.

And the image that comes to mind when I say this word is probably not Benjamin Franklin. But I'll explain why you should.

The image that pops into your head is most likely something of a pasty kid sitting in your basement playing some prank, a shady criminal trying to steal your identity, or an international rogue with a political agenda.

And mainstream culture kind of encourages the idea that hackers are something we should fear.

But like technology and most things in the tech world, hacking has as much power for good as it does for evil.

For every hacker trying to steal your personal information, there's another hacker building tools to help you find your loved ones after a disaster or monitor the quality of your environment after an oil spill.

Hacking is really just an amateur innovation to an existing system, a very democratic activity.

It's about critical thinking.

It's about questioning the existing way of doing things.

The idea is that if you find a problem, try to solve it instead of just complaining about it.

And in many ways, hacking built America.

Betsy Ross was a hacker.

The Underground Railroad was a great hack.

From the Wright brothers to Steve Jobs, hacking has always been a cornerstone of American democracy.

So, if there's one thing I want to tell you here today, it's that the next time you think about who a hacker is, you won't be thinking of this man, but this man, Benjamin Franklin, one of the greatest hackers of all time.

Although he was one of America's most prolific inventors, he famously never filed patents because he believed that all human knowledge should be freely available.

He brought us bifocals and lightning rods, and, of course, his cooperation on the invention of American democracy.

And with Code For America, we try to embody the spirit of Ben Franklin.

He was a politician, a politician whose notion of citizenship always presupposed action.

He believes that governments can be built by the people, and we call such people civic hackers.

It's no wonder, then, that the values ​​that underlie a healthy democracy—cooperation, empowerment, participation, and enterprise—are the same values ​​that underlie the Internet.

So it's no wonder that many hackers focus on government issues.

But before I show you what civic hacking looks like with a few examples, I want to make it clear that you don't have to be a programmer to be a civic hacker.

We just need to believe that we can put in place a 21st century toolset to address the problems facing governments.

Also, I often hear from the Code for America civic hacker community that they didn't realize how much non-technical work was actually put into a civic hacking project.

Remember.

You are potential civic hackers.

So what exactly is civic hacking?

Last year, our team in Honolulu (in this case, three full-time fellows who had been in the public service for a year) were asked by the city to rebuild their website.

And it was a large-scale project with tens of thousands of pages, which was impossible in a few months.

Instead, they decided to build a parallel site that was better suited to how citizens actually wanted to interact with the information on the city's website.

They are looking for answers to their questions and want to take action once answered, which is very difficult to do from a site like this.

So our team built Honolulu Answers. It's a very simple search interface where you enter a search term or question and get plain answers that guide you to action.

The site itself was easy to build, but the team faced the challenge of how to arrange all the content.

It would have taken the three of them a very long time, especially considering none of them were actually from Honolulu.

So they did something really radical given how governments are used to working.

They asked the public to write the content.

You've heard of Hackson.

They held a write-up one Saturday afternoon -- ("Wild pigs are a nuisance, what should I do?") (Laughter) -- Wild pigs seem to be a big problem in Honolulu.

One Saturday afternoon, I was able to populate most of the content on most of the frequently asked questions, but more importantly, I created a new way for the public to participate in government.

Now, I think this is a really great story on its own, but it gets even more amazing.

At National Civic Hacking Day this past June in Oakland, where I live, the Oakland Code For America team took the Honolulu Answers open source code base and turned it into Oakland Answers. We also held a writing session where we picked the most frequently asked questions and invited citizens to write their answers. And I joined the action.

I created this answer and several others.

And to this day, I try to articulate the sense of authority and responsibility I feel for the place where I live, based on this small act of participation.

And by linking my small act with the thousands of other small acts of participation we are enabling through civic hacking, I believe we can reinvigorate civil rights and restore trust in government.

At this point, you may be wondering what city officials think about all this.

In fact they love it.

As we know, cities are being asked every day to do more with less and are constantly looking for innovative solutions to deep-seated problems.

Thus, providing citizens with a way to participate other than attending City Hall meetings gives cities the ability to actually conduct government business in their communities.

Now, I don't want to leave the impression that civic hacking is just an American phenomenon.

This is happening all over the world and one of my favorite examples is in Mexico City. In Mexico City, the Mexican House of Representatives signed a deal with a software developer earlier this year to build an app that lawmakers use to track their bills.

So this was for only a few members of the House of Representatives.

He signed a two-year contract for $9.3 million.

Now, a lot of people were really upset about this, especially the geeks who knew that $9.3 million for a very simple app was absolutely outrageous.

But instead of taking to the streets, they issued a challenge.

They asked Mexican programmers to build something better and cheaper, offered a prize of $9,300, 10,000 times cheaper than the government contract, and gave applicants 10 days.

And in those 10 days, they submitted 173 apps, 5 of which went to Congress and are still in app stores today.

And thanks to this action, that contract was voided and now this has sparked a movement in Mexico City, home of one of our partners, Code for Mexico City.

So what you see in all three locations – Honolulu, Oakland and Mexico City – is the core element of civic hacking.

It is citizens who have decided to find and fix what could work better, and through their efforts are building a 21st century ecosystem of participation.

They are creating a whole new set of ways for citizens to participate beyond voting, signing petitions and protesting.

They can actually build a government.

Now, back to my friend Ben Franklin, one of his lesser-known accomplishments was founding the first volunteer fire company in Philadelphia, called the Brigade, in 1736.

That's because he and his friends realized that the city was struggling to cope with all the fires that were happening in the city, and built a solution in true civic hacker fashion.

Code for America has its own brigade working on the project I just described and wants you to follow in Ben Franklin's footsteps and join us.

There are 31 brigades in the United States.

We are pleased to announce today the opening of the Brigades to international cities for the first time, starting with cities in Poland, Japan and Ireland.

You can find out if there is a brigade where you live at brigade.codeforamerica.org. If you don't have a brigade where you live, we can help.

We have created a toolkit. It's also on brigade.codeforamerica.org and will support you along the way.

Our goal is to build a global network of civic hackers who innovate existing systems to solve deep-seated problems, support local governments, and build tools to empower citizens.

So come hack with us.

thank you.

(applause)

I work with children with autism.

Specifically, we are developing technologies that support communication.

Now, many of the problems faced by children with autism have a common cause, and that cause is difficulty understanding abstractions and symbolism.

Because of this, they have great difficulty with language.

Let's talk a little bit about why.

You can see that this is a picture of a bowl of soup.

we can all see it. We all understand this.

These are two other pictures of Soup, but you can see that these are more abstract. These are not very specific.

And when it comes to language, we find that the look, look, and sound of words have nothing to do with the beginning of the word or what it stands for: a bowl of soup.

So it is essentially a completely abstract, completely arbitrary representation of what is in the real world, which is incredibly difficult for children with autism.

That's why most people who work with children with autism, speech therapists and educators, try to help them communicate with pictures instead of words.

So if an autistic child wants to say "I want soup," the child chooses three different pictures: "I," "I want," and "Soup."

And this has been incredibly effective. People have been doing this for the last 30, 40 years.

In fact, a few years ago I wrote an app for the iPad that does exactly this. It's called Avaz, and the way it works is for kids to choose different pictures.

Arrange these pictures to form sentences and read these sentences.

So Avaz is essentially an image converter and an image-to-speech translator.

Well this worked very well.

As you know, thousands of children around the world use this. I started thinking about what this does and what it doesn't do.

And I noticed something interesting. Avaz helps children with autism learn languages.

Learning word patterns is useless.

Let's discuss this in a little more detail.

Consider the following statement: "I want soup tonight."

Now, it's not just words that convey meaning here.

It is also the way these words are arranged, the way these words are changed and arranged.

That's why a sentence like "I want soup tonight" is different than a sentence like "I want soup tonight" which makes no sense at all.

Here is another hidden abstraction that children with autism have great difficulty coping with. It's the fact that words can be changed, arranged to have different meanings, and convey different ideas.

Now, this is the so-called grammar.

And grammar is incredibly powerful. Grammar is the one component of language that allows us to take this finite vocabulary we all have and convey an infinite amount of information, an infinite amount of ideas.

It's a way of putting things together to say what you want to say.

So after developing Avaz, I spent a long time wondering how I could teach grammar to children with autism.

The solution came from a very interesting point of view.

I happened to see an autistic child conversing with her mother and this happened.

Quite suddenly, very naturally, the child stood up and said, "Eat."

Now, what was interesting was the way the mother asked the child questions to try and get the meaning out of what the child was trying to say.

So she asked, "What do you want to eat? Do you want ice cream?"

do you want to eat Anyone else want to eat?

Want some cream now? Would you like to eat ice cream at night? ”

And what my mother did, I thought, was unbelievable.

She was able to convey her ideas to the child without using grammar.

And I thought maybe this is what I was looking for.

Instead of placing the words in order, in order, as sentences, place the words in this map. Instead of placing the words in order, they are all linked by placing them as questions, question-answer pairs.

When you do this, what you are conveying is not the English sentence, but actually the meaning, the meaning of the English sentence.

Now, meaning is, in a sense, what underlies language.

It comes after thought and before language.

And I had the idea that this particular expression might convey the meaning in its raw form.

So I got super excited about this, jumping around and wondering if I could translate every sentence I heard into this.

And it turns out that this is not enough.

Why is this not enough?

This is not enough. Because if you want to convey something like a denial, if you want to say "I don't want the soup", you can't do that with a question.

You can do that by changing the word "want".

Again, if you want to say "I wanted soup yesterday", you can do so by translating the word "want" into "want".

It's past tense.

This is a decoration I added to complete the system.

This is a map of words combined as questions and answers, on which these filters are applied to modify them to represent certain nuances.

Let's illustrate this with another example.

Consider the following statement: "I said I couldn't pay the carpenter."

That's a pretty complicated sentence.

Because of how this particular system works, you can start anywhere in this sentence.

Start with the word "tell".

This is the word "tell".

Now, since this happened in the past, I'll "tell" it.

Now what I'm going to do is ask a question.

So who said? I said.

who did you tell? I said to the carpenter.

Then start with another part of the sentence.

Start with the word "pay" and add an ability filter to it to "can pay".

Then you can make it "can't pay" and put it in the past tense to make it "couldn't pay".

So who couldn't pay? could not pay.

Who couldn't pay? I couldn't pay the carpenter.

And then tie the two together and ask the question: "What did I tell the carpenter?"

I said I couldn't pay the carpenter.

Now let's think about this. This is — (applause) — this is the languageless version of this sentence.

There are two or three interesting things about this.

First, you can start anywhere.

I didn't have to start with the word "tell".

I could have started anywhere in the sentence, or I could have made this whole.

Second, if I'm not an English speaker and speak some other language, this map would actually apply to any language.

Maps are practically language independent, as long as the questions are standardized.

I call it FreeSpeech. I spent months playing with this.

I tried various combinations of these.

And I noticed something very interesting about FreeSpeech.

I was converting languages, converting English sentences to FreeSpeech sentences and vice versa.

And then I realized that with this particular construct, this particular way of expressing language, you can actually create very concise rules that go back and forth between FreeSpeech on the one hand and English on the other.

So we could actually write a set of rules to translate this particular expression into English.

So I developed this.

I have developed something called FreeSpeech Engine. This engine takes a FreeSpeech sentence as input and outputs a fully grammatical English text.

And by combining these two elements, expressions and engines, we were able to create an app, a technology, that teaches not only words but grammar to children with autism.

So when I tried this on my autistic children, I found that I saw an incredible amount of identification.

In FreeSpeech, they were able to produce sentences that were much more complex than their English counterparts, but were also much more effective. I started to wonder why.

And I had an idea, so I'd like to talk about this idea next.

About 15 years ago, around 1997, a group of scientists were trying to understand how the brain processes language and discovered something very interesting.

They found that when you learn a language as a child, at age 2, you use a specific part of the brain, whereas when you learn a language as an adult, say you want to learn Japanese now, a completely different part of the brain is used.

I don't know why this is so, but I think it's because when you learn a language as an adult, you almost always learn it through your mother tongue, your first language.

An interesting thing about FreeSpeech is that when creating sentences or creating language, when autistic children create language in FreeSpeech, they are not using this support language or bridge language.

They are constructing sentences directly.

And this gave me this idea.

Is it possible to use FreeSpeech to teach language to people without disabilities, but not children with autism?

So I tried some experiments.

The first thing I did was create a jigsaw puzzle with these questions and answers coded in the form of shapes and colors and have people put these together to understand how this works.

And then I made an app, a game out of it. Children can play with words and learn language by reinforcing visual structures and reinforcing sounds.

There is a lot of potential and potential in this and the Indian government recently licensed this technology from us and intends to try it out on millions of different children looking to teach English.

And the dreams, hopes and visions actually mean that by learning English this way, you will learn it with the same proficiency as your mother tongue.

Ok, let's talk about something else.

Let's talk about speech.

This is speech.

Therefore, speech is the primary means of communication between us all.

Now, the interesting thing about speech is that it is one-dimensional.

Why one dimensional?

Sound is one dimensional.

Our mouths are also one-dimensional because they are made that way.

Our mouths are designed to produce one-dimensional sounds.

But when we think about the brain, the thoughts in our heads are not one-dimensional.

So we have rich, complex, multidimensional ideas.

Now language, it seems to me, is an invention of the brain to convert this rich, multidimensional thought into speech on the one hand.

The interesting thing is that we do a lot of information work today, and almost all of it is in the linguistic realm.

Take Google for example.

Google trolls all these countless billions of websites, but they are all in English, and when you want to use Google, you go to Google search, type in English, and English matches English.

What if you could do this with FreeSpeech instead?

I suspect that if you do this, you'll find algorithms such as search and retrieval to be much simpler and more effective because you're not dealing with the audio data structure.

Instead, they are processing data structures of thought.

data structure of thought.

That's a provocative idea.

But let's look at this in a little more detail.

This is the FreeSpeech ecosystem.

On one side there is a Free Speech expression, and there is a FreeSpeech Engine that generates English.

Come to think of it, FreeSpeech is completely language independent.

There is no specific information about English.

So everything this system knows about English is actually encoded into the engine.

It's a very interesting concept in itself.

We encoded the entire human language into a software program.

But if you look inside the engine, it's really not that complicated.

It's not very complicated code.

Even more interesting is the fact that most of that engine's code isn't really English-specific.

And that gives rise to this interesting idea.

It might be very easy to actually create these engines in so many different languages ​​like Hindi, French, German, Swahili, etc.

And that gives another interesting idea.

For example, let's say I'm a newspaper or magazine writer.

You can create content in one language, FreeSpeech, and anyone who consumes that content, reading that particular piece of information, can choose any engine and read it in their native language.

This is a very attractive idea, especially for India.

We have many different languages.

There is a song about India which describes the country (in Sanskrit) as follows:

It means "one who always smiles and speaks a beautiful language."

Language is beautiful.

I think it is the most beautiful human creation.

I think it's the most wonderful thing our brain has invented.

Language entertains, educates, enlightens, but what I love most about language is that it empowers.

I would like to say goodbye to you.

Here are some photos of my collaborators. They were my first collaborators when I started working on language, autism, and more.

The girl's name is Pavna and that is her mother, Kalpana.

And although Pavna is an entrepreneur, Pavna is about 23 years old, so her story is much more notable than mine.

She has quadriplegic cerebral palsy and has been unable to move or speak since birth.

And what she's accomplished so far, graduating from school, going to college, starting a company, working with me to develop Avaz, all these things she's done by just moving her eyes.

Daniel Webster said: “If all my possessions were taken away with one exception, I would choose to retain the power of communication, because with it I could take back all that was left.”

That's why, of all these great applications of FreeSpeech, what sticks out to me the most is this ability to enable children with disabilities to communicate, the power of communication, and the power to bring back all the rest.

thank you.

(Applause.) Thank you. (Applause.) Thank you. thank you. thank you. (Applause.) Thank you. thank you. thank you. (applause)

I am very happy to be here today to talk to you about how we can repair damaged brains. As a neurologist myself, I am particularly excited about this field because I believe it offers one of the greatest ways in which we can offer hope to patients living with today's devastating and incurable brain diseases.

Now comes the problem.

Here you see a picture of the brain of a person with Alzheimer's disease next to a healthy brain, and what is clear is that the Alzheimer's brain is stained red and has obvious damage: atrophy and scarring.

And you could show them similar pictures of other diseases, such as multiple sclerosis, motor neuron disease, Parkinson's, or even Huntington's, and they would all tell similar stories.

And taken together, these brain diseases represent one of the major public health threats of our time.

And the numbers here are truly amazing.

Currently, 35 million people are living with one of these brain diseases at any given time, costing the world $700 billion annually.

I mean, think about it.

That's more than 1% of the world's GDP.

And things are getting worse. Because these are generally age-related diseases, and because we are living longer, all these numbers are going up.

So what we really need to ask ourselves, regardless of the scale of the social problem, is why, given the devastating impact these diseases have on individuals, why are there no effective treatments?

In order to think about this, we first need to give a crash course on how the brain works.

That means you need to pass on everything you learned in medical school.

(Laughter) But trust me, this won't take long.

have understood? (Laughter) The brain is very simple. The brain consists of four cells, two of which are shown here.

There are nerve cells, then there are myelinating cells, or insulating cells.

It is called an oligodendrocyte.

And when these four cells work together in health and harmony, they create an amazing symphony of electrical activity. This electrical activity underpins our ability to think, express emotions, remember, learn, move, and feel.

But likewise, each of these four cells, alone or together, can run amok or die, in which case they take damage.

Doing so will damage the wiring.

Your connection will be interrupted.

And it is evident from the slow conduction.

Ultimately, however, it is clear that this damage manifests itself as disease.

And, for example, if the nerve cells that begin to die are motor neurons, you have motor neuron disease.

So I want to actually illustrate what happens with motor neuron disease.

This is my patient, John.

I just met John at the clinic last week.

And I asked John to tell me something about his problem that led to his initial diagnosis of motor neuron disease.

John: I was diagnosed in October 2011 and my main problem was breathing problems, difficulty breathing.

Siddharsan Chandran: I don't know if you got it all right, but what John was telling us was that dyspnea eventually led to the diagnosis of motor neuron disease.

John is now 18 months into that journey, and I just asked him to tell me something about his current predicament.

John: What I'm feeling right now is that I'm having trouble breathing.

Weakness in hands, arms and legs.

So, I mostly use a wheelchair.

SC: John told us that he is in a wheelchair most of the time.

So what these two clips show is not just about the devastating consequences of the disease, but also about the shocking pace of the disease. A healthy adult man can become wheelchair- or ventilator-dependent in as little as 18 months.

And let's be honest, John could be anyone's father, brother, or friend.

This is what happens when motor nerves become weak.

But what happens when those myelin cells die?

will have multiple sclerosis.

The scan image on the left is a view of the brain, with a map of brain connections overlaid with the area of ​​damage.

We call them demyelinating lesions.

But it's damaged and white.

So I know what you are thinking here.

You're thinking, "Oh my god, this guy said he was going to talk about hope, but all he did was talk about something really dark and depressing."

He said these diseases are terrifying.

They are devastating, prevalence is rising, costs are prohibitive, and worst of all, there is no cure. where is the hope

Well, did you know? I think there is hope.

And there is hope for this next section, a section of the brain of another person with MS. Because what this section shows is that, amazingly, the brain can repair itself.

It doesn't work well enough.

There are two things I want to show you again.

First and foremost is the suffering of this MS patient.

And again, this is another white blob.

But the important thing is that the area circled in red highlights the area in pale blue.

But that pale blue part was once white.

That's how it got damaged. It is now repaired.

Let me be clear, it's not the doctor's fault.

It's not the doctor's fault, but the doctor's.

This is natural restoration.

This is amazing because there are stem cells in the brain that can lay down new myelin, a new insulator, over damaged nerves.

And this observation is important for two reasons.

The first is that it challenges one of the myths we learned in medical school, or at least I learned in the last century, that the brain, unlike bone and liver, does not repair itself.

However, as it actually is, it is not effective enough.

The second thing gives us very clear direction for new treatments. So you don't have to be a rocket scientist to know what to do here.

We just need to find ways to promote the endogenous natural repairs that happen anyway.

So the question is, you knew about it all along, as we do, so why don't you get that kind of treatment?

And it partly reflects the complexity of drug development.

Now, when you think of drug development, you might think of it as a pretty expensive but risky bet. The odds for this bet are approximately: 10,000 to 1, because we need to screen about 10,000 compounds to find one potential winner.

And it could take 15 years, spend over a billion dollars, and still have no winners.

So the question for us is, can we change the rules of the game to shorten the odds?

To that end, we need to think about where the bottlenecks for drug discovery lie.

And one of the bottlenecks is in the early stages of drug discovery.

All screenings are done in animal models.

But we do know that the proper study of humanity, in the words of Alexander Pope, is human.

So the question is, can we study these diseases using human material?

And of course it is absolutely possible.

Stem cells can be used, especially human stem cells.

And human stem cells are remarkably simple cells that can do two things. It can self-replicate, make more of itself, but it can also be specialized to make bone, liver, or, importantly, nerve cells, perhaps even motor neurons and myelin cells.

And the long-standing challenge has been to harness the power, the undeniable power, of stem cells to realize the promise of regenerative neurology.

And I think I can do it now. We can do that because there have been some big discoveries in the last 10, 20 years.

One of them was here in Edinburgh, and it's probably the only famous sheep, Dolly.

Dolly was thus created in Edinburgh, making Dolly the first example of cloning a mammal from an adult cell.

However, I believe that an even more significant advance for the purposes of today's discussion was made in 2006 by a Japanese scientist named Yamanaka.

And what Yamahana has done is, in a wonderful form of scientific cuisine, he has shown that four ingredients, just four ingredients, can effectively transform any cell, even an adult cell, into a master stem cell.

The importance of this cannot be overstated. Because it means that anyone in this room, especially a patient, will be able to create a customized, individualized tissue repair kit.

By taking skin cells and turning them into master pluripotent cells, we can create disease-relevant cells that not only have research but also therapeutic potential.

Now, that idea in medical school is a recurring theme between me and medical school. — It would be silly, but it's an absolute reality today.

And I believe this is the foundation of regeneration, restoration, and hope.

And while we are on the theme of hope, there is hope for all of you who may have failed in school. Because this is John Gurdon's school report card.

[“I think he has an idea of ​​what it would be like to be a scientist. It’s just silly that he’s showing it now.”] So they didn’t think much of him at the time.

But what many may not know is that he won the Nobel Prize in Medicine just three months ago.

So, coming back to the original question, what are the potential of these stem cells, or this destructive technology, for repairing damaged brains (called regenerative neurology)?

I think there are two ways of thinking about this. One as a great 21st century drug discovery tool and the other as a form of therapy.

So I'd like to talk a little bit about both.

Drug discovery in cooking is often talked about.

It's that simple. You see a patient with a disease, say, motor neuron disease, take a skin sample, and as I said, reprogram pluripotency to generate living motor neurons.

It's easy, because that's what pluripotent cells can do.

Importantly, however, their behavior can then be compared to that of comparable but healthy counterparts, ideally unaffected relatives.

In doing so, genetic variation can be matched.

And that's exactly what we did here.

This was a collaboration with a colleague. Chris Shaw in London. Steve Finkbeiner and Tom Maniatis in the US.

What you're seeing is amazing, these are living, growing motor neurons taken from patients with motor neuron disease.

It happens to be an inherited form.

I mean, just imagine.

This would have been unimaginable ten years ago.

So, apart from watching them grow and start the process, we can also manipulate them to fluoresce, but importantly, we can track individual health and compare diseased versus healthy motor neurons.

Putting all this together, we can see that sick people, represented by the red line, are 2.5 times more likely to die than healthy people.

And the big thing about this is that you then have a great assay for drug discovery. Because what would you want from a drug, and this can be done through high-throughput automated screening systems. You can say to drugs, "Just one thing. Find a drug that brings the red line closer to the blue line, because it's probably a high-value candidate that can be brought directly into human trials, avoiding most of the bottlenecks I talked about in animal model drug discovery, if that makes sense." Great.

But I would like to go back to using stem cells directly to repair damage.

There are also two ways of thinking about this, and they are not mutually exclusive.

The first, which I think will benefit us the most in the long run, is to think about the stem cells that are already in the brain, although they aren't considered that way yet, and I've passed that on.

Stem cells are present in our brains, even in diseased brains. A sure way to be smart is to find a way to stimulate and activate the stem cells already in the brain so that they can respond and repair damage appropriately.

that will be the future.

There will be drugs that will make it happen.

But another way, even in the brain, is to effectively parachute into cells and transplant cells to replace dying or lost cells.

I would like to talk about an experiment here. This is a clinical trial that we did and recently completed. It was done in collaboration with my colleagues at UCL, especially David Miller.

So this research was pretty straightforward.

We asked multiple sclerosis patients a simple question. Do stem cells from bone marrow protect neurons?

So what we did was take this bone marrow, grow the stem cells in the lab, and inject them into a vein.

I keep this sound very simple.

A lot of people took five years off, right?

And it gave me gray hair and caused all sorts of problems.

But conceptually, it's inherently simple.

So you gave it intravenously, right?

So, to gauge whether this was successful, we measured the optic nerve as a measure of outcome.

And it's good for measuring symptoms in MS patients. Sadly, I suffer from vision problems such as poor vision, poor vision.

So, using David Miller's scans, the optic nerve size was measured three times: 12 months, 6 months, and before the infusion. Then you can see the red line that slowly descends.

This indicates that the optic nerve is shrinking. This is not surprising, because the nerves are dying.

After that, when the stem cells were injected and the measurement was repeated twice at 3 months and 6 months, surprisingly, the line almost rose.

This suggests that the intervention was protective.

I myself do not believe that anything happened because the stem cells created new myelin or new nerves.

I think they encouraged endogenous stem cells, or progenitor cells, to do their job, wake up, and produce new myelin.

This is a proof of concept.

I'm really looking forward to it.

So I would like to end with the theme I started with: rebirth and hope.

So I asked John about his hopes for the future.

John: I hope that in the future, through the research that you are doing, you will develop treatments that will allow people like me to live a normal life.

SC: So that speaks volumes.

But first I would like to end by thanking John. Thank you John for allowing us to share his insights and these clips with you all.

But I would like to add to John and others that my own view is that I am hopeful for the future.

I believe that disruptive technologies like stem cells, which I have tried to describe to you, offer very real hope.

And I think the day when we can repair the damaged brain is sooner than we think.

thank you.

(applause)

Here are some images of the galaxy cluster.

That's exactly what it sounds like.

They are huge collections of galaxies, held together by mutual gravitational forces.

Therefore, most of the dots you see on your screen are not individual stars, but clusters of stars, or galaxies.

Now, by showing you some of these images, you can quickly see that clusters of galaxies are very beautiful objects, but more than that, they are mysterious, amazing, and useful.

It serves as the largest laboratory in the universe.

And as a lab, explaining clusters of galaxies is the same as explaining experiments that can be performed with clusters of galaxies.

I think there are four main types. The first type I want to describe is the very large type.

So how big?

Well, here's an image of a particular galaxy cluster.

It is so heavy that light passing through it is bent and distorted by this cluster's extreme gravity.

And indeed, if you look carefully, you can see a ring around the cluster.

Now let's get to the numbers. This galaxy cluster has a mass of over 10 billion suns.

It's just amazing how large these systems can get.

But more than mass, there is this additional feature.

Since they are essentially isolated systems, they can be thought of as miniature versions of the entire universe, if desired.

And many of the questions we may have about the large universe, such as how gravity works,

A study of these systems may provide the answer.

It was so big, wasn't it?

The second thing is very hot.

If you take an image of the galaxy cluster and subtract all the starlight, you're left with this big blue blob.

This is false color.

What we actually see is X-ray light.

And the question is what is emitting this light, if not a galaxy?

The answer is hot gas, gas at millions of degrees. In fact, it's plasma.

Why it's so hot is back to the previous slide.

The extreme gravity in these systems is accelerating gas particles to high speeds, and high speeds mean high temperatures.

This is the main idea, but the science is a draft.

This plasma has many fundamental properties that still confuse and baffle us and boost our understanding of the physics of very hot things.

The third is looking at very small things.

Now, to explain this, I need to tell you a very disturbing fact.

Most of the matter in the universe is made up of atoms.

you were deceived

Most of it consists of something very, very mysterious that we call dark matter.

Dark matter does not like to interact much, except through gravity, and of course we would like to know more about it.

If you're a particle physicist, you'll want to know what happens when you crush things.

And dark matter is no exception.

So what do we do?

To answer that question, you have to ask another question. That's what happens when galaxy clusters collide.

here is the image.

A galaxy cluster is a representative slice of the universe, so it's a scaled-down version.

They are mostly composed of dark matter, which is what you see in this bluish purple.

Red represents hot gas, and of course many galaxies are visible.

What happened was a gigantic, gigantic scale particle accelerator.

This is very important. Because what it means is that very small effects that might be difficult to detect in the laboratory can be intricately intertwined and observable in nature.

It's very interesting.

The reason clusters of galaxies tell us about dark matter, the reason they tell us about the physics of being so small, is precisely because they are so big.

Fourth is the physics of something very strange.

It's true that what I've said so far is ridiculous.

Well, if there's anything strange about it, I think it's dark energy.

If you throw a ball in the air, you think it will go up.

What I don't expect is that it will accelerate.

Similarly, cosmologists understand why the universe is expanding.

They don't understand why it's expanding faster than ever.

They named the cause of this accelerated expansion and called it dark energy.

And, once again, we would love to know more about it.

So one of the questions we have in particular is what effect dark energy will have on the universe at its largest scale.

Depending on the strength, structure formation can be faster or slower.

Well, the problem with the large-scale structure of the universe is that it's horribly complex.

This is a computer simulation.

And we need a way to simplify it.

Well, I would like to think about this using an analogy.

If you want to understand the sinking of the Titanic, the most important thing is not to model the small positions of all the small parts of the broken boat.

The most important thing is to keep track of the two largest pieces.

Similarly, by tracking the largest parts of the universe, we can learn a lot about it at its largest scale. The largest part of them is the galaxy cluster.

So you might feel a little cheated as I get closer to the end.

So, we've started talking about how clusters of galaxies are useful, and we've given some reasons why, but what are they actually used for?

Now, to answer this, I would like to quote Henry Ford when asked about cars.

he said: "If I asked people what they wanted, they would say a faster horse."

Today, as a society, we face many difficult issues.

And the solution to these problems is not clear.

They are not fast horses.

It requires an enormous amount of scientific ingenuity.

So you have to be focused, yes you have to be focused, but you also have to remember innovation, ingenuity and inspiration. These come in when you zoom out and step back to widen your field of view.

I can't think of a better way to do this than by studying the universe around us. thank you.

(applause)

Almost two years ago, while driving in Germany, I turned on the radio.

Europe was in the midst of the euro crisis at the time, and the headlines were all about European countries being downgraded by US rating agencies.

When I heard that, I thought, "What is a rating agency and why is everyone so upset about their job?"

Well, if you were sitting next to me in the car that day and told me I would dedicate the years to come to reforming them, obviously I would have called you a lunatic.

But let's think about what's really crazy. How these rating agencies operate.

And I want to explain not only why it's time to change this, but also how it can be changed.

Now let's talk a little bit about what rating agencies actually do.

Just like reading car magazines before buying a new car, or reading product reviews before deciding what kind of tablet or phone to buy, investors read reviews before deciding what kind of product to invest their money in.

Ratings can go down from so-called AAA, which means the best performing product, to so-called BBB-, which means a fairly risky investment.

Rating agencies are rating agencies.

They rate banks.

They even rate financial products like the infamous mortgage-backed securities.

But we can also rate nations, and these ratings are called sovereign ratings, and I would like to focus on these sovereign ratings in particular.

And I know you're thinking as you listen to me now, so why should I really care about this?

Be honest.

Well, ratings affect you.

They affect us all.

When rating agencies rate a country, they basically assess the country's debt and its ability and willingness to repay the debt.

Therefore, if a country is downgraded by a rating agency, it will have to pay more money to borrow money in the international market.

So it affects you as a citizen and as a taxpayer. Because you and your brethren have to borrow more money to get into debt.

But what if the cost is so high that the country can't afford to pay any more?

That would make other services such as roads, schools and health care unavailable in the country.

Sovereign ratings affect everyone, so this is why you should be careful.

That's why I think they should be defined as public goods.

It should be transparent, accessible, and free for everyone.

But here's the situation. The rating agency market is dominated by only three players, Standard and Ratings. Poor's, Moody's, Fitch, etc. have found that whenever the market is concentrated, there is really no competition.

There is no incentive to improve product quality.

And let's face it, credit rating agencies have to change the way they operate despite their contribution to putting the global economy in jeopardy.

Second point, do you really buy a car based solely on the dealer's advice?

Obviously different, right? It would be irresponsible.

But that's actually what happens every day in the rating agency space.

Customers of these rating agencies, as well as countries and corporations, pay fees for their own ratings and this clearly creates a conflict of interest.

The third point is that the rating agencies don't disclose how they actually do their ratings, but in this day and age, you can't even sell a candy bar without listing the full contents.

But we don't really know what the different factors are when it comes to ratings, which are a key factor in the economy.

We have tolerated rating agencies being opaque about their work and this needs to change.

There is little doubt that the sector needs a complete overhaul, not just marginalization.

I think it's time to take bold action.

I think it's time to upgrade your system.

This is why we at the Bertelsmann Foundation have invested so much time and effort into exploring alternatives in this area.

And we developed the first model for a non-profit rating agency on sovereign risk, which we call the acronym INCRA.

INCRA will change the current system by adding one more nonprofit.

It is based on a non-profit model based on sustainable donations.

These donations generate income that allows us to run our business, run our rating agency, and make our ratings available to the public.

But this alone is not enough to make a difference, right?

INCRA will also be based on a very clear governance structure that avoids conflicts of interest and will involve many stakeholders in society.

INCRA will not only be a European and American rating agency, but will become a truly international rating agency, with equal interests, voice and representation, especially in emerging markets.

The second major difference that INCRA makes is whether it bases its sovereign risk assessment on a broader set of indicators.

Think about it.

When we do a sovereign rating, we basically look at a country's economic underpinnings, or macroeconomic fundamentals.

But we also have to question who is cultivating the economic soil of the country.

Well, there are many gardeners in the country and one of them is the government. So we have to ask how the country is governed.

How is it managed?

This is why we have developed what we call forward-looking indicators.

These are indicators for a deeper understanding of a country's socio-economic development.

We hope you agree that it is important to know if governments are willing to invest in renewable energy and education.

It is important for you to know whether your government can handle the crisis and whether it can finally implement the reforms promised.

For example, if INCRA were to rate South Africa now, we would, of course, be looking very closely at the country's youth unemployment rate, which is the highest in the world.

If more than 70 percent of a country's population under the age of 35 is unemployed, it will unsurprisingly have a significant impact on the economy today and even more in the future.

Well, here are our friends at Moody's, Standards &amp; Poor's and Fitch will say they will consider this as well.

But guess what? I'm not exactly sure how they will consider this.

And this brings us to the third big difference that INCRA makes.

INCRA will not only publish its ratings, but also its metrics and methodology.

Therefore, in contrast to the current system, INCRA will be completely transparent.

So, in a nutshell, INCRA will offer an alternative to the current system of the big three rating agencies by adding new non-profits that will increase competition, make the sector more transparent and also improve quality.

I know that sovereign ratings may still seem like a small part of this very complex world of global finance to you, but I would say that this is very important and very important to fix because sovereign ratings affect us all. Because sovereign ratings should be addressed and defined as public goods.

This is why we are currently testing the model and looking to see if it can bring together a group of talented and motivated actors to bring INCRA to life.

I truly believe that building INCRA benefits everyone, and that we now have a unique opportunity to transform INCRA into the cornerstone of a new and more inclusive financial system.

Because we have neglected the financial giants for too long.

It's time to give them companions.

thank you.

(applause)

Let's talk a little bit about the relationship between strategy and technology.

We tend to think of business strategy as essentially a rather abstract and perhaps rather timeless piece of economic thought.

What I would argue is that, in fact, business strategy has always made assumptions about technology, and those assumptions are changing, indeed changing quite dramatically, and so what it leads us to is that business strategy is a different concept than what we mean.

Let's start with a little history, if possible.

The idea of ​​strategy in business owes its origins to two intellectual giants: BCG founder Bruce Henderson and Harvard Business School professor Michael Porter.

Henderson's central idea was what should be called Napoleon's idea of ​​focusing the masses against weakness and overpowering the enemy.

Henderson recognized that in the world of business there are many phenomena that are characterized by what economists call increased profits: scale and experience.

The more you do something, the better it gets disproportionately.

So he found the logic to invest in that kind of overwhelming mass to achieve a competitive advantage.

And this is the first time that a strategic concept, essentially military, has been introduced into the business world.

Porter agreed with the premise, but justified it.

He pointed out that while that is all very well, there are actually multiple steps for companies.

They have different components, each of which can be driven by a different kind of strategy.

A company or business can actually be favorable in some activities and unfavorable in others.

He argued that essentially forming the concept of a value chain, a series of steps in which raw materials become components, assembled into a finished product, and then distributed, benefits accrue to each of those components, and the benefit of the whole is in a sense the sum or average of the benefits of its parts.

And this value chain thinking was based on the realization that it is transaction costs that bind businesses together, that by nature they need to be coordinated, and that organizations are often more efficient at coordinating than the market, so the nature, roles and boundaries of cooperation are defined by transaction costs.

Based on these two ideas, Henderson's idea of ​​increasing returns to scale and experience, and Porter's idea of ​​a heterogeneous value chain, the overall picture of business strategy was built.

My point here is that these assumptions are actually becoming invalid.

First, consider transaction costs.

Transaction costs actually have two components.

One is about information processing and the other is about communication.

These are the economics of processing and communication that have evolved over time.

As we all know from so many contexts, they have changed radically since the time when Porter and Henderson first formulated their theories.

Communication costs have actually fallen even faster than transaction costs, especially since the mid-90s, which is why communication, the Internet, has exploded in such a dramatic way.

Now, this reduction in transaction costs has a significant impact. Because even though transaction costs are the glue that binds the value chain together, lower transaction costs mean less savings.

The need for vertically integrated organisations, at the very least, may become fragmented.

You don't have to, but you can.

In particular, it allows a competitor of one business to use its position at one stage of the value chain to infiltrate, attack, or disintermediate competitors of another business.

It's not just an abstract proposition.

There are many very specific stories about how it actually happened.

A prime example is the encyclopedia business.

The encyclopedia business in the days of leather bound books was basically a distribution business.

Most of the costs were commissions to salespeople.

With the advent of CD-ROMs, and then the Internet, new technologies made knowledge distribution orders of magnitude cheaper and the encyclopedia industry collapsed.

Of course, it is now a very well-known story.

In fact, this was, more generally, the story of the first generation of the Internet economy.

The idea was that lower transaction costs would fragment the value chain, thereby allowing the elimination of intermediaries, the so-called deconstruction.

One of the questions I've been asked from time to time was, when Britannica no longer has a business model, what are the alternatives to encyclopedias?

And it took a while for the answer to become clear.

Of course we know what it is. That's Wikipedia.

Now, what's special about Wikipedia isn't its distribution.

What's special about Wikipedia is how it's created.

Wikipedia is, of course, a user-created encyclopedia.

And indeed, this defines the second decade of the Internet economy, the decade when the Internet as a noun became the Internet as a verb.

It became a series of conversations that ushered in an era of user-generated content and social networks.

Now, what this really meant with respect to the Porter-Henderson framework was a sort of collapse of economies of scale.

It turns out that the tens of thousands of autonomous individuals who write encyclopedias can do as good a job as professionals in hierarchical organizations, and certainly much cheaper.

So basically what was happening was that one layer of this value chain became fragmented as individuals could take over where organizations were no longer needed.

But there is another question that this graph clearly raises. It's been 20 years since we've been there, is there anything that distinguishes the third year?

And what I would argue is that there is indeed something that distinguishes the third one, and that it corresponds exactly to the kind of Porter-Henderson logic we have been talking about.

And it's about the data.

Back in the year 2000, a lot of people were talking about the information revolution, and it was true that the world's data stock was growing, and it was actually growing very quickly.

But it was still overwhelmingly analog at that point.

Back in 2007, not only was the world's data stock exploding, but there was also a massive replacement of analog with digital.

And more importantly, if you look closely at this graph, you can see that about half of all digital data is information with IP. address.

It can be on your server or on your PC.

But an address with an IP means it can connect to other data with an IP. address.

That means it will be possible to bring half of the world's knowledge together to see patterns that are completely new.

If you trace this number back to the present day, it's probably something like this:

I'm confused.

If you calculate this number all the way back to 2020, courtesy of IDC, you'll get the exact numbers, of course.

It is interesting that the future is much more predictable than the present.

And that means a 100x increase in the stock of information connected via IP. address.

Now, if the number of connections you can make is proportional to the number of pairs of data points, then 100 times more data means 10,000 times more patterns you can see in that data. This is only for the last 10 or 11 years.

I would argue that this is a big change, a profound shift in the economy of the world in which we live.

The first human genome, James Watson's genome, was mapped in 2000 as the culmination of the Human Genome Project. It took about $200 million and about 10 years of work to map the genome composition of just one person.

Since then, the cost of genome mapping has fallen.

In fact, costs have fallen so dramatically in recent years that they are now under $1,000 and are confidently projected to fall below $100 by 2015. This is an extraordinary phenomenon as the cost of genome mapping has fallen by 5-6 orders of magnitude in just 15 years.

Now, in a time when genome mapping cost millions, sometimes tens of thousands, it was basically a research enterprise.

Scientists gathered a representative group of people to observe the patterns, and then tried to make generalizations about human nature and disease from the abstract patterns they found in these particular select groups of people.

But while you're waiting, what happens when you can map a genome for $100, $99?

It becomes more clinical than anything else.

When you go to the doctor for a cold, the first thing the doctor does is map your genome, if he hasn't already done it. At that point what they're doing now is not starting with the abstract knowledge of genomic medicine and trying to figure out how it applies to you, but starting with your specific genome.

Now think about its power.

Consider where we are headed when we can combine genomic and clinical data, data on drug interactions, and environmental data increasingly collected by devices such as mobile phones and medical sensors.

Think about what happens when you collect all the data, combine it, and find patterns that weren't visible before.

It will probably take time, but I think this will spark a revolution in medicine.

Great, a lot of people are talking about this.

However, there is one thing that has received less attention.

How does a huge sharing model across all these databases fit into the business models of the institutions, organizations and companies involved in this business today?

If your business is based on its own data, if your competitive advantage is defined by your data, how in the world is that company or society actually going to achieve the value implied in technology?

So what's essentially happening here, genomics is just one example, is that technology is driving the natural expansion of activity beyond the institutional boundaries we're used to thinking about, especially in terms of how business strategy as a discipline is formulated.

The basic story here is that what was once a vertically integrated, oligopolistic competition of essentially homogeneous competitors is somehow evolving from a vertical to a horizontal structure.

Why is this happening?

This is happening because transaction costs are plummeting and size is polarizing.

Plunging transaction costs could weaken the glue that holds value chains together and cause them to separate.

The polarization towards very small economies of scale (small is beautiful) allows scalable communities to replace traditional corporate production.

Scaling in the opposite direction, such as big data, drives business structures towards creating new kinds of institutions that can achieve that scale.

But in any case, the typical vertical structure is driven to a more horizontal structure.

This logic isn't just about big data.

For example, if we look at the telecommunications industry, the same is true for fiber optics.

Exactly the same can be said for the so-called “big science” when we look at the pharmaceutical industry and university research for that matter.

And conversely, if you look at the energy sector, for example, it's all about how households produce green energy efficiently and conserve energy efficiently. So it's actually the opposite.

This is a fragmentation of size as very small companies can replace traditional company sizes.

In any case, what we are facing is the horizontalization of the industrial structure, which means a fundamental change in how we think about strategy.

That means, for example, that strategy needs to be thought of as a curation of this kind of horizontal structure. There, business definitions, industry definitions, etc. are really a result of the strategy, not a presupposition of the strategy.

That means, for example, that we need to come up with ways to achieve cooperation and competition at the same time.

Think about the genome.

We have to deal with very big things and very small things at the same time.

And we need an industrial structure that can accommodate very different motives, from the amateur motives of people in local communities, to perhaps government-built infrastructure, and even to the social motives of cooperative institutions built by competing companies. Because it's the only way companies scale.

This kind of transformation renders the traditional assumptions of business strategy obsolete.

They take us into a whole new world.

These require us to think very fundamentally different ways of thinking about the structure of business, whether public or private, and ultimately that makes strategy interesting again.

thank you.

(applause)

I had brain surgery 18 years ago. Since then, brain science has become my personal passion.

I'm actually an engineer.

First of all, I recently joined Google's Moonshot group. There was a division called the Display division of Google X. The brain science research I'm talking about today was research I was doing outside of Google before I joined Google.

That said, there is a stigma associated with having brain surgery.

are you smart yet?

If not, can I make myself smart again?

After neurosurgery, I lost part of my brain and had to deal with that.

It wasn't gray matter, it was the center of the slimy area that makes important hormones and neurotransmitters.

Immediately after surgery, I had to decide how much to take over a dozen powerful chemicals each day. If you don't eat anything, you will die within hours.

For 18 years, day after day, I had to decide on chemical combinations and mixtures and try to get them in order to survive.

There were several close calls.

Luckily, I'm an experimentalist at heart, and since there really isn't a clear and detailed roadmap for this, I decided to experiment to find a more optimal dosage.

I started experimenting with different mixtures and was amazed at how small changes in dosage dramatically changed my sense of self, who I was, how I thought, how I behaved towards people.

In one particularly dramatic case, I actually experimented with doses and chemicals typical of men in their early twenties for a few months, and was amazed at how my thinking changed.

(Laughter) I was angry all the time, I was always thinking about sex, and I thought I was the smartest person in the world. Of course, over the years, I've met people like that, or a toned-down version of it.

I was kind of extreme.

But what surprised me was that I didn't mean to be arrogant.

In fact, I was trying to actually solve the problem at hand, with some trepidation, but it didn't work.

So I couldn't deal with it.

I changed the dosage.

However, that experience gave me a new appreciation for men and what they would go through, and I have gotten along with them much better ever since.

What I was trying to do by modulating these hormones, neurotransmitters, etc., was try to regain my intelligence, creative thinking, and flow of ideas after illness and surgery.

And I think mostly in images, so that became an important metric for me. So how do you get the mental image that you use as a method of rapid prototyping, that is, how you try different new ideas of ideas, sizes, and run scenarios.

This kind of thinking is not new.

Philosophers like Hume, Descartes, and Hobbes saw things similarly.

They believed that mental images and ideas were actually the same thing.

Some people dispute this today, and there is a lot of debate about how the mind works, but to me it's simple. For most of us, mental images are central to inventive and creative thinking.

So, years later, I have adjusted myself and have a lot of nice and really vivid mental images with a lot of refinement and an analytical backbone behind them.

So now I'm working on how to get the mental images in my head onto the computer screen faster.

Can you imagine that a film director could use only his imagination to create the world in front of him?

Or are you the musician who drives the music out of your head?

As a way for creative people to share at the speed of light, this has incredible potential.

And really, the only remaining bottleneck in making this happen is increasing the resolution of the brain-scanning system.

So let me explain why we think we're pretty close to that goal by sharing two recent experiments by two top neuroscience groups.

Both used fMRI technology (functional magnetic resonance imaging technology) to image the brain. Here is a set of brain scans by Giorgio Ganis and colleagues at Harvard University.

And the left column shows brain scans of people viewing the images.

The middle column shows brain scans imagined by the same individual looking at the same image.

And the right column is created by subtracting the middle column from the left column, and you can see that the difference is almost zero.

I've repeated this for many different individuals using many different images and always get similar results.

There is little difference between seeing an image and imagining seeing the same image.

Now I would like to introduce another experiment. This was done in Jack Gallant's lab at Berkeley, California.

They were able to decode brain waves into recognizable fields of view.

So let me set this up.

In this experiment, subjects were shown hundreds of hours of YouTube videos while their brains were scanned to create a large library of brains that responded to video sequences.

A new movie with new images, new people, new animals was then shown and a new set of scans recorded.

Using only the brain scan data, the computer decoded that new brain scan and displayed what it thought the person was actually seeing.

The right side shows the computer's guesses, and the left side shows the presented clip.

This is amazing.

We are very close to being able to do this.

You just need to increase the resolution.

And remember, when you look at an image, and when you imagine the same image, you make the same brain scan.

Therefore, this was done using the highest resolution brain scanning system currently available, whose resolution has actually improved about 1,000-fold over the past few years.

Then you need to increase the resolution another 1,000x to see more depth.

How do we do that?

There are many techniques for this approach.

One method is to crack the skull and insert the electrodes.

i haven't.

Many new imaging techniques have been proposed, some of which I have proposed, but given the recent success of MRI, the first question must be asked. Is this technology dead?

Conventional wisdom says that the only way to get higher resolution is to use larger magnets, but at the moment, larger magnets only provide incremental resolution improvements, not the 1,000x resolution improvement needed.

I'm proposing the idea of ​​making a better magnet instead of a bigger one.

There have been some new technological breakthroughs in nanoscience applied to magnetic structures that have spawned a whole new class of magnets that allow us to lay down very fine and detailed magnetic field patterns throughout the brain, and they can be used to create really holographic-like interference structures to precisely control many patterns. Shown here by shifting things.

Just like making a spirograph, you can create more complex structures by slightly changing the arrangement.

So why is it important?

Over the years in MRI, a lot of effort has gone into making really big magnets.

But most of the recent advances in resolution have actually come from FM's ingeniously clever encoding and decoding solutions. MRI system radio frequency transmitter and receiver.

Also, let's note the structured magnetic pattern in addition to the FM instead of the uniform magnetic field. radio frequency.

So, by combining the magnetic pattern with the F.M. pattern, radio frequency processing greatly increases the information that can be extracted in a single scan.

And on top of that, layering on our ever-growing knowledge of brain structure and memory can multiply the knowledge you need by a factor of 1,000.

And with fMRI, we should be able to measure not just oxygenated blood flow, but the hormones and neurotransmitters I mentioned, and even direct neural activity, which is a dream.

We will be able to send ideas directly to digital media.

Can you imagine if we could leapfrog language and communicate directly with human thought?

What can we do then?

And how do we learn to deal with the unfiltered truth of human thought?

I think the internet was great.

These are big questions.

It may be irresistible as a tool to improve thinking and communication skills.

And indeed, this very same tool may prove to be a cure for Alzheimer's disease and similar diseases.

We have little choice but to open this door.

Pick a year anyway. Will it happen in 5 years or 15 years?

It's hard to imagine it taking longer than this.

We need to learn how to take this step together.

thank you.

(applause)

Thank you for posting the photo of my colleague here.

(Laughter) I'll tell you about them.

Well, let's experiment. I don't usually do experiments. I am a theorist.

But let's see what happens when we press this button.

Sure enough. OK. I used to work in this field of elementary particles.

What if you cut it into pieces?

what is it made of?

And these particle laws are valid throughout the universe and are deeply related to the history of the universe.

We are familiar with the four forces. There must be many others, but they are very, very close and we haven't interacted much yet.

The main thing I want to talk about is that in this area of ​​fundamental physics there is an amazing experience that beauty is a very successful criterion for choosing the right theory.

And how could that happen?

Well, here's an example from my own experience.

In fact, it's pretty dramatic for this to happen.

In 1957, three or four of us put forward a partially complete theory of one of these forces, this weak force.

And that didn't match seven, count, seven experiments.

All the experiments were wrong.

And we thought it was so beautiful that we published it before we knew it, thinking it must be right.

The experiment must have gone wrong, and it did.

Well, our friend over there, Albert Einstein, said people were like, "You know, there's a guy who did an experiment that didn't agree with special relativity.

DC mirror. How is it? ' And he said, 'Oh, it's going to go away.' (Laughter) Now, why would that work?

So what does beautiful mean? it is one.

I'll try to clarify it partially.

Why does it work, and does this have anything to do with humans?

I will give you the answer to the last question I posed. That is, it has nothing to do with humans.

Somewhere on some other planet, around a very distant star, perhaps somewhere in another galaxy, there could be beings who are at least as intelligent and interested in science as we are. It's not impossible. I think there are probably many.

Perhaps no one is close enough to interact with us.

But they could easily show up there.

And suppose they have very different sensory apparatus.

They have 7 tentacles, 14 small funny compound eyes, and a brain shaped like a pretzel.

Are there really different laws?

A lot of people believe that, but I think it's sheer stupidity.

I think there are laws out there, but of course we don't always understand them very well, but we try. And we try to get closer and closer.

And one day we may actually figure out a fundamental unified theory of particles and forces, what I call the "fundamental laws."

We may not be too far from there.

But even if we haven't encountered it in our lifetime, we can still think it's there, and we're just trying to get closer and closer to it.

I think that's the main point.

Express them mathematically.

And when mathematics is so simple, when it is possible to write a theory in a very short space without doing too much complexity in terms of mathematical notation, that is essentially what we mean by beauty or grace.

Here's what I wanted to say about the law. they really are there.

Newton certainly believed so.

And here he said, "It is the business of natural philosophy to discover those laws."

As a basic law, there is one assumption here.

There is an assumption that the fundamental law actually takes the form of a unified theory of all particles.

Now, some call this the theory of everything.

That's wrong, because the theory is quantum mechanical.

I won't go into too much detail about quantum mechanics, what it's like, etc.

Anyway, I've heard a lot of wrong things about it. (laughs) There are movies that contain a lot of wrong content.

But the important thing here is to predict probabilities.

Well, those probabilities can be almost certain.

And in many familiar cases, of course it does.

However, it may not be the case and may only lead to different results.

In other words, the history of the universe is not determined only by basic laws.

There are basic laws and an incredibly long series of accidents, or chances, on top of that.

And the basic theory does not include such chance results. They are additional.

So it's not all theory. And indeed, the vast amount of information in the universe around us comes from those accidents, not just the basic laws.

Now, it is often said that getting closer and closer to the basic laws by examining phenomena at lower energies, then higher energies, then higher energies, or shorter distances, then shorter distances, and even shorter distances, is like peeling an onion.

And we continue to build more powerful machines, accelerators for particles.

As we delve deeper and deeper into the structure of particles, perhaps we get closer and closer to this basic law.

Now, as you peel the onion and get closer and closer to the underlying law, you will find that every skin has something in common with the previous skin and the next. If you write them out mathematically, you'll see that very similar mathematics is used.

It requires very similar mathematics.

That's really remarkable, and that's the central feature of what I'm going to say today.

That's what Newton called it -- it's Newton, by the way -- that's it.

This person is Albert Einstein. Hello Al! And anyway, he personified nature as a woman, saying, "Nature fits herself."

So what happens is that there is a new phenomenon, a new skin, the inner skin of the smaller skin of the onion that we have come to resembles the skin of a slightly larger onion.

And the kind of math you used for the previous skin is pretty much the same as what you need for the next skin.

That's why the equation looks so simple.

Because they use math that we already have.

A trivial example is: Newton discovered the law of gravity that exceeds the square of the distance between objects on which gravity acts.

Coulomb of France discovered the same law for electricity prices.

Here is an example of this similarity:

If you look at gravity, you can see a certain law.

Now let's turn to electricity. Sure enough. Same rule.

A very simple example.

There are many more sophisticated examples.

Symmetry is very important in this discussion.

I know what that means. For example, a circle becomes symmetrical when rotated around its center.

Rotating around the center of the circle does not change the circle.

If you take a sphere in 3D and rotate it around the center of the sphere, all those rotations leave the sphere alone.

They are spherical symmetries.

So, in general, we say that symmetry exists under a particular operation if it does not change the phenomenon or its description.

Maxwell's equations are of course symmetric under rotations through space.

It doesn't matter if you rotate the whole space by an angle, it doesn't change the electrical or magnetic phenomena.

There was a new notation for this in the 19th century that makes the equation much simpler.

Einstein then used his special theory of relativity to investigate a set of symmetries in Maxwell's equations called special relativity.

So these symmetries make the equations even shorter and more beautiful.

let's see. You don't need to know what these mean. It makes no difference.

But you can also just look at the form. (Laughter) You can see it when you look at the form.

Above, at the top, you'll see a long list of equations containing three components in three directions (x, y, z) in space.

Then use vector analysis to use rotational symmetry and get the following set:

Then, using the symmetries of special relativity, we get an even simpler setting here and show that the symmetries are getting better and better.

The higher the symmetry, the better the simplicity and elegance of the theory are expressed.

The last two, the first equations show that charges and currents cause all electric and magnetic fields.

The second equation below shows that there is no magnetism otherwise.

Magnetism comes only from electric charges and currents.

One day you may find a small hole in the discussion.

But for now it is.

Well, here begins a very exciting development that many people have never heard of.

I'm sure you've heard of it, but it's a bit difficult to explain technically, so I'll leave it at that. Just to mention. (Laughter) But Chenning Yang, who we call "Frank" Yang -- (laughter) -- and Bob Mills, 50 years ago, proposed this generalization of Maxwell's equations with new symmetries.

A whole new symmetry.

The mathematics is very similar, but there was a whole new symmetry.

They hoped that this would somehow contribute to particle physics, but it didn't. It did not contribute to particle physics per se.

But then some of us generalized it even more. And it has come true!

And it portrayed the strong and weak forces very beautifully.

Here I repeat what I said earlier. Each onion skin shows similarities to the adjacent skin.

So the mathematics for adjacent skins is very similar to what is required for new skins.

Therefore, we already know how to write beautifully and concisely, so it looks beautiful.

Now let's introduce the theme. We believe that there is a unified theory that underlies all regularities.

The unification effort is simple.

Symmetry expresses simplicity.

And across the scale, in other words, from one onion skin to another, self-similarities exist.

Close self-similarity. And that would explain this phenomenon.

This explains why beauty is a success criterion for choosing the right theory.

Here is what Newton himself said: "Nature is very harmonious and self-conforming."

One of the things he was thinking about is something most people take for granted today, but in his day it wasn't.

I'm not sure if it's absolutely true, but many people have told it.

Four people have said. When the plague broke out in Cambridge, when he was on vacation from college and went to his mother's farm, he said he saw an apple fall on a tree or a head or something.

And he suddenly realized that the force that pulls the apple to Earth could be the same force that regulates the motion of the planets and the moon.

It was a great unification for its time, but today it is taken for granted.

It's the same as the theory of gravity.

So he said about this natural principle, consonance, as follows. "This natural principle is very far from a philosopher's conception, but I have refrained from explaining it in the book, lest I be considered an extravagant freak..." That's what we all have to be careful about, especially at this meeting (laughs).

"...so it prejudices the reader against all these things that were the primary design of the book."

Now, who today would argue that it is just the hubris of the human mind?

Does that mean that the force that makes an apple fall to the ground is the same force that moves the planets, the moon, etc.? We all know that. That's the nature of gravity.

It is not in the human head. Of course, the human mind can appreciate it, enjoy it, and use it, but it doesn't. It does not come from the human mind.

It comes from the nature of gravity.

And that applies to everything we're talking about.

They are the nature of the basic laws.

The basic law is that different onion skins are similar to each other, so the calculation of one skin is a beautiful and easy way to describe the phenomenon of the next skin.

Here we say that Newton did many things that year: gravity, the laws of motion, calculus, white light composed of all the colors of the rainbow.

And he could have written quite a few essays on "what I did in my summer vacation."

(Laughter.) So there is no need to postulate these principles as separate metaphysical postulates.

They are derived from basic theory.

They are so-called emergent traits.

You Don't Need -- You don't need anything more to get more.

That is the meaning of emergence.

Life can come from physics, chemistry, and many accidents.

The human mind arises from neurobiology and many accidents, just as chemical bonding arises from physics and certain accidents.

Knowing that these subjects derive from more basic matters and accidents does not diminish their importance.

This is a general rule and very important to be aware of.

You don't need more than that to get anything.

People keep asking that when they read my book Quarks and Jaguars. "Isn't there something beyond what's out there?" they say.

Perhaps they mean something supernatural.

Anyway, it doesn't. (Laughter) Nothing more is needed to explain anything further.

thank you very much. (applause)

The Arab Spring of 2011 captured the world's attention.

The incident also attracted the attention of authoritarian governments in other countries, who were concerned that the revolution would spread.

In response, they stepped up surveillance of activists, journalists and dissidents who feared sparking a revolution in their country.

A prominent activist who was arrested and tortured by the Bahraini government said investigators showed him transcripts of his phone calls and text messages.

Of course, it's no secret that governments can intercept phone calls and text messages.

That's why many activists specifically avoid using the phone.

Instead, they use tools such as Skype, which are believed to be immune to interception.

they are wrong

Over the last few years, there has been an industry of companies that provide governments with surveillance technology, specifically technology that allows governments to hack into the computers they monitor.

Instead of eavesdropping on network communications, they hack into your computer, turn on your webcam, turn on your microphone, and steal documents from your computer.

When the Egyptian government collapsed in 2011, activists raided secret police offices and among the many documents they found was this document by Gamma Corporation, Gamma International.

Gamma is a German company that manufactures surveillance software and sells it exclusively to the government.

It's important to note that most governments don't really have the in-house capability to develop this software.

Small companies don't have the resources or the expertise. As such, there is a market for Western companies willing to provide tools and technology for a price.

Gamma is just one of those companies.

It should also be noted that Gamma has never actually sold software to the Egyptian government.

They sent an invoice for the sale, but the Egyptians did not buy it.

Instead, apparently the Egyptian government used a free demo version of Gamma's software.

(Laughter) This screenshot is from a sales video produced by Gamma.

In fact, they're a relatively clever presentation that just highlights the fact that police can sit in an air-conditioned office and remotely monitor someone with absolutely no idea what's going on.

Webcam light does not come on.

There is nothing to indicate that the mic is enabled.

Managing Director of Gamma International.

His name is Martin Munch.

There are many photographs of Munch.

This is probably my favourite.

I zoom in on his webcam a little bit.

You can see a little sticker on his camera.

He knows what surveillance is possible and clearly doesn't want it to be used against him.

Munch said he plans to use his software to apprehend terrorists and locate pedophiles.

Of course, I also admit that once the software is sold to the government, there is no way of knowing how it will be used.

Gamma's software resides on servers in countries around the world, many of which have really bad records and human rights violations.

They actually sell their software all over the world.

Gamma isn't the only one in this business.

As I said earlier, this is a $5 billion industry.

One of the other big names in the industry is an Italian company called Hacking Team.

Well, Hacking Team has probably the smartest presentation.

The videos they produce are very sexy. So we'll play the clip to give you a feel for both what the software does, but also how it's marketed to government customers.

(Video) Narrator: You want to see through your target's eyes.

(music) You have to hack the target.

[“While the target is browsing the web, exchanging documents, receiving SMS and crossing borders”] they need access to a variety of platforms.

["Windows, OS X, iOS, Android, Blackberry, Symbian, Linux"] I need to overcome encryption and capture relevant data.

[Skype & Skype] Encrypted Calls, Target Locations, Messaging, Relationships, Web Browsing, Voice to Voice. Video"] that you can't be tracked by stealth.

["Unaffected by any protection system. Hidden collection infrastructure"] Deployed nationwide.

["Manage up to hundreds of thousands of targets from one place"] That's exactly what we do.

Christopher Soghoian: So it would be crazy if it wasn't true, but the fact is that Hacking Team's software is being sold to governments around the world.

For example, last year it was discovered that the Moroccan government was using the tool to target Moroccan journalists.

Found in a great many countries.

Therefore, Hacking Team is also actively working on the US law enforcement market.

In the past year or so, the company opened a sales office in Maryland.

The company also hired a publicist.

They attend surveillance industry conferences attended by law enforcement officials.

They spoke at the conference.

What I found most interesting was that they actually paid for the coffee break for the Law Enforcement Conference earlier this year.

I can't say for sure if Hacking Team sold their technology in the US, but I can tell you that if they don't, it's not because they're not trying hard.

So, as I said before, governments that don't really have the resources to build their own tools end up buying off-the-shelf surveillance software, so we know that the Tunisian government, for example, might use the same software as the German government.

Everyone buys ready-made goods.

Because the Federal Bureau of Investigation in the United States has the budget to build its own surveillance technology, I spent several years trying to figure out if and how the FBI hacked the computers it monitored.

Friends of mine from the Electronic Frontier Foundation, a civil society organization, have obtained hundreds of documents from the FBI detailing next-generation surveillance technology.

Most of these documents have been heavily redacted, but if you zoom in on the slides you can see the term remote control unit.

Well, when I first looked into this, I had never heard of this unit before.

I have been researching surveillance for over 6 years.

I had never heard of it.

So I went on the internet, did some research, and finally found my mother lode when I landed on LinkedIn, a social networking site for job seekers.

There were many former US government contractors who had previously worked in remote control units, and their résumés provided amazing detail on what they had done in their previous jobs.

(Laughter.) So I got this information and passed it on to a Wall Street Journal journalist I knew and trusted, and she was able to get in touch with a couple of other former law enforcement officers to talk about the background and confirm that indeed the FBI has a dedicated team that does nothing but hack into people's computers.

Like Gamma and Hacking Team, the FBI has the ability to remotely activate webcams and microphones, steal documents, and capture web browsing information.

There is one big problem with government hacking: terrorists, pedophiles, drug dealers, journalists, and human rights activists all use the same kind of computer.

No drug dealers' phones, no journalists' laptops.

We all use the same technology. In other words, in order for governments to be able to hack the computers of the real bad guys, our devices must also be hackable.

That is why governments around the world are adopting this technology.

They have embraced hacking as a law enforcement technique, without any real discussion.

In the United States, where I live, there are no congressional hearings.

Given the power and potential for abuse of this technique, which has yet to be enacted in legislation specifically sanctioning this technique, an informed public debate is crucial.

thank you very much.

(applause)

The year is 1800.

A strange little invention is making headlines.

It's called a microscope.

You can see tiny organisms that are invisible to the naked eye.

It will soon be medically discovered that many of these organisms are actually responsible for horrific human diseases.

Imagine what happened to society when, not far from here, British moms found themselves actually drinking monster soup in teacups. This is from London.

Fast forward 200 years.

This monster soup still exists and has taken root in developing countries around the tropics.

Malaria itself alone kills one million people each year, and over a billion people are at risk for various types of malaria infections and need testing.

Now, putting faces on many of these monsters is actually pretty easy.

Observe with a microscope and dyes such as acridine orange, fluorescent dyes, and Giemsa.

They all have faces.

Why are Alex from Kenya, Fatima from Bangladesh, Navjut from Mumbai and Julie and Mary from Uganda still waiting months to be able to diagnose the cause of their illness?

The main reason is that diagnostic scalability is completely out of reach.

And remember that number. 1 billion.

The problem lies in the microscope itself.

Research microscopes are the pinnacle of modern science, but they were not designed for field testing.

Neither was originally designed for diagnostics.

They are heavy, bulky, very difficult to maintain and cost a lot of money.

Here is a picture of Mahatma Gandhi in his 40's using exactly the same equipment that we actually use to diagnose tuberculosis today. At his ashram in Sevagram, India.

Two of my students, Jim and James, traveled to India and Thailand and began to ponder this issue.

I saw all kinds of donated equipment.

We saw the fungus growing through the lens of the microscope.

And I've also seen people who have a working microscope but don't even know how to turn it on.

Out of that work and that trip was actually the idea of ​​what we call Foldscopes.

So what is fold scope?

The Foldscope is a fully functional microscope, a platform for all kinds of advanced microscopy, including fluorescence, brightfield, polarization and projection, built purely by folding paper.

So think about how that is possible.

Here are some examples and we'll look at some of them.

It starts with a piece of paper.

Shown here are all the components that can be used to build a functional brightfield and fluorescence microscope.

So there are three stages: an optical stage, an illumination stage, and a mask holding stage.

And there are micro-optics on the bottom, which are actually embedded in the paper itself.

What you do is you pick it up and I tab it off and break it as if you were playing with it like a toy.

This paper has no instructions or language.

There is an embedded code, a color code, that indicates exactly how to fold a particular microscope.

When completed, it will look like this. It has all the features of a standard microscope, just like an XY stage, for example where you can put your sample slide.

This is a standard that has been optimized over the years, and many healthcare professionals are really used to it, so we didn't want it to change.

This is what changes, but the standard staining remains the same for many different diseases.

Pop this in.

There is an XY stage and then there is a focusing stage. This is a deflection mechanism built into the paper itself that allows the lens to move and focus in microns.

What's really interesting about this object is that my students don't like me doing this, but I'm going to do this anyway, it's a solid device.

You can power it up, throw it on the floor, and actually stomp it.

Despite being designed with a very flexible material like paper, it will last a long time.

Another interesting fact, which is actually sent as a standard diagnostic tool, is that the envelope contains 30 different fold scopes with different configurations all in one folder.

Then randomly choose one.

It turned out that this product was actually designed specifically for malaria, as it has a fluorescence filter specifically built for malaria diagnostics.

So the idea for a very specific diagnostic microscope was born here.

So until now I haven't really been able to see what I see from one of these setups.

So what I want to do is if you can dim the lights please. It turns out that the foldscope is also a projection microscope.

I have these two microscopes and just rotate it, go behind the wall and project. That way I can see exactly what I'm looking at.

What you're looking at -- (applause) -- this is a cross-section of the compound eye, and if you zoom in further, it's there through the Z axis.

You can check how the lens is actually cut in the cross-sectional pattern.

As another example, one of my favorite insects, which I hate, is the mosquito. You can see the antennae of the Culex pipiens.

right there.

It all starts with the simple setup that was actually described.

So my wife is washing clothes every time I leave them in the dryer and field testing some microscopes.

In other words, it turned out to be waterproof. And -- (laughter) -- it's just fluorescent water, but I don't know if you can actually see it.

This also shows how projection scopes work.

You can see how the beam is projected and bent.

Can I turn the lights on again?

I'm running out of time, so I'll show you right away, but in terms of how much it would cost to manufacture, the biggest idea was roll-to-roll manufacturing. That's why we built this with 50 cent parts and cost.

(Applause.) And what this allows us to do is think about new paradigms in microscopy. This is what we call using and throwing microscopy.

I will briefly introduce some of the parts that are included.

Here is a piece of paper.

That's when I was thinking about this idea.

This is A4 paper.

These are the three stages that are actually displayed.

And for the optical component, which you can see in the inset to the right, we had to find a way to manufacture the lenses in the paper itself at very high throughput. So, we use processes of self-assembly and surface tension to build an achromatic lens in the paper itself.

That's where the lens comes into play.

There are several light sources.

And basically, it's thanks to origami that all the parts line up in the end. This is because origami enables micron-scale optical alignment accuracy.

So while this looks like a simple toy, the engineering aspects put into this stuff are pretty sophisticated.

Now, another obvious thing we should do is usually go to the third floor and drop it off the floor itself if you want to show that these microscopes are robust.

It is there and survives.

So the next step for us is to actually complete the field trials.

Starts at the end of summer.

We are in the process of building thousands of microscopes.

This will be the first time a field test has been done with the highest density microscope ever in a specific location.

We started collecting data on malaria, Chagas disease, and giardia from the patients themselves.

And I would like to leave this picture.

I never expected this before, but it's a very interesting link between hands-on science education and global health.

What tools are we really giving the kids who will be battling this monster soup tomorrow?

We want you to be able to print your Foldscope and carry it around in your pocket.

thank you.

(applause)

[This talk contains graphic images. I encourage you to use your judgment] I collect objects.

I collect branding irons used to mark slaves as property.

I collect manacles for adults and restraints for adults as well as children.

I collect Lynch postcards.

Yes, they are drawing lynchings.

These are postcards that also depict the large crowds who attended these lynchings and were also used for correspondence.

I collect pro-slavery books that portray black people as criminals or soulless animals.

I brought you something today.

This is a ship's branding iron.

Used to mark slaves.

Well, they weren't actually slaves when they were marked.

they were in africa

However, they were marked with an "S" denoting enslavement when taken to the United States and to Europe.

Another object or image that captured my imagination in my youth was the clan robe.

Growing up in South Carolina, I watched Ku Klux Klan rallies occasionally, actually more often than not, but the memory of those events never left my mind.

And it wasn't until 25 years later that I actually did anything with that image.

A few years ago I started studying clans, three different waves of clans, especially the second wave.

The second wave of the clan had over 5 million active members, representing 5% of the population at the time, as well as the population of New York City at the time.

Klang's robe factory in Buckhead, Georgia, has been so busy that it has turned into a 24-hour factory to fill orders.

They always had 20,000 robes on hand to keep up with demand.

As an artifact collector and artist, I really wanted Clan Robes to be part of my collection. Because artifacts and objects tell stories. But I couldn't find a really good quality robe.

What if black men in America can't find the quality clan robes they're looking for?

(laughs) So I had no choice.

I decided to make the best quality cran robes in America.

These are not traditional Klan robes as seen at KKK gatherings.

I used Kente fabric, camouflage, spandex, burlap, silk, satin and different patterns.

Made for different age groups. It is made for toddlers as well as small children.

Also made for toddlers.

After making many robes, I realized that the policies the clan had or intended to have 100 years ago are still in place today.

We are isolating our schools, communities and workplaces, and it is not the hooded people who maintain these policies.

My work is about the long-term effects of slavery.

We are not just dealing with the remnants of systemic racism.

It's the foundation of everything we do.

Again, we intentionally separated our neighborhoods, work and school.

We practice voter suppression.

We disproportionately represent imprisoned minorities.

We have environmental racism. We have police brutality.

I brought a few things today.

The stealthy side of racism is part of its power.

If you have been discriminated against, you may not always be able to prove that you have been discriminated against.

Racism has the power to hide, and it keeps you safe because it blends in with you.

I created this robe to explain it.

At the core of American capitalism is slavery.

In capitalism, slaves were capital.

Nathan Bedford Forrest, who became the first Grand Wizard in 1868, was a Confederate soldier and billionaire slave trader.

Chattel slavery, the wealth generated from slaves as property, would surprise people.

Cotton sales in 1860 alone were worth $200 million.

This is equivalent to $5 billion today.

Much of that wealth can be seen today through generational wealth.

Oh, I forgot the other crops too.

There are indigo, rice and tobacco.

Throughout 2015, I made one robe per week.

After making 75 robes, I had an epiphany.

I have a perception that white supremacy exists, but the greatest force of white supremacy is not the KKK, but the normalization of systemic racism.

I also noticed something else.

Robe no longer had any power over me.

But if we, as a nation, look collectively at these objects, branding irons, shackles, and robes, and recognize that they are part of our history, then we can find our way to a place where they no longer have power over us.

If we look at systemic racism and acknowledge that it is ingrained in the very way our country is, then we can really do something about intentional racism in our schools, neighborhoods and workplaces.

But only then can we really address, confront this legacy of slavery, and dismantle this ugly legacy of slavery.

thank you very much.

(applause)

This is a vending machine in Los Angeles.

Located in a shopping mall, they sell fish roe.

A caviar vending machine.

This is Art-o-mat. An art vending machine that sells small works of art by various artists, usually limited to small wooden blocks or matchboxes.

I'm Oliver Medvedik.

He's not a vending machine, but he's one of the founders of Genspace, a community biolab in Brooklyn, NY. At Genspace, anyone can take a class and learn how to grow glow-in-the-dark E. coli, extract DNA from strawberries, and more.

In fact, I saw Oliver do one of the strawberry DNA extractions about a year ago. This is what led me down this strange path, and I will tell you about it.

I never thought DNA was beautiful until I saw it in this way.

Many people, especially those in the art community, don't necessarily approach science this way.

After this, I immediately joined Genspace and asked Oliver, "If strawberries can do this, can humans do it?"

About 10 minutes later, we were both spitting into a vial and coming up with a protocol for human DNA extraction.

I started doing this myself.

Then I attended a dinner party with some artist friends and talked about the project, and they couldn't believe they could actually see the DNA.

So I said, okay, let's get the supplies out now.

And started throwing weird dinner parties on Friday nights. People would come in and do a DNA extraction and video it. Because this kind of funny portrait was also created.

(Laughter) These people aren't necessarily involved in science on a regular basis.

You can kind of tell by looking at their reaction.

(Laughs) But they were into science and it was really inspiring to see them excited about science.

So I started doing this regularly.

(Laughter) It's a weird thing to do on a Friday night, but that's what I started.

I collected the DNA of an entire group of friends in small vials and started sorting them.

It was like this.

And it started making me think of some things.

First, it looked a lot like my Facebook wall.

So, in a way, we created something like a genetic social network.

And second, one day a friend came over and saw this on my table and said, "Uh, why are they numbered?

And I didn't even think about it.

The numbering is due to the order in which the DNA was extracted.

But that got me thinking about collecting toys, what's going on in the toy world in the blind box toy world, and being able to collect these rare toys.

I bought these boxes and have no idea what's inside.

But when opened, it contains toys of various rarities.

I thought it was interesting. I thought of this together with caviar vending machines and art au matte.

And for some reason, one night I decided to paint a picture of a vending machine, and I was drawing a picture of a vending machine.

There was a vial with my DNA in it, a beautiful collaboration between the strands of DNA and the vending machine coils.

So I decided to create an art installation called DNA Vending Machine.

here it is.

(music) [DNA Vending Machine is an art installation about increasing access to biotechnology. ] (music) [Human DNA samples can be purchased from conventional vending machines at affordable prices. ] (music) [Each sample comes with a limited edition collectible portrait of an anthropomorphic specimen. ] (music) [DNA vending machines treat DNA as collectible material and highlight the legal issues surrounding DNA ownership. ] (music ends) Gabriel Barcia-Colombo: The DNA Vending Machine is currently on display in several New York galleries and is selling quite well.

There are currently 100 in the first edition, and we hope to publish another edition in the near future.

We would like to have it in a subway hub such as Grand Central or Pennsylvania Station, next to other vending machines in that location.

But actually, I would like to ask the audience a question regarding this and many of my art projects. When biotechnology and DNA sequencing become as cheap as, say, laser cutting and 3D printing, or buying caviar from a vending machine, will you submit a DNA sample as part of the vending machine?

How much are these samples worth?

Buy other people's samples?

And what can you do with that sample?

thank you.

(applause)

So my defining moment did not come all at once.

In 2010, I had the opportunity to be considered for promotion from my position as Director of Policy Planning at the US State Department.

This was the moment for me to lean forward in a handful of the top jobs in foreign policy and push myself forward. I had just successfully completed a massive 18-month project for Secretary Clinton and knew I could do more.

The woman I thought would have said yes.

But I spent two years commuting between Washington and Princeton, New Jersey, where my husband and two teenage sons live, and it didn't go well.

I considered staying in Washington for two more years, or kicking my sons out of school and my husband out of work and asking him to join me.

But deep down, I knew that going home was the right decision, even if I didn't fully recognize the woman who made the choice.

It was a decision based on love and responsibility.

I couldn't keep watching my son make the wrong choices without being there for him when he needed me.

But the real change happened more slowly.

The following year, while my family recovered, I began to realize that even if I could go back to government, I didn't want to.

I didn't want to miss the five years my sons had at home.

I finally allowed myself to accept what really mattered most to me, not what I was conditioned to want or perhaps conditioned myself to want. And that decision led to a re-evaluation of the feminist narrative I grew up with and had always defended.

I'm still fully committed to the cause of gender equality, but let's think about what that equality really means and how best to achieve it.

I have always embraced the idea that it is the men at the top of their careers who have the most respect and power in society. Therefore, we have always embraced the idea that a measure of gender equality should be how many women are in positions such as prime minister, president, CEO, director, manager, Nobel laureate, and leader.

I still believe that we should do everything we can to reach that goal.

But that's only half of true equality, and I now think we'll never get there unless we recognize the other half.

I propose that true equality, perfect equality, does not simply mean judging women by men's standards.

It means creating a much wider range of equally respected choices for women and men.

And getting there will require changes in workplaces, policies and culture.

True equality in the workplace means valuing family as much as work and understanding that the two reinforce each other.

As a leader and manager, I have always acted on the belief that when family comes first, work doesn't come second, life comes together.

If you work for me and have family issues, I expect you to work on them. And I am confident that the work will be done and done better, and that confidence is always backed up.

Workers who have a reason to go home to care for their children and family are more focused, more efficient, and more results-oriented.

And breadwinners who are also caregivers have a much broader range of experience and connections.

Consider a lawyer who spends part of his time attending his children's school events and talking to other parents.

He is far more likely to bring new clients to his firm than a lawyer who never leaves the office.

And caregiving itself fosters perseverance, and much perseverance, and fosters empathy, creativity, resilience, and adaptability.

These are all characteristics that will become increasingly important in a fast, horizontal, networked global economy.

Good companies really know this.

The companies that have won awards for workplace flexibility in the U.S. include some of the most successful, with a 2008 National Survey of Workforce Transformation showing that employees with flexible and effective workplaces are more engaged at work, are more satisfied and loyal, have lower levels of stress, and have higher levels of mental health.

And a 2012 survey of employers showed that deep and flexible practices can actually reduce operating costs and increase adaptability in the global service economy.

So you might think that work-over-family privilege is just an American problem.

But, sadly, work obsession is no longer a uniquely American disease.

Twenty years ago, when my family first started going to Italy, we were basking in the siesta culture.

A siesta is not just about avoiding the heat of the day.

It's actually just as important as savoring the warmth of a family lunch.

Now, reflecting the progress of global companies and the 24-hour race, fewer and fewer companies are shutting down for siesta.

So creating a place for those we love is actually a global obligation.

In policy terms, true equality means recognizing that the work traditionally done by women is just as important as the work traditionally done by men, regardless of who does it.

please think about it. In order for humans to survive, it is equally necessary to earn bread and care.

At the very least, if we are to survive the barter economy, someone has to earn an income, and someone has to turn that income into care and livelihoods for loved ones.

Now, when most of you hear me talk about paid work and caregiving, you instinctively replace those categories with men's work and women's work.

And we usually don't dispute why men's jobs are advantageous.

But consider the case of a same-sex couple like my friends Sarah and Emily.

they are psychiatrists.

They got married five years ago and now have two-year-old twins.

They love being mothers, but they also love their jobs and are really good at what they do.

So how are they going to divide the breadwinner and caregiver responsibilities?

Should one of them stop working or spend less time at home?

Or should both of us change our habits so that we can have more flexible schedules?

And what criteria should we use to make that decision?

Who earns the most, or who is most committed to their career?

Or who has the most flexible boss?

A same-sex perspective helps people understand that balancing work and home is not a woman's problem, but a family problem.

Sarah and Emily are lucky. Because they have a choice as to how much they want to work.

Millions of men and women have to become both breadwinners and caregivers to earn the income they need, and many of those workers are busy.

They piece together care arrangements that are often inadequate and actually unsafe.

If earnings and caregiving are truly equal, why shouldn't governments invest in caregiving infrastructure as the foundation of a healthy society as much as they invest in physical infrastructure as the backbone of a successful economy?

Governments that understand – not surprisingly here – governments that understand Norway, Sweden, Denmark and the Netherlands provide universal childcare, support for caregivers at home, schools and early childhood education, protection for pregnant women, and care for the elderly and disabled.

These governments invest in their infrastructure the same way they invest in roads, bridges, tunnels and railroads.

These societies also show that earning and caregiving are mutually reinforcing.

These countries consistently rank among the top 15 most competitive economies globally, while also ranking very high on the OECD's Better Life Index.

In fact, these governments rank higher than other governments such as our country, the United States and Switzerland, which have higher average income levels but lower work-life balance rankings.

So changing the workplace and building the infrastructure of care will make a big difference, but unless we change the culture, we won't have equally valuable options. The necessary cultural change means re-socializing men.

(Applause.) More and more, in developed countries, women are socialized into thinking that our place is no longer just in the home, but in reality men are still in the same place they used to be.

Men are still socialized that they must be breadwinners and that self-esteem is derived from how well they outperform other men on the career ladder.

The feminist revolution still has a long way to go.

Certainly not perfect.

But 60 years after The Feminine Mystique was published, many women actually have more options than men.

We can choose to be breadwinners, caregivers, or a combination of the two.

On the other hand, when a man decides to become a caregiver, he risks his masculinity.

His friends may applaud his decision, but inwardly they are troubled.

Isn't the measure of a human being his willingness to compete with other humans for power and prestige?

And many women, as well as men, have such thoughts.

We know that many women still judge a man's attractiveness based primarily on their career success.

Women can drop out of the workforce and still be attractive partners.

For men, it's a dangerous proposition.

Therefore, as parents and partners, we should socialize our sons and husbands to be whatever they want to be, such as a caregiver or a breadwinner.

To make caregiving cool for men, we should interact with them.

(Applause) I think I can hear the voices of those who are thinking, "No way."

But in reality, that change is already happening.

At least in the United States, many men take pride in their cooking and, frankly, are obsessed with stoves.

They are in the delivery room.

They take parental leave whenever possible.

They can walk a baby, crouch a toddler, and, increasingly, do household chores as their wives do.

In fact, some male college students are starting to say, "I want to be a stay-at-home husband."

That would have been unthinkable 50 or even 30 years ago.

In Norway, men are automatically given three months of parental leave but lose it if they choose not to take it, a senior government official said companies are starting to look at prospective male employees and frown if they don't take the leave when they actually have children.

It means that unwillingness to be a fully involved father is beginning to seem like a character flaw.

So I was raised to believe that advocating for women's rights meant doing everything in our power to bring them to the top.

And I still hope to live long enough for men and women to be equally represented at all levels of the workforce.

But I have come to believe that we should love everything about our families as much as we love our jobs, and embrace the idea that if we do the right things for those we love, we can all be better at what we do.

Thirty years ago, Carol Gilligan, a brilliant psychologist, studied adolescent girls and identified an ethic of care as important a component of humanity as an ethic of justice.

It turns out that the word "I don't care" is as much a part of who we are as being "It's unfair."

Bill Gates agrees.

He argues that the two great forces of human nature are selfishness and consideration for others.

Let's do both together.

Let the feminist revolution be a humanist revolution.

As a human race, we will be better caregivers and breadwinners.

As unlikely as it may seem, I grew up in a society where my mother placed cigarettes in a small vase at dinner parties, where blacks and whites used separate bathrooms, and where everyone claimed to be heterosexual.

Not so much today.

A revolution for human equality can happen.

It's happening.

it will happen.

How far and how fast is up to us.

thank you.

(applause)

Please raise your hand and ask a question. Who has an iPhone?

Who has an Android smartphone?

who has a blackberry?

Who would publicly admit to owning a Blackberry?

(Laughter) So let me guess. How many of you, like me, bought a pay-as-you-go SIM card when you got here?

They probably didn't even know they were using African technology.

Pay-as-you-go is a technology or idea pioneered in Africa 15 years ago by a company called Vodacom, and now, like franchising, pay-as-you-go has become one of the most dominant economic activities in the world.

So I talk about innovation in Africa. I think this is innovation in its purest form, the inevitable.

But before that, let me ask you another question.

No need to raise your hand.

These are rhetorical.

Why did Nikola Tesla have to invent the alternating current that powers the lights in this building and in the city we are in?

Why did Henry Ford have to invent a production line to produce these Fords that sell anything as long as it's black?

And why did Eric Merrifield have to invent dross?

empty gaze. Doros looks like this, and you can see Robben Island behind it.

This is a little dross, but Eric Merrifield is the most famous inventor you've never heard of.

In 1963, a storm hit the port of a small South African town called East London. He came up with the idea while watching children playing with a toy made of cow bone called a drosse.

It's like a giant jumping jack and every port in the world uses it as a breakwater.

A global shipping economy would not be possible without such African technology.

So whenever I talk about Africa, I have to post a picture of this world from space. Then people will say, "Look, it's the Dark Continent."

Not really.

It's a map of innovation.

And it's very easy to see where innovation is happening.

Not all places with a lot of electricity do.

(Laughter) (Applause) And the reason it's not is because people are watching TV or playing Angry Birds.

(Laughter) (Applause) So it's happening in Africa.

Now, this is real innovation, not the way people have plagiarized words to talk about new product launches.

This is true innovation, and I define it as problem solving.

People are solving real problems in Africa.

why? Because you have to.

Because we have real problems.

And when we solve people's real problems, we also solve people's problems around the world.

In California, everyone is so excited that they can read credit cards by sticking a small square of plastic into their cellphones, and it is said that they have "unchained credit cards from point-of-sale terminals."

wonderful. Why do you need a credit card?

We've been doing that for years in Africa and we've been doing it with phones like this.

This photo was taken in Kitengela, about an hour south of Nairobi. The amazing thing about a payment system pioneered in Africa called M-Pesa is that it works with phones like this.

It uses SMS, so it works on any phone.

It is said that with this you can pay your bills, buy groceries, pay your children's school fees, and even bribe customs officials.

(Laughter) There's about $25 million in transactions per day through M-Pesa.

40% of Kenya's GDP moves through M-Pesa using such phones.

And I think this is just a feature phone.

It's actually an African smartphone.

It's a radio, it's a flashlight, and best of all, it has amazing battery life.

why? Because that's what we need.

Africa has a really serious energy problem.

By the way, you can also update Facebook and send Gmail from your mobile like this.

So we found a way to use available technology to send money via M-Pesa, like a checking system for the mobile age.

I'm from Johannesburg, a mining town.

It's built on gold.

This is a photo I posted on Instagram.

And the difference today is that today's gold is mobile.

If you think about the North American rail system and how it worked, first came the infrastructure and then the industry around it, the brothels. It's like the internet today, isn't it? — and everything else associated with it: bars, saloons, etc.

Mobile is the gold today, and mobile is the enabler of all this.

So what can you do with it?

Well, this is by a guy named Bright Simmons from Ghana, and it's about taking drugs. Some people may end up spending their entire monthly salary on it. Scrape the code and send it to an SMS number to find out if it's legitimate or expired.

Really simple, really effective, really life saving.

In Kenya there is a service called iCow which sends me very important information on how to care for my dairy products.

Kenya's dairy business is a $463 million business, but only a few liters of milk per day separate the subsistence farmer from the wealthy.

And if we can do that, we can lift ourselves out of poverty.

It's very easy as it just uses a basic phone.

No electricity!

Use a windmill and build it out of old bicycle parts like William Kamkwamba did.

You've probably heard that there is another African busy destroying the world's auto industry.

He is also finding ways to reinvent the solar and power industry in North America and, with any luck, will take us to Mars, hopefully in my lifetime.

He is from Pretoria, the capital of [South Africa], about 50 kilometers from where I live.

Now let's go back to Joburg. It is also called Egori, which means the city of gold.

And I don't believe that not only is mobile the gold of today, but that gold is underground.

We believe in gold.

As you've heard other economists say, we're at the point where China started its boom, and we're heading there.

We hear the West talking about innovation at the edge.

Of course it's happening on the edge. Because in the middle everyone is updating Facebook, or worse, trying to figure out Facebook's privacy settings.

(Laughter) That's not a very catchy tagline.

This is innovation beyond boundaries.

I mean, people like to call Africa a mobile-first continent, but it's actually a mobile-only continent, so while everyone else is doing all that, we're solving the world's problems.

So I just want to say one thing.

[You're welcome.] (Laughter) (Applause)

Did anyone in the room think about sex today?

(Laughter) Yes.

Thank you for putting your hand up there.

Well, I'm here to biologically validate your dastardly fantasies.

I'm here to tell you some things you may not have known about Wildsex.

Now, when humans think of sex, male and female forms generally come to mind, but for millions of years no such specific category even existed.

Sex is simply a fusion of bodies, or a drop of DNA shared between two or more beings.

It wasn't until about 500 million years ago that structures similar to the penis and vagina that released DNA and the vagina that received it began to appear.

Now, you're always thinking about things that belong to our own species, these very familiar structures. However, the diversity seen in the sexual structure of the animal kingdom, which has evolved in response to many factors surrounding reproduction, is rather surprising.

Penile diversity is particularly rich.

This is a paper nautilus.

It is a closely related species of squid and octopus, and males have a different axis.

What is Hectococtilus?

Removable and swim penis.

It leaves [the male's body], locates the female by pheromone cues in the water, attaches to her body, and deposits sperm.

For decades, biologists felt that Hectococtilus was, in fact, an entirely different organism.

Well, the tapir is a mammal native to South America.

And tapirs have penises that are easy to grasp.

In fact, the dexterity of that penis is much like what we do with our hands.

They then use this dexterity to completely bypass the vagina and inject sperm directly into the woman's uterus. Needless to say, its size is pretty good.

But the largest penis in the animal kingdom is not the tapir penis.

In fact, the largest penis-to-body size ratios in the animal kingdom are small beach barnacles. This video demonstrates what a human penis would look like if it were the same size as a barnacle.

(Laughter) Hmm, hmm. (Laughter) With such a variety of anatomy, some might think that the penis fits neatly into the vagina everywhere for successful reproduction.

Simply insert part A into slot B and you are good to go.

But of course that's not exactly what happens. That's because you can't just consider form.

We also need to think about function, and when it comes to sex, function has to do with the contributions made by gametes, sperm and eggs.

And these contributions are never equal.

Eggs are very expensive to produce, so it's no surprise that females are very careful about who they share their eggs with.

Sperm, on the other hand, is plentiful and cheap, so it makes sense for men to have a “more sex is better” strategy when it comes to leaving offspring for future generations.

So how do animals deal with such highly mismatched needs between males and females?

That is, if females do not choose a particular male, or if they have the ability to store sperm and simply have enough of it, it makes more sense to spend their time doing other things that are biologically relevant, such as avoiding predators, caring for young, gathering and consuming food.

Of course, this is bad news for men who haven't yet banked their sperm, and it sets the stage for some pretty drastic strategies for successful fertilization.

This is bed bug sex, aptly called traumatic insemination.

Males have barbed, barbed penises that literally pierce the female, but not near her vagina.

They stab it anywhere on her body and the sperm only travels through her bodily fluids to the ovaries.

If a woman has many stab wounds, or if the stab wound becomes infected, it can actually cause death.

Now, if you've been taking a quiet walk by the lake and happen to see ducks having sex, you've definitely been on your guard. Because it looks like gang rape.

Frankly, that's exactly what it is.

A group of men grab and hold the women and force their spiraling penises into corkscrew-shaped vaginas over and over again.

It takes less than a second from relaxation to ejaculation.

However, it is the female who actually has the last laugh, as she can actually manipulate her posture to make the ovaries more accessible to the sperm of certain suitors.

Well, I like sharing stories like this with my audience because we humans tend to think of sex, sex is fun, sex is good, there's romance, there's an orgasm.

But it wasn't until mammals appeared about 65 million years ago that orgasm really evolved.

But in some animals it was happening long before that.

There are some more primitive ways to please your partner.

Male earwigs have very large or very small penile appendages.

This is a very simple genetically inherited trait, and males are otherwise no different.

Those with long penile appendages are bigger, stronger, and otherwise quite different.

So, going back to our biological thinking, we might think that females should choose to have sex with males with shorter appendages. Because women can use their time for other things. These include avoiding predators, caring for children, and finding and consuming food.

But biologists have repeatedly observed that females choose to have sex with males with long appendages.

why would they do this?

According to the biology literature, "During mating, certain male reproductive organs may elicit more favorable female responses through superior mechanical or stimulatory interactions with the female reproductive tract."

Hmm.

These are Mexican guppies, and found in the maxilla are extensions of epidermal fibers, and these fibers basically form the fish's mustache.

Males have now been observed to peck the genital openings of females before mating with them, which I affectionately call "magnums." Hypothetically, men with such fishy mustaches are overwhelmingly more common in women.

There's a little guppy porn out there for you.

As such, we have seen very different strategies that men use to acquire female partners.

We've seen coercion strategies that basically use sexual constructs in coercive ways to get women to have sex.

We've also seen arousal strategies where men actually please their female partners and get them to choose them as sex partners.

Now, unfortunately, in the animal kingdom, this is a coercion strategy that we see again and again.

It is very common in many phyla, from invertebrates to birds, mammals and, of course, primates.

Interestingly, some mammals have evolved special reproductive organs that do not allow females to be sexually coerced.

Female elephants and female hyenas have a penile clitoris, an enlarged clitoral tissue that hangs outward like a penis, and indeed it is very difficult to determine the sex of these animals simply by observing their external morphology.

So before a man can insert his penis into a woman's vagina, the woman has to take out this penile clitoris and basically turn it inside out inside her body.

So imagine inserting one penis into another.

Unless women participate in the action, it won't happen.

Now, even more interesting is the fact that elephant and hyena societies are entirely matrilineal. Society is run by females, groups of females, sisters, aunts, and offspring, and when young males reach sexual maturity, they are shut out of the group.

In hyena societies, adult males actually sit at the bottom of the social scale.

They can participate in killing only after everyone else, including descendants.

Therefore, depriving a man of the power of his penis seems to deprive him of all social power.

So what is the message you get from my talk today?

Well, sex isn't just about putting part A into slot B and expecting offspring to run around all over the place.

The sexual strategies and reproductive structures found in the animal kingdom fundamentally determine how males and females respond to each other, which in turn determines how populations and societies form and evolve.

So it may come as no surprise to you that animals, including us, spend a considerable amount of time thinking about sex. But what might surprise you is the extent to which their lives and many other aspects of our lives are affected by sex.

Thank you and happy fantasies.

(applause)

Today I would like to talk about how we can change our brains and society.

Meet Joe.

Joe is 32 and a killer.

I met Joe 13 years ago in the life ward of Wormwood Scrubs, a high security prison in London.

Imagine here.

As the name suggests, it looks and feels like a mugwort scrub.

Built by convicts at the end of the Victorian era, it houses some of Britain's most dangerous prisoners.

These people have committed unspeakable evil.

And I'm here to study their brains.

I was part of a team of researchers at University College London with a grant from the UK Department of Health.

My assignment was to study a group of inmates who were clinically diagnosed psychopaths.

That meant they were the most ruthless and most aggressive of all prison inhabitants.

What was the basis of their actions?

Did their symptoms have a neurological cause?

And if there is a neurological cause, can we find a cure?

So I want to talk about change, especially emotional change.

As a child, I was always interested in how people change.

My mother, a clinical psychologist, would sometimes see patients at home in the evenings.

She had closed the living room door, and I imagined something magical happening in that room.

When I was five or six, I would sneak up in my pajamas and sit outside with my ears stuck to the door.

More than once or twice I fell asleep and had to push me away at the end of the session.

And I think that was when I walked into the secure interview room on my first day at Wormwood Scrubs.

Joe sat across a steel table and greeted me with a deadpan expression.

The warden of the prison looked equally unconcerned and said, "If you have any trouble, just press the red buzzer and we'll come to you right away."

(Laughter) I sat down.

A heavy metal door slammed behind me.

I looked up at the red buzzer on the opposite wall, far behind Joe.

(laughs) I saw Joe.

Perhaps sensing my concern, he leaned forward and said as reassuringly as possible:

(Laughter) In the months that followed, we tested Joe and fellow inmates, specifically looking at their ability to classify different images of emotion.

and examined their physical reactions to those emotions.

So, for example, when looking at a picture like this of someone looking sad, most people will immediately feel a slight measurable physical reaction, such as an increased heart rate or skin sweating.

The psychopaths in our study were able to accurately describe the pictures but were unable to express the necessary emotions.

They showed no physical response.

It was as if they knew the language but not the music of sympathy.

So we wanted to take a closer look at this, using MRI to image their brains.

It turns out that it is not such an easy task.

Imagine transporting a group of clinically insane people in shackles and handcuffs to central London during rush hour. To get each person into the MRI scanner, you have to remove all metal objects, including handcuffs, handcuffs, and, I learned, body piercings.

But after some time I got a tentative answer.

These people weren't just victims of troubled childhoods.

There was something else.

People like Joe have a defect in a brain region called the amygdala.

The amygdala is an almond-shaped organ deep in each hemisphere of the brain.

It is believed to be the key to empathic experiences.

Generally, the more empathetic a person is, the larger and more active the amygdala.

Our inmate population had a defective amygdala, which likely led to a lack of empathy and immoral behavior.

Now let's take a step back.

Acquiring moral behavior is usually just part of growing up, like learning to speak.

At 6 months of age, almost all people can distinguish between living and non-living things.

By the age of 12 months, most children can imitate the purposeful behavior of others.

For example, if your mother raises her hand and stretches, you imitate her behavior.

First off, this isn't perfect.

I remember my cousin Sasha, who was 2 years old at the time, going through picture books, licking one finger and flicking the page with the other, licking one finger and flicking the page with the other.

(Laughter) Little by little, we build the foundations of our social brain, so by the age of three or four, most, if not all, children acquire another prerequisite for empathy: the ability to understand the intentions of others.

The fact that this developmental advance is universal regardless of where in the world we live or what culture we live in strongly suggests that the basis for moral behavior is innate.

If you doubt this, try breaking promises to your 4-year-old like I did.

You will find that the mind of a four-year-old is anything but simple.

It resembles a Swiss Army knife with a fixed mental module and a keen sense of fairness finely honed during development.

The early years are critical.

Much like adults learn a foreign language, it seems they have a chance of becoming even more difficult to master moral issues.

I'm not saying it's impossible.

A great recent study from Stanford University showed that people who played a virtual reality game playing the role of a good, helpful superhero actually became more considerate and kind to others afterward.

I'm not saying now to give criminals superpowers, but that we need to find ways to change the brains and behavior of Joe and people like him for the benefit of criminals and the rest of us.

So can the brain change?

For over 100 years, neuroanatomists and later neuroscientists held the view that after early childhood development, the adult brain is incapable of growing new brain cells.

The brain can only change within certain set limits.

That was the established theory.

But then, in the 1990s, led by Elizabeth Gould of Princeton University and others, research began to show evidence of neurogenesis in the adult mammalian brain, the birth of new brain cells, first in the olfactory bulb responsible for smell, then in the hippocampus involved in short-term memory, and finally in the amygdala itself.

To understand how this process works, I quit psychopathy and joined an Oxford lab specializing in learning and development.

We studied mice instead of psychopaths because the same pattern of brain responses appears in many different species of social animals.

Thus, when mice are housed alone and without much stimulation in standard cages, essentially shoeboxes filled with cotton wool, not only do they not grow, they often exhibit bizarre repetitive behaviors.

This naturally social animal loses the ability to bond with other mice and can even become aggressive when introduced to mice.

However, mice housed in what we termed 'enriched environments', i.e., large environments with wheels and ladders, areas to explore, and live with other mice, exhibit neurogenesis, the birth of new brain cells, and, as we have shown, perform better in a variety of learning and memory tasks.

Now they don't develop enough morality to cross the street with a little old mouse shopping bag, but the improved environment results in healthy, social behavior.

In contrast, mice housed in standard cages are no different from prison cells, but have dramatically lower levels of new neurons in their brains.

It is now clear that the amygdala of mammals, including primates like ours, can exhibit neurogenesis.

In some areas of the brain, over 20 percent new cells are formed.

We are only beginning to understand what the exact function of these cells is, but what that means is that the brain is capable of amazing changes by the time we reach adulthood.

However, our brains are also very sensitive to environmental stress.

Glucocorticoids, stress hormones released by the brain, suppress the growth of these new cells.

Increased stress slows down brain development, resulting in less adaptability and higher stress levels.

This is the interaction between nature and nurture in real time before our eyes.

Come to think of it, it's ironic that the current solution for people with stress on the amygdala is to put it in an environment that actually hinders its potential for further growth.

Of course, imprisonment is a necessary part of protecting the criminal justice system and society.

Our study does not suggest that offenders should submit MRI scans as evidence in court and get away with it just because they have an amygdala defect.

The evidence is actually to the contrary.

Our brains can change, so we need to take responsibility for our actions and the brain needs to be responsible for its rehabilitation.

One way such rehabilitation may work is through restorative justice programs.

Here, if the victim chooses to participate, the perpetrator is met in a safe and structured face-to-face meeting, the perpetrator is encouraged to take responsibility for his or her actions, and the victim takes an active role in the process.

In these situations, the perpetrator is perhaps for the first time able to see the victim as a real person with thoughts, feelings and genuine emotional responses.

This stimulates the amygdala and may be a more effective rehabilitation than simple imprisonment.

A program like this won't work for everyone, but for many, it can be a way to break the frozen sea inside them.

So what can we do now?

How can we apply this knowledge?

I would like to leave you with three lessons that I have learned.

The first thing I learned was that I needed to change my mindset.

Since Wormwood Scrub was built 130 years ago, society has advanced in virtually every aspect, including the way schools and hospitals are run.

But the moment we talk about prisons, it's as if we're back in Dickensian times, if not the Middle Ages.

For too long, I think we have been misled into believing that human nature cannot be changed. And it costs us as a society a great price.

We know the brain is capable of amazing changes, but the best way to achieve it, even as an adult, is by changing and adjusting your environment.

The second thing I learned is that we need to build alliances of people who believe that science is essential to bring about change in society.

For neuroscientists, it's very easy to put an inmate with high security into an MRI scanner.

In practice, it turns out not to be so easy, but ultimately what we want to show is whether recidivism can be reduced.

Answering such complex questions requires the collaboration of people from diverse backgrounds, including laboratory-based scientists and clinicians, social workers and policy makers, philanthropists and human rights activists.

Finally, we believe we need to change our own amygdala. Because this question goes to the heart of who we are, not just who Joe is.

We need to change the way we view Joe as a completely incorrigible person. Because if we see Joe as an utterly incorrigible figure, how does he see himself differently?

Ten years later, Joe is released from Wormwood Scrub.

Will he be among the 70 percent of inmates who end up reoffending and returning to prison?

Wouldn't it be even better if Joe could train his amygdala, which stimulates the growth of new brain cells and connections while he's in prison, so he can face the world after he's released?

Certainly, it would benefit us all.

(Applause.) Thank you. (applause)

Every 12 months, China hosts the world's largest human migration.

Three billion trips are made to reunite and celebrate families during the 40-day travel period of Chinese New Year.

Today, the toughest of these trips are made by the country's 290 million migrant workers, and for many of them it's a once-a-year chance to go home and see their parents and left-behind children.

However, travel options are very limited. Airplane tickets cost nearly half of my monthly salary.

That's why most people choose the train.

Their average migration distance is 700 kilometers.

The average travel time is 15 and a half hours.

And the country's trucks now have to handle 390 million travelers each Spring Festival.

Until recently, migrant workers had to wait in long lines, even days, just to buy a ticket, and were often tricked by scalpers.

And when the day of the trip finally came, they still had to deal with near-crowded conditions.

But technology is beginning to mitigate this experience.

Mobile and digital tickets now account for 70% of sales, and queues at stations are significantly reduced.

Digital ID scanners are replacing manual checks, speeding up the boarding process and artificial intelligence being deployed across the network to optimize travel routes.

A new solution was invented.

Didi Chuxing, China's largest taxi-hailing platform, has launched a new service called Hitch, which matches car owners driving home with passengers looking for long-distance routes.

In its third year in business, Hitch served 30 million trips this holiday season, the longest of which was over 1,500 miles.

That's the distance from Miami to Boston.

This huge demand for migrant workers has prompted rapid upgrades and innovations throughout the country's transportation system.

At present, China's Internet is developing in both familiar and unfamiliar ways.

Much like Silicon Valley, some of the tectonic shifts in technology and consumer behavior are driven by academic research, driven by corporate greed, with an occasional sprinkle of privilege and the whims of youth.

I am part of the American tech industry, both as a consumer and as a corporate leader.

So I know a lot about this kind of fuel.

But about a year and a half ago, I moved from my home in New York City to Hong Kong to become CEO of the South China Morning Post.

And from this new perspective, I observed that things that were less familiar to me were driving a lot of innovation and a lot of entrepreneurship in China.

It's an economy of overwhelming needs serving a disadvantaged population that has been cut off from China's boom for 30 years.

The stark disparities that exist between the rich and the poor, the urban and the rural, the academic and the uneducated, form the soil for incredible empowerment.

So when capital and investment focus on the needs of those hanging at the bottom of the economic ladder, we begin to see how the Internet can truly become a job creator, an education enabler, and in many other ways a way forward.

Of course, China is not the only place where this alternative fuel exists, nor is it the only place where it is possible.

But the country's sheer size and status as an emerging superpower create opportunities for the needs of its people to have a truly compelling impact.

When explaining the rapid growth of China's technology industry, many observers will cite two reasons.

The first is the 1.4 billion people who call China home.

The second is active government participation, or broader intervention depending on how you look at it.

Today, central authorities have spent a lot of money on network infrastructure over the years, creating an attractive investment climate.

At the same time, they have advocated for standards and regulations, resulting in rapid consensus and thus rapid adoption.

It has the world's largest pool of tech talent thanks to generous educational incentives.

And local domestic companies have so far been shielded from international competition by market controls.

Of course, if you look at the Chinese internet, you can find very serious concerns about widespread censorship and dystopian surveillance.

China, for example, is rolling out a social credit rating for all citizens, rewarding or limiting citizens based on quality traits such as honesty and honesty.

At the same time, China is deploying facial recognition in many of its 170 million closed-circuit cameras.

In Xinjiang, where Muslim minorities are already under constant surveillance, artificial intelligence is being used to predict crime and terrorism.

But the Internet continues to grow and it is huge, much bigger than most of us realize.

By the end of 2017, China's internet population reached 772 million users.

That's more than the combined populations of the United States, Russia, Germany, the United Kingdom, France and Canada.

98% of them are active on mobile.

92% of them use messaging apps.

Today, there are 650 million consumers of digital news, 580 million consumers of digital video, and Taobao, the country's largest e-commerce platform, currently boasts 580 million monthly active users.

About 80 percent larger than Amazon.

On-demand trips by bike and car now account for 10 billion trips per year in China.

That's two-thirds of all trips around the world.

So it's a very complicated situation.

Although the Internet exists in a limited and possibly manipulated form within China, it is still massive and has greatly improved the lives of its citizens.

Therefore, even with its imperfections, China's Internet growth should not be ignored and deserves closer scrutiny.

Let me tell you two more stories today.

Luo Zhaoliu is a 34-year-old engineer from Jiangxi.

His hometown was once a very important area for the Communist Party, as it is now the birthplace of the Red Army.

But decades of isolation from the country's economic and manufacturing centers have rendered it irrelevant.

Like many people of his generation, Luo left home at a young age to find work in the big cities.

He ended up in Shenzhen, one of China's tech hubs.

As young people migrate, these rural villages are left with only the elderly, who are really struggling to get out of extreme poverty.

Nine years later, in 2017, Luo decided to return to Jiangxi. He believed that China's burgeoning e-commerce market would help rebuild the village.

Like many rural areas, the Luo family specialized in producing very specific local crafts, in this case fermented tofu.

So he set up a small factory and started selling locally made goods online.

China's major cities have seen an increase in consumption over the years.

But recently, technology has fueled an explosion in craft sales among China's middle and upper classes.

WeChat and other e-commerce platforms allow local producers to market and sell their goods well beyond their original distribution territories.

Research firms actually track this impact by counting so-called “Taobao Villages”.

This is a rural village where at least 10% of households sell goods online and have a steady income.

And the growth over the last few years has been remarkable.

There were only 20 Taobao villages in 2013, 212 in 2014, 780 in 2015, 1,300 in 2016, and over 2,100 at the end of 2017.

There are now nearly 500,000 active online stores, generating $19 billion in annual sales and creating 1.3 million new jobs.

In the first year after returning to his hometown, Luo was able to employ 15 villagers.

And sold about 60,000 pieces of tofu.

Due to rapidly growing demand, we plan to hire 30 more people next year.

China's rural areas are littered with 60 million orphaned children.

And as migrant workers, they grow up with at least one parent far away from home.

Living in the countryside presents many challenges and often involves traveling vast and dangerous distances just to get to school.

They make up 30 percent of the country's elementary and high school students.

10-year-old Zhang Wenxuan is one such student.

Every day, he travels an hour each way to school across remote landscapes and deep canyons.

But when they arrive in a small rural village in Gansu, there are only two other students at the school.

Today, Zhang's school is one of 1,000 in Gansu province alone, with fewer than five enrolled students.

As a result, with limited student interaction, poorly qualified teachers, and poorly furnished and uninsulated school buildings, rural students have long been at a disadvantage and have few paths to higher education.

However, with the establishment of the Sunshine Classroom, Chan's future changed dramatically. He is now part of a digital classroom of 100 students in 28 different schools, taught by qualified and accredited teachers via live streaming from hundreds of miles away.

He has access to new subjects such as music and art, new friends, and experiences far beyond his home.

Recently, Chan was even able to visit the Frederiksborg Castle Museum in Denmark – virtually, of course.

Well, online education has existed outside China for many years.

But it has never reached a truly transformative scale. This is probably because the traditional education system in other technology centers in the world is much more advanced and much more stable.

However, China's extreme geography and scale create a huge and urgent need for innovation.

Shenzhen has a tech startup that has grown to 300,000 students in just one year.

And according to the Post's best estimates, there are currently 55 million rural students across China who can be addressed and accessed by live-streaming classes.

The market for this need is larger than the entire US student population in kindergarten through 12th grade.

It is therefore very encouraging to learn that private investment in education technology in China currently exceeds $1 billion annually, with an additional $30 billion of public funding between now and 2020.

As China's Internet continues to grow, despite its imperfections, limitations and controls, the lives of once-forgotten people have irrevocably improved.

The focus is on those in need, not those in need, and that fuels a lot of the curiosity, creativity, and development we see.

And we will continue to do so.

In the United States, the Internet population, or penetration rate, is currently at 88 percent.

In China, Internet penetration is still only 56% of the population.

That means over 600 million people are still offline and unconnected.

This is almost twice the population of the United States.

It's a big chance.

Wherever this alternative fuel exists, whether it is in China, Africa, Southeast Asia, or the heart of America, we should follow it with capital and effort and strive to have both economic and social impact around the world.

Just imagine what more would be possible if the global needs of the underserved population became the main focus of our inventions.

thank you.

(applause)

I want you to think about the third word ever said about you, or if you were a delivery person, who was the delivery person.

And you can say it or say it out loud if you want.

It was -- the first two were "that's...".

(Laughter) Well, you can see that. I'm also working on the ambiguous issue of girls and boys. So the mixed answer was quite apt.

Of course, now, as we all have, the answer is often not at birth, but at ultrasound, unless the prospective parent is surprised.

But since the third word describes your gender, I want you to think about what leads to that utterance of the third word.

In other words, it was created by a depiction of your genitals.

Now, as a pediatric endocrinologist, I used to be, and still am, somewhat involved when there is a discrepancy between what you look like on the outside and what you are on the inside, and you literally have to determine what your gender is.

But nothing can define you at birth.

When I talk about definitions, I'm talking about your sexual orientation.

We don't say, "That's...a gay boy!"

"It's a lesbian girl!"

These situations do not clearly define themselves until the 20th year of life.

Nor do they define your gender. Describe your self-concept as distinct from your anatomical gender. I mean, do you think of yourself as a man, a woman, or somewhere in between?

It can appear in the first decade of life, but can be very confusing for parents. Because it is very normative for children to play and behave in ways that transcend gender. In fact, studies show that even 80 percent of children who behave in such ways do not sustain a desire to be of the opposite sex by the time puberty begins.

But by the time puberty begins, around 10 to 12 years old for girls and 12 to 14 years old for boys, there will be breast budding and a two- to three-fold increase in gonads for genetic boys, by that particular point, a child who claims he or she has the wrong body is almost certainly transgender, and is highly unlikely to change that feeling no matter how much someone tries restorative therapy or other harmful things.

Now, I had relatively little personal experience with this as it is relatively rare.

And my experience was more typical, but only because I was practicing as an adolescent.

And I saw a 24-year-old genetically female go to Harvard with three male roommates who knew the whole story, and the registrar, who had always had her name on the roster as male, came up to me after graduation and said, "Help me, I know you know endocrinology."

And indeed, I have treated many who were born without gonads.

This was not rocket science.

But I made a deal with him that if you tell me, I'll treat you.

And he did.

And what an education I got from taking care of all the members of his support group.

And I got really confused. Because I thought at that age it would be relatively easy to give people the sex hormones they affirm.

But then my patient got married, was born male, married as a male, had two children, and then married a woman who went through a transition to female.

And now this delightful lady is attached to a male patient of mine - in fact, they were legally married because they appeared as male and female, and who knows?

(laughter) And I was confused--"Who does this make anyone gay?

Can you straighten this out? ”

I used to confuse sexual orientation and gender identity.

And my patient said to me, "Look, look, look.

A quick look at this will help you understand: Sexual orientation is who you go to bed with.

Gender identity is who you sleep as. ”

(Laughter.) And then I learned from a lot of adults -- I've cared for about 200 adults -- that you can never guess more than chance if they're gay, straight, bi, or if their affirmed gender is asexual unless you take a peek in the waiting room to see who their partner is.

In other words, one thing has nothing to do with the other.

And the data show it.

Now, taking care of 200 adults, it felt very painful.

These people, many of them had to give up most of their lives.

Sometimes parents refused them, siblings, their own children, and forbade divorced spouses from seeing their children.

It was very bad, but why did you do this at the age of 40, 50?

Because I felt that I had to affirm myself before committing suicide.

And indeed, untreated transgender suicide rates are among the highest in the world.

What should I do then?

Intrigued, I went to a conference in the Netherlands, experts in the field, and saw the most remarkable.

They were treating young people by blocking them from unwanted puberty after taking them through the toughest psychological tests for sex.

Because basically kids look pretty much the same regardless of gender until they reach puberty, at which point feeling like they're the wrong gender makes them feel like Pinocchio turned into a donkey.

The illusion that your body turns into who you want it to be when you reach puberty is actually invalidated at puberty.

And they fall apart.

That's why we put puberty on hold -- why put it on hold?

You can't give the opposite hormones when you're young.

They will eventually become stunted. Do you think you could have a meaningful conversation with a 10-year-old girl or a 12-year-old boy about the effects of such treatments on fertility?

In other words, this will buy the diagnostic process 4-5 years before the problem can be resolved.

They can get more tests and live without feeling that their body is running away from them.

And in a program they call "12-16-18," children are given block hormones around the age of 12, and at 16 they are retested and eligible to take it again. Remember, blocking hormones are reversible, but administration of hormones of the opposite sex can cause breast and facial hair to blow out and change your voice, depending on what you're using. Their effects are permanent or require surgery or electrolysis to remove and never actually affect the body. voice.

This is a serious story, 15, 16 years ago.

When you turn 18, you are eligible for surgery.

And although there is no good female-to-male genital surgery, male-to-female surgery has deceived gynecologists.

That's very good.

So I observed the patients, and observed the patients who looked like everyone else except for delayed puberty.

But when they are dosed with hormones that match their affirming gender, they are made to look beautiful.

It looks normal.

You will never be found in the crowd.

So at that point, I decided to do this.

This is where the field of pediatric endocrinology comes into play. In fact, it's for children ages 10-14 because that's pediatric endocrinology.

So I brought in some kids, and now this became the standard of care, and [Boston] Children's Hospital was behind it.

When I showed them pictures of the children before and after treatment, those who did not receive treatment, those who wanted treatment, and the Dutch, they came to me and said, 'We must do something for these children.'

Now, where were these kids before?

They were suffering outside, that's where they were.

So we started the program in 2007.

This was the first program of its kind in North America, but it was actually of the Dutch variety.

Since then, there have been 160 patients.

Are they from Afghanistan? no.

Of those, 75 percent were from within 250 miles of Boston.

Some came from England.

Jackie was abused in the Midlands of England.

She was 12 years old there and was living as a girl, but she was being beaten.

Since it was a horror show, they had to homeschool her.

And the reason the British came was because they don't treat people under the age of 16. This means that even with adequate testing, whatever happens will put them in an adult institution.

Besides, Jackie was destined to be 6'5 tall due to skeletal imprints.

Still, she is just beginning male puberty.

Well, I did something a little innovative. Because I know about hormones and that estrogen is much more powerful than testosterone in closing epiphyses, growth plates and stopping growth.

So I blocked her testosterone with blocking hormones, but added estrogen at age 13 instead of 16.

And here she is, 16, on the left.

On her 16th birthday, she went to Thailand, where she underwent genital plastic surgery.

I'll do it at 18:00 now.

And she ended up being 5 feet 11 inches.

But more than that, her breast size is normal. By blocking testosterone, every patient will have a normal breast size if they come to our clinic at the right age before it is too late.

And she is on the far right.

She made a public appearance as a semi-finalist in the Miss England competition.

The judges argued, "Can we do this?"

One of them quipped, "But she's more natural than half of the other contestants."

(Laughter) Some are a little twisted, but it's all in her DNA.

And she made a great publicist.

And when she approached me with a modeling contract, she teased me by saying, “If you had made me 6ft 1in, I might have had more opportunities as a model.”

(laughs) Go figure.

So I think this photo says it all.

It really says it all.

These are Nicole and her brother Jonas, identical twins who have been proven to be identical.

Nicole has affirmed herself as a girl since she was three years old.

At 7, they changed her name and came to me at the very beginning of male puberty.

At just 14 years old, Jonas is one of the first to imagine male puberty in this family. Because he looks 16 years old.

But it becomes even more important why we should be aware of where the patient is.

Nicole is on adolescent lockdown here and Jonas is in biological control.

This is what Nicole would be like if we hadn't done it.

He has a prominent larynx.

You can see that he has angular bones in his face, a mustache and a height difference. Because he's going through a growth spurt that she can't.

Nicole is currently taking estrogen.

She has a bit of a mold.

The family traveled to the White House last spring to help overturn anti-discrimination legislation. There was a bill in Maine that would block the right of transgender people to use public restrooms, and the bill was about to pass, and that would be a problem, but Nicole personally visited every legislator in Maine and said,

When they see me, they'll understand why I'm not a threat in the women's bathroom, but I'm a threat in the men's. ”

And they finally got it.

So where do we go from here?

Well, there is still a way to go when it comes to anti-discrimination.

Only 17 states have antidiscrimination laws against discrimination in housing, employment, and public accommodations, five of which are in New England.

We need cheaper drugs.

They cost a fortune.

And we need to retrieve this state from the DSM.

It's as much a mental illness as being gay or lesbian, but in 1973 it disappeared and the whole world changed.

And this does not affect anyone's budget.

This is less common.

But the risk of doing nothing for them not only puts them all at risk of dying by suicide, it also says something about whether we are a truly inclusive society.

thank you.

(applause)

[“Rebecca Neuberger Goldstein”] [“Stephen Pinker”] [“The Long Reach of Reason”] Cabbie: $22. Stephen Pinker: Okay.

Rebecca Neuberger Goldstein: Reason seems to be in troubled times: popular culture delves into new depths of stupidity, political debate becomes a race to the bottom.

We live in a time of scientific creationism, 9/11 conspiracy theories, psychic hotlines, and a resurgence of religious fundamentalism.

Overthinkers are often denounced as elitist, and even in academic circles there is an attack on logocentrism, the crime of letting logic dominate thought.

SP: But is this necessarily a bad thing?

Perhaps reason is overrated.

Many pundits have argued that good hearts and unwavering moral clarity are better than the love triangle of overeducated policy geeks like Best & Brightest that have dragged us into the quagmire of Vietnam.

And was it not reason that gave us the means to plunder the earth and threaten humanity with weapons of mass destruction?

In this way of thinking, it is character and conscience that save us, not ruthless calculation.

Besides, humans are not brains on a stick.

A fellow psychologist of mine has shown that we are guided by our bodies and emotions, and use our petty reason only to justify our intuition after the fact.

RNG: How can a rational argument cause the invalidity of a rational argument?

See, you're trying to convince us of the impotence of reason.

You are not intimidating or bribing us into suggesting that we settle the matter with a show of hands or a beauty pageant.

By the very act of persuading us to your position, you are acknowledging the power of reason.

I don't understand why here. No way.

You participated in the debate and you have already lost.

SP: But can reason lead us in a good, decent, moral direction?

After all, you pointed out that reason is only a means to an end, and that the end depends on the passion of the reasoner.

If reason wants peace and harmony, it can show the way to peace and harmony;

Can reason force the reasoner to want less cruelty and waste?

RNG: By itself the answer is 'no', but it doesn't take long to switch that to 'yes'.

There are two necessary conditions. The first is that all reasoners care about their well-being.

It is one of the passions that reason needs to work in, and it is clearly present in all of us.

We are all passionately concerned about our own well-being.

The second condition is that the reasoners are members of a community of reasoners who can influence each other's well-being, exchange messages, and understand each other's reasoning.

And that certainly applies to our gregarious, talkative species, endowed with an instinct for language.

SP: Well, it sounds good in theory, but did it work that way in practice?

In particular, can you explain a significant historical development that I spoke about here at TED about five years ago?

So we seem to be becoming more human.

Centuries ago, our ancestors burned cats alive as a form of popular entertainment.

The knights continued their constant warfare by trying to kill as many peasants as possible.

The government executed people for frivolous reasons, such as stealing cabbage or criticizing the royal gardens.

Executions were designed to be as long and painful as possible, including crucifixion, seppuku, and chastisement on wheels.

Good people kept slaves.

Despite all our shortcomings, we have abandoned these barbaric practices.

RNG: So do you think it's human nature that has changed?

SP: Not exactly. I think we still have instincts that can lead to violence: greed, tribalism, revenge, dominance, sadism.

But we also have instincts that can push us away, such as self-control, empathy, a sense of fairness, what Abraham Lincoln called the superior angel of our nature.

RNG: So if human nature didn't change, what encouraged the better angels?

SP: Well, among other things, our circle of sympathies has widened.

Many years ago, our ancestors felt pain only in their families and villages.

But with the expansion of literacy and travel, people became more and more empathetic to a wider range of circles, clans, tribes, nations, races, and perhaps eventually all of humanity.

RNG: How can hard-headed scientists trust kind-hearted empathy so much?

SP: They can and do.

Neurophysiologists have discovered neurons in the brain that respond to the actions of others in the same way that they respond to our actions.

Empathy emerges early in life, perhaps before the age of one.

Books on empathy, such as The Civilization of Empathy and The Age of Empathy, have become bestsellers.

RNG: I totally agree. I mean, who is not?

But in itself it is a weak instrument for moral progress.

The first is that they are naturally biased toward kinship, babies, and warm, fluffy animals.

Ugly outsiders can go to hell as far as empathy goes.

And even our best attempts to evoke sympathy for those who have nothing to do with us fail miserably. This is the sad truth about human nature, pointed out by Adam Smith.

ADAM SMITH: Suppose the great empire of China were suddenly engulfed in an earthquake, and consider how the human population in Europe would react upon receiving information of this terrible tragedy.

I imagine that he would, first of all, very strongly express his sorrow for the misfortune of the unfortunate.

He had many melancholy thoughts about the dangers of human life, and once all these human feelings were duly expressed, he pursued his work and pleasures with the same ease and tranquility as if such an accident had never occurred.

If I were to lose my little finger tomorrow, I wouldn't be able to sleep tonight, but I would be snoring with the deep relief that if I didn't see my little finger, billions of my fellow countrymen would be doomed.

SP: But if empathy wasn't enough to make us more human, what else?

RNG: Well, you didn't mention one of our most effective superior angels, reason.

Reason has muscles.

That is the driving force behind expanding the circle of empathy.

All the humanitarian developments you mention stem from thinkers who explained why certain practices were untenable.

They demonstrated that the way people treat certain other groups is logically inconsistent with the way they claim to be treated themselves.

SP: You mean that reason can actually change people's minds?

Don't people just stick to beliefs that serve their own interests and conform to the culture in which they were raised?

RNG: Here's an interesting fact about us. Contradictions haunt us, at least when we have to face them. This is another way of saying that we are susceptible to reason.

And if we look at the history of moral progress, we can trace a direct path from logical arguments to actual changes in how we feel.

Thinkers often argue why a practice is untenable, irrational, and inconsistent with pre-existing values.

Their essays go viral, are translated into many languages, are debated in pubs, coffee houses, salons and dinner parties, influencing leaders, legislators and public opinion.

Ultimately, their conclusions are absorbed by the common sense of decency, erasing any trace of the original argument that got us there.

Few people today feel the need to have a rigorous philosophical debate about why slavery is wrong, or why public hangings or violence against children are wrong.

Now I feel these things are wrong.

But just these arguments had to be made and have been made for centuries past.

SP: You mean it took a step-by-step discussion for people to understand why burning heretics at the stake was a little bit wrong?

RNG: Oh, yes. French theologian Sebastien Castellio makes this claim.

Sebastian Castelio: Calvin says he's sure, but other denominations say they're sure.

Who will be the judges?

If that is certain, to whom is it so? to Calvin?

But why, then, is he writing so many books about plain truths?

Given the uncertainty, we have to define a maverick simply as one who disagrees with one's opinion.

And if we try to kill heretics, the logical outcome will be a war of annihilation, as each is confident in himself.

SP: Or a terrible punishment, such as breaking into a car?

RNG: The prohibition of cruel and unusual punishment in our constitution was a response to a pamphlet distributed by Italian jurist Cesare Beccaria in 1764.

Cesare Beccaria: As punishment becomes more cruel, the human mind, which, like liquid, always adapts to the level of surrounding objects, becomes rigid, and after 100 years of cruel punishment, turning the wheel does not cause as much terror as previous imprisonments.

All that is necessary for punishment to achieve its purpose is that the harm it inflicts outweighs the benefits gained from the crime, and this calculation should take into account the certainty of punishment and the loss of profits generated by the offense.

Anything beyond this is unnecessary and therefore domineering.

SP: But certainly the anti-war movement relied on mass demonstrations, catchy tunes by folk singers, and harrowing photographs depicting the human toll of war.

RNG: There is no doubt about it, but the modern anti-war movement goes back to a long chain of thinkers, including Erasmus, the father of modernity, who argued why we should mobilize emotion against war.

Erasmus: The benefits of peace are spread far and wide and reach many people, but in war, even if something goes well, the benefits are returned only to a few people, and those who do not deserve it.

One man's safety is due to the destruction of another.

One person's bounty is obtained from another person's looting.

The cause of joy in one becomes the cause of sorrow in the other.

Whatever misfortunes in war are indeed serious, and conversely whatever is called luck, is barbaric and cruel fortune, irreverent happiness which derives its existence from the misfortunes of others.

SP: But we all know that the abolitionist movement relied on faith and emotion.

This was a Quaker-led movement that first gained popularity when Harriet Beecher Stowe's novel Uncle Tom's Cabin became a bestseller.

RNG: But the ball started rolling a century ago.

John Locke bucked the millennia-long trend of viewing the practice as completely natural.

He argued that it contradicted the principles of rational government.

John Locke: Human liberty under government is to live in common with all the people of that society, to have permanent rules made by the legislative power established in that society, to be subject to one's own will in all that the rules do not dictate, and to be free not to be subject to the fixed, uncertain, unknown and arbitrary will of others, just as natural liberty is not subject to any other than natural law.

SP: That word sounds familiar.

Where have you read it before? Oh yes.

Mary Astell: If nations don't need absolute sovereignty, why do families need absolute sovereignty?

Or if it's family, why not in the state?

Since no reason can be argued that one is not favored more strongly than the other, how is it that all women are born slaves, if all men are born free, as women ought to be, if obedience to the unchanging, uncertain and unknown arbitrary will of men is the perfect condition of slavery?

RNG: All such cooperation options are included in Reason's job description.

One movement for enlarging rights inspires another because the logic is the same, and once you understand it, it becomes all the more uncomfortable to ignore the contradiction.

In the 1960s, the civil rights movement influenced movements for women's rights, children's rights, gay rights, and even animal rights.

But just two centuries earlier, Enlightenment thinker Jeremy Bentham had exposed the indefensibility of practices such as cruelty to animals.

Jeremy Bentham: The question is not whether they can think logically or speak, but whether they can suffer.

RNG: And gay persecution.

JB: When it comes to basic pranks, obviously it doesn't hurt anyone.

On the contrary, it creates joy.

Both partners are happy.

If either is unwilling, the act is a crime, and the nature of the effect is quite different.

Personal injury. It's a kind of rape.

As for risks other than pain, many of them tend to be examples, even if they are.

But what are the trends in this example?

Engage others in the same act.

However, this practice does not cause any kind of pain to anyone.

SP: Yet, in each case, it took at least a century for the claims of these great thinkers to trickle down and permeate the entire nation.

You may wonder about our times.

Are there practices we stick to even though the arguments against them are obvious to everyone?

RNG: When our great-grandchildren look back on us, will they be as appalled by some of our deeds as our forefathers with slave-owning, burning of heretics, wife-beating, gay-bashing?

SP: I think everyone here can come up with an example.

RNG: I choose animal cruelty on factory farms.

SP: Acceptance of imprisonment and rape of non-violent drug offenders in our prisons.

RNG: We are reducing donations to life-saving charities in developing countries.

SP: Possession of nuclear weapons.

RNG: resorting to religion to justify the unjustifiable, such as prohibition of contraception.

SP: What about religion in general?

RNG: Well, I'm not holding my breath.

SP: Yet I have come to believe that reason is the superior angel who deserves the greatest credit for the moral progress that mankind has enjoyed, and that it holds the greatest hope of continuing moral progress in the future.

RNG: And remember, friends, if you find the argument flawed, it depends on the reason why you point it out.

thank you. SP: Thank you.

(applause)

I'm here today to talk to you about a problem.

This is a very simple yet devastating problem that is spreading across the globe and affecting all of us.

The problem is anonymous companies.

Sounds very dry and technical, doesn't it?

But anonymity companies make it difficult, and sometimes impossible, to track down the actual people involved in some truly gruesome crimes.

So why am I here talking to you guys?

Well, I guess I'm a lifelong troublemaker. I guess when my parents taught my twin brother and I to question authority, they had no idea where that would lead.

(Laughter.) And, predictably, I think they probably really regretted it when I was a poor teen, when I greatly questioned their authority.

And many of the teachers at school didn't appreciate it either.

See, I've been asking this question all the time since I was about 5, why?

But why does the earth revolve around the sun?

But why is blood red?

But why should we go to school?

But why should we respect teachers and authorities?

And little did I know that this question would form the basis of all my actions.

Long ago, in my twenties, one rainy Sunday afternoon in north London, I was sitting with Simon Taylor and Patrick Alley, busy filling mail envelopes in the office of the campaign group I was working at the time.

And as usual, we were talking about world problems.

And especially we were talking about the civil war in Cambodia.

And we've talked about it over and over again.

But suddenly we stopped, looked at each other and said: But why not change this?

And now, after more than 20 years since that slightly crazy question, and many campaigns to alert the world to the problem of war-financing blood diamonds, Global Witness is now an 80-strong team of activists, investigators, journalists and lawyers.

And we are all driven by the same belief that change is really possible.

So what exactly does Global Witness do?

We research and report to uncover who is truly responsible for funding conflict, stealing millions of dollars from citizens around the world, also known as state looting, and destroying the environment.

And we are campaigning hard to change the system itself.

And we are doing this because many of the countries rich in natural resources like oil, diamonds and timber are home to some of the poorest and most disenfranchised people on the planet.

And much of this injustice is made possible by current accepted business practices.

And one of them is an anonymous company.

We are now confronting an anonymous company in a number of investigations that have exposed how in the Democratic Republic of the Congo a secret transaction involving an anonymous company was robbing citizens of one of the poorest countries on the planet well over $1 billion.

This is twice the combined budget for health and education in the country.

Alternatively, in Liberia, international predatory logging companies have used front companies to seize very large pieces of native Liberian forest.

Alternatively, political corruption in the Malaysian state of Sarawak has led to the destruction of much of the forest.

Well, it also uses an anonymous company.

We secretly filmed the former prime minister's family and lawyers telling our undercover investigators exactly how these dubious transactions are conducted using companies like these.

And the scary thing is that there are many other examples in all areas.

This is truly a grand scandal hidden in plain sight.

Whether it's the Zetas, the ruthless Mexican drug cartels, they use anonymous corporations to launder profits while drug-related violence is tearing communities apart across the Americas.

Or an anonymous company that bought out Americans' tax debt, racking up legal costs and giving homeowners the choice to "pay or lose the house."

Imagine being threatened with losing your home at times for just a few hundred dollars in debt, and not knowing who you were actually up against.

Now anonymous companies are also great for breaking sanctions.

It turns out that the Iranian government, through a series of front companies, owned a building on Fifth Avenue in the heart of Manhattan despite US sanctions.

And Juicy Couture, home of the velvet tracksuit, and other companies were unwitting tenants there.

Examples abound, such as the horsemeat scandal in Europe and the mafia in Italy, but they have been using these companies for decades.

America's $100 million Medicare scam, supplying arms to wars around the world, including in Eastern Europe in the early 90's.

The recent Ukrainian revolution also revealed the existence of anonymous companies.

But for all the cases we and others expose, there are many more that remain hidden due to the current system.

And that's the simple truth. Some of the people responsible for the outrageous crimes that stole from you and me and millions of others are invisible and dodging responsibility. And they're doing it easily, and they're using legal structures to do it.

And really, it's unfair.

So, you may be wondering what exactly is an anonymous company and can you actually set up and use a company without anyone knowing your identity?

The answer is yes you can.

But if you're like me, you'll want to see some of it with your own eyes. So let me show you.

First, you need to decide where you want to install it.

Well, at this point you might be imagining a nice tropical island tax haven, but surprisingly my hometown of London, and indeed England, is one of the best places in the world to set up an anonymous company.

And the other, and even better, unfortunately, it's America.

Did you know that in some states across the United States, less identification is required to start a business than to obtain a library card? Delaware is one of the easiest places in the world to form a company anonymously.

Now, let's say this is America, and let's say it's Delaware. Now you can find your company's service provider by simply going online.

These companies will set it up for you, but remember that this is all legal and routine business practice.

I'll show you one here, but there are many other options.

Once you have made your selection, select the type of company you prefer and enter your contact information, name and address.

But don't worry, it doesn't have to be your name.

It may belong to your attorney or service provider, but it is not for public record in any way.

Next, add the company owner.

This is the important part, but again, it doesn't have to be you. Because you can be creative and choose among candidates from all over the world.

And candidates are people who can legally pay to become owners of the company.

You don't even have to be an actual human being if you don't want others involved.

It could be another company.

And finally, enter your company name, add a few more details, and make the payment.

And it takes hours or more for the service provider to process it.

But 10 minutes of online shopping can create an anonymous company.

And not only is it easy, really easy, and cheap, it's also completely legal.

But the fun doesn't have to end there. You may want to be even more anonymous.

Well, that's fine too.

You can keep adding corporate owned layers and more.

Like a giant web, you can create hundreds of layers containing hundreds of companies across different countries, with each layer adding anonymity.

Each layer makes it more difficult for law enforcement and others to identify the true owner.

But who does this benefit?

It may be to the benefit of companies and certain individuals, but what about us ordinary people?

There's not even a global debate about whether it's okay to abuse companies in this way.

And what does that mean for us?

Well, the example that really bugs me is one I came across recently.

And it's from a horrific fire in a Buenos Aires nightclub about ten years ago.

It was New Year's Eve.

A space meant to hold 1,000 was crammed with 3,000 very happy spree-goers, many of them teenagers.

Then tragedy struck, a fire broke out, plastic decorations melted from the ceiling, and toxic fumes filled the club.

People tried to escape, but found that part of the fire door had been chained shut.

Over 200 people died.

700 were injured in an attempt to escape.

As the families of the victims, the city and the country shook with shock, investigators tried to find out who was responsible.

A search for the club's owner turned up an anonymous company instead, confusing the identities of company officials.

In the end, various people were prosecuted and some even sent to prison.

But it was a terrible tragedy, and it should not have been so difficult to find out who was responsible for these deaths.

Because in an age when so much information is out in the open, why should this vital information about corporate ownership be hidden?

How can tax evaders, corrupt government officials, arms dealers, etc. hide their identities from the public?

Why is this confidentiality so acceptable as a business practice?

Anonymous companies may be the norm now, but they weren't always.

Companies were founded to give people the opportunity to innovate without having to risk everything.

Corporations are established to limit financial risk and are not intended to be used as moral shields.

Companies are not meant to be anonymous, nor are they required to be.

And my wish came true.

My hope is to know who owns and controls companies, and to ensure that companies are not used anonymously against the public interest.

Together, let's ignite global opinion, change the law and usher in a new era of openness in business.

So what does this look like?

But what if you could go online and find out who really owns a company?

Imagine if this data was open, free, and accessible across borders to citizens, businesses, law enforcement, and others alike.

Imagine how transformative that would be.

So how do we do this?

Well, there's only one way.

We need to work together to change laws around the world, list the true owners of companies, and create public registries that everyone can access without loopholes.

Sure, it's ambitious, but there's momentum on this issue, and I've seen momentum gains over the years, and we're just getting started on this issue.

I have such an opportunity right now.

And the TED community, made up of creative and innovative thinkers and doers across society, can make a difference.

You can really make this change happen.

Well, an easy starting point is the Facebook page address behind me. Join now to support the campaign and spread the word.

It will be the starting point for our global campaign.

And techies, we'd love to help prototype a public registry to demonstrate how powerful this tool is.

Campaign groups around the world have rallied to tackle this issue.

The UK government is already working on it. We support these public registries.

And just last week, the European Parliament voted 600-30 in favor of a public registry.

It's momentum.

(Applause) But it's still early days.

Like many other countries, the US still needs to participate.

And to succeed, we all need to work together to help and push politicians. Because without it, real, far-reaching, world-changing change will not happen.

Because this isn't just about changing the law, it's about starting a debate about what companies are allowed to do and in what ways it's acceptable to use company structures.

This is not just a dry policy issue.

This is a human problem that affects us all.

This means being on the right side of history.

Global citizens, innovators, business leaders, individuals, we need you.

Let's start this global movement together.

Let's do it, let's stop anonymous companies.

thank you.

(applause)

Imagine you are a student in my lab.

What I want you to do is create a biology-inspired design.

So the challenge is: We want you to help us create a fully 3D, dynamic and parameterized contact model.

Literal translation: "Can you help me make the legs?"

And it's a real challenge and I want you to help me.

Of course, challenges also have prizes.

It's not a TED award, but it's a T-shirt limited to our laboratory.

Send me your ideas for foot designs.

Now, what do you have to do if you want to design your feet?

First we need to know what a leg is.

If you look it up in the dictionary, it says, "The lower leg that comes into direct contact with the ground when standing or walking," and that's the traditional definition.

But what do you have to do if you really want to do research?

We need to go to the literature and find out what is known about the foot.

Then go to the literature department. (Laughter.) You are probably familiar with this literature.

The problem is that I have a lot of legs.

how do i do this

Every foot should be investigated and the principles of how it works should be extracted.

And I want you to help me do that in this next clip.

Watch this clip, look for principles, and also think about the experiments you plan to understand how your feet work.

Are there common themes? Principles?

what would you do?

What kind of experiments will you run?

oh. (Applause.) Our research into the biomechanics of animal locomotion has allowed us to create a blueprint for the foot.

The design is inspired by nature, but not a copy of a specific foot, but a synthesis of many foot secrets.

Now we know that animals can go anywhere.

As you can see, it can move on different substrates, such as the possibility of contact, the movement of its surface, and the type of scaffolding present.

If you want to study how feet work, you need to simulate their surfaces and debris.

When we did that, here's a new experiment we did. The spider was placed and run on a surface with 99 percent of the contact area removed.

But it didn't even slow the animal down.

It is still running at 300 miles per hour, which is equivalent to human speed.

Now how is that possible? Well, look more carefully.

Decrease the speed by a factor of 50 to see how the legs hit the simulated debris.

Legs act as feet.

And indeed, this animal contacts other parts of the leg more often than the traditionally defined foot.

Paws are distributed along the entire leg.

You can also do another experiment where you lift the roach by the leg or remove the leg.

I'm taking out cockroaches. look at their feet

If there are no legs, it will look like this: It doesn't slow down either.

You can run at the same speed even without that section.

No problem for cockroaches. If you care, they will grow again.

how are you doing

Please take a good look. It's been slowed down by a factor of 100 and see what it's doing with the rest of the leg.

This is also acting as a distributed foot and is very effective.

Now, the question we have is, how common are diversified bars?

And this next animal's behavior surprised us when we first saw it.

Journalists, this is off the record. it is embargoed.

Let's see what it is!

It's a bipedal octopus disguised as a rolling coconut.

Discovered by Christina Huffard and shot by Sea Studios here in Monterey.

Another type of bipedal octopus was also described.

It mimics floating algae.

It walks on two legs, with its other arm raised in the air so that it cannot be seen.

(Applause.) And look at how you use that leg to get over difficult terrain.

It uses beautifully distributed legs to make it appear as if even obstacles don't exist. It's truly extraordinary.

Escher painted this picture in 1951. He thought he created an animal fantasy.

But we do know that art mimics life, and it turns out that nature evolved the following animals three million years ago.

This is a shrimp-like animal called a stomatopod, and here's how it migrates on Panama's beaches. It actually rolls and sometimes rolls uphill.

This is the ultimate dispersion bar. In this case, the whole body works like a leg.

So if you want to add the first important feature to your Blueprint, add distributed foot contact.

Not just conventional feet, but legs and even bodies.

Will this help inspire new robot designs?

We took the biological inspiration for this robot named RHex built over the past few years by this outstanding engineer.

The RHex foot started out very simple and was adjusted over time to end up with this semicircle.

why is that? We'll show you in the video.

Notice where the robot makes contact with its legs to deal with this very difficult terrain.

In fact, you can see that it uses the semicircular leg as a balancing leg.

Watch this go on.

You can see it clearly on this rubble.

Extraordinary. There is no sensing and all controls are built directly into the regulated leg.

Really simple, but beautiful.

Now, you may have noticed something else about animals as they run through rough terrain.

And my assistant will help me here.

When you touch the roach's leg, can you bring me the mic?

What did you feel when you touched the roach's leg?

Did you notice anything?

Boy: Spiky.

Robert Full: Full of thorns, right? It's really thorny, isn't it? It kind of hurts.

Maybe we can give it to our curator to see if he's brave enough to touch a cockroach.

(laughs) Chris Anderson: Did you touch it?

RF: So if you look closely at this, you can see they have spines, but until a few weeks ago no one knew what they were doing.

They thought they were for protection and for sensory structures.

We found them to serve another purpose. This is part of its spine.

They are tuned to easily crush in one direction to pull the legs out of the rubble, but stiffen in the opposite direction, allowing you to pick up on surface differences.

Crabs usually move on sand, so they don't lose their footing until they come to our lab.

And this kind of mesh has no spines, which is problematic.

Crabs do not have spines, which is a problem in such rugged terrain.

But, of course, we can make artificial spines, so we can deal with that.

You can create a spine that catches on simulated debris and collapses when removed for easy extraction.

We tested it by attaching artificial spines to crabs, as seen here.

Do we really understand tuning principles? The answer is yes.

This is 20 times slower and the crab just zooms over its simulated debris.

(Laughter) (Applause) A little better than nature.

Therefore, we need to add a tuned spine to the blueprint.

Now, can this help us think about designing more effective climbing robots?

Well, RHex is: RHex is having issues on rails. Problems occur on smooth rails as seen here.

So why not add a spine? A colleague of mine did this at Penn University.

Dan Koditschek attached some steel pegs (very simple version) to the robot. And now RHex is on that steel rail. no problem!

How is that done?

Let's slow down. That way you can see the spines moving.

Watch the legs come around and you'll know they'll be there in no time.

You couldn't do that before. You just slip, get caught and fall.

And look again. Succeeded.

Now, just because your feet and spine are distributed doesn't mean you can climb vertical surfaces.

This is really, really hard.

But look at this animal, do it!

One of the things I'm passing through is climbing this vertical plane, which is a smooth metal plate.

It's amazing how fast you can do it, but when you slow it down you see something very amazing.

that's a secret. This animal climbs effectively by gliding and watching. And really, in terms of grabbing the surface, it's doing something horrible.

In fact, it looks like you are swimming on the surface of the water.

If you look at it in action, you can better model its behavior as a fluid.

In reality, the dispersed legs act like paddles.

The same is true when you see this lizard running on fluidized sand.

Please pay attention to its feet.

Despite interacting with surfaces that we normally think of as solid, they actually act as paddles.

This is no different than what my former undergraduate student discovered when figuring out how lizards can run on water.

Can this be used to make better robots?

Martin Buehler, now working for Boston Dynamics, took the idea and turned RHex into Aqua RHex.

Here is an RHex with a paddle, transformed into an amazingly mobile swimming robot.

However, for rough surfaces, animals add claws.

And if you hold it, you will probably feel it.

did you touch it?

CA: Yes.

RF: And they're very good at grabbing surfaces with these claws.

One of my collaborators, Mark Cutkoski of Stanford University, is a prominent engineer who developed this technique called Shape Deposition Manufacturing, which allows the nail to be embedded directly into the prosthetic leg.

And here's a simple version of the new robot leg. I'll show you a little later.

Now let's attach the claws to the blueprint.

But if you look at animals, they use hybrid mechanisms including claws, spines, hairs, paws, glue, capillary adhesion, and many others to actually maneuver on any surface.

These are all from different insects.

Ant is crawling on a vertical surface.

Let's see that ant.

This is an ant's leg. Here you can see hair and nails and this.

This is when the feet are in the air.

See what happens when your foot rests on the sandwich.

Can you see what happens?

That pad will come out. And that's where the glue is.

Here is the ant's foot from below, and when the nail does not dig in, the pad will automatically come out without the ant doing anything.

Just push it out.

This was a difficult shot to take. I believe this is a shot of Ali's leg riding a superstring.

So it's pretty hard to do.

Looking closer, it looks like this. Here are the ant legs, and the glue.

We discovered that this adhesive could be an interesting two-phase mixture.

It certainly helps to hold it.

So, stick a sticky pad on the blueprint.

You might get inspired here and think about smooth surfaces.

Now here's something better.

Geckos are a very good example of nanotechnology in nature.

These are its legs.

They look like aliens. And the secret they keep sticking to has to do with hairy toes.

They run up the ground at a speed of 1 meter per second and take 30 steps in that second. They are barely visible.

At slow speeds, the feet land in 8ms and leave in 16ms.

And it's weird to see how they detach it.

It can be peeled from the surface in the same way as peeling off tape.

very strange. How does it stick?

If you look at their feet, they have leaf-like structures called linala that have millions of hairs.

And each hair can develop the worst split ends.

It has 100 to 1000 split ends, which is the secret that allows close contact.

Geckos have one billion of these 200-nanometer-sized split ends.

Also, it doesn't stick with glue, it doesn't work like Velcro, it doesn't work with suction.

We found that they work solely through intermolecular forces.

So, to match the blueprint, I split some of the hair.

This inspired the design of the first self-cleaning dry adhesive, and we are pleased to announce that a patent has been issued.

And here's the simplest version in nature, and here's my collaborator Ron Fearing's attempt at an artificial version of this dry glue made out of polyurethane.

And this is my first attempt to get it working under some load.

There is a great deal of interest in this in various fields.

There are probably thousands of possible uses.

A lot of people think so, and we're excited to bring this to life.

We have the product you imagined. For example, here's a bio-inspired band-aid, with the band-aid glue removed.

We collected some hairs from a molting gecko. I applied 3 rolls of it to make this Band-Aid.

This is an undergraduate volunteer. We have 30,000 undergraduates, so you can choose among them. This is actually just a red pen mark.

But it makes for an incredible Band-Aid.

It is aerated, easy to remove, non-irritating and can be used underwater.

I think this is a great example of how curiosity-driven research can lead to unimaginable consequences, even though it just made me wonder how something climbed.

This is just one example of why we need to support curiosity-based research.

I'm peeling off the Band-Aid.

So we redefined what a foot is.

The question, then, is can these secrets be harnessed to create better foot designs than those found in nature?

This is a new project. We are trying to create the first climbing search and rescue robot that does not use suction or magnets and can only move on a limited set of surfaces.

I call this new robot "Robot in Scan Real Environment" or RiSE, which stands for Climbing Environment. We have an extraordinary team of biologists and engineers developing this robot.

And this is RiSE.

It has six legs and a tail. It's on a fence and a tree.

And this is the first step on the RiSE slope.

Do you have audio? I hear it rise.

And here it is coming towards you as the first step up the wall.

This is very new as we are only using the simplest legs here.

But we think we got the robot dynamics right.

But Mark Cutkoski takes it a step further.

He is the one who can build feet and toes manufactured by this shape deposition.

The next step is to create a flexible toe, add spines and claws and set it up for dry glue.

So the idea is to first move the toes and feet correctly, try to climb, and finally put it on the robot.

And that's exactly what he did.

In fact, he developed a mountaineering footbot inspired by nature.

And here are the designs of Katkosky and his amazing students.

So these are adjusted toes, there are six of them, and they're put together in a blueprint and use the principles I just talked about.

This means that there is absolutely no suction or glue involved, and when it is finally attached to the robot it will be as biologically inspired as an animal and hopefully able to climb any surface.

Next, climb up the side of the Stamford building.

Speed ​​increased. Again, I will be climbing on foot.

It's not the whole robot yet, but it's in development. You can see how it is attached.

These tailored structures allow the spine, friction pads, and ultimately adhesive bristles to grip very difficult and difficult surfaces.

So they were able to get this - which is now 20 times faster - can you imagine it going upstairs and trying to rescue someone? OK?

Now you can visualize it. It's not impossible.

It's a very rewarding job. But more on that later.

Finally, we learned design secrets from nature by observing the structure of the foot.

I learned that control should be distributed to smart parts.

Instead of focusing everything on your brain, put some of the control in your coordinated feet, legs, or even your body.

By their very nature, they use hybrid solutions rather than single solutions to these problems, and they are integrated, beautiful and robust.

And third, rather than imitating nature, we strongly believe in taking inspiration from biology and combining these new principles with the best engineering solutions out there to create something better than nature.

So there is a clear message. Whether we are interested in basic and fundamental research on really interesting, strange and wonderful animals, whether we want to build search and rescue robots that save people in earthquakes and fires, or whether we are interested in medicine, we must preserve nature's design.

Otherwise, these secrets will be lost forever.

thank you.

Chris Anderson: Civil Rights, The Future of the Internet.

So I'd like to welcome the man behind these revelations, Ed Snowden, to the TED stage.

(Applause.) Ed is somewhere far away in Russia, and he's controlling this bot from his laptop, so he can see what the bot sees.

Ed, welcome to the TED stage.

What do you actually see?

Edward Snowden: Oh, I see everyone.

This is great.

(laughter) CA: Ed, I have a few questions.

Over the past few months you have been called many things.

You've been called a whistleblower, a traitor, and a hero.

What words would you use to describe yourself?

ES: You know, everyone involved in this discussion is struggling with me and my character and how to describe me.

But come to think of it, this shouldn't be a problem for us.

It doesn't matter who I really am.

If I'm the worst person in the world, you can hate me and move on.

What really matters here is the problem.

What really matters here is the kind of government we want, the kind of internet, the kind of relationship between people and society.

And that's what I'd like the discussion to go in that direction, and we've seen that trend growing over time.

If I were to describe myself, I wouldn't use the word "hero".

I don't use "patriot," nor do I use "traitor."

I am an American, and I consider myself a citizen like everyone else.

CA: So just a little background for those who don't know the whole story -- (applause) -- about this time a year ago you were stationed in Hawaii as an NSA consultant.

As a system administrator, you have access to their system and have begun releasing certain confidential documents to some hand-picked journalists leading up to the June disclosures.

So what drove you to do so?

ES: You know, when I was sitting in Hawaii, and years before that, when I was working in intelligence, I saw a lot of things that disturbed me.

We do a lot of good things, things to do, and help people in the information community.

But some have gone too far.

There are things that shouldn't be done and decisions made in secret without the public's knowledge, without the public's consent, and without even government representatives knowing about these programs.

As I began to get serious about these issues, I wondered: How can we do this in the most responsible way that maximizes the public good while minimizing risk?

And among the solutions I could come up with, other than going to Congress, there was no law and there was no legal protection for private employees who were information contractors like me, so I risked being buried with information and never known to the public.

But there's a reason the First Amendment to the U.S. Constitution guarantees us a free press. It is to enable hostile media not only to challenge the government, but to work with the government to dialogue and discuss how to inform the public about issues of vital importance without jeopardizing national security.

And I believe that by working with journalists and giving all my information back to the American people, rather than leaving the publishing decisions to myself, I was able to have a solid debate with a huge investment by the government that ultimately benefited everyone.

And the risks that have been threatened, the risks that have been stoked even by governments, have never materialized.

I have never seen any evidence that any specific harm occurred. Therefore, I am happy with the decision I made.

CA: So let's show the audience some examples of what you've revealed.

If you can get the slide up, Ed, I don't know if you can see it, but it's here.

This is a slide from the PRISM program, but maybe you can tell the audience what this reveals.

ES: The best way to understand PRISM is to first talk about what PRISM isn't because there is a bit of controversy.

Much of the discussion in the US has been about metadata.

They say it's just metadata, just metadata, and they're talking about a specific legal authority called Section 215 of the Patriot Act.

This allows for warrantless wiretapping and mass surveillance of country-wide phone records, such as phone records -- who you're talking to, when you're talking to, where you've traveled, and more.

These are all metadata events.

PRISM is content.

It's a program that the government can force on American corporations, and the government can make them do the dirty work for the NSA.

And even though some of these companies resisted, some (I think Yahoo was one of them) challenged it in court, but they were never tried in open court, so they all lost.

They were tried only in secret courts.

And what we've seen, something about the Prism programs that's very concerning to me, was that there was a talking point with the US government where they said 15 federal judges had reviewed these programs and found them legal, but they're saying that what you say is a secret court under a secret interpretation that's believed to be 11 years that were only reprimanded for 33 years over 33 years over 33 years over 33 years.

They are not the ones we want to dictate what the role of American corporations should be in a free and open Internet.

CA: Well, this slide that we're showing here shows the dates that the various technology companies, the Internet companies, are said to have joined the program, and the dates that we started collecting data from those companies.

Now they deny cooperating with the NSA.

How did the NSA collect that data?

ES: Yes. So the NSA's own slides call it direct access.

What this means for a real NSA analyst, someone like me who used to work in Hawaii as an intelligence analyst targeting Chinese cyber hackers and such, is that the source of the data comes directly from their servers.

That doesn't mean a group of corporate representatives sitting in a smoky room with the NSA hanging around and making backroom deals on how to distribute this.

Today, companies are responding in different ways.

Some are responsible.

Some people have a slightly lower sense of responsibility.

But the bottom line is that how this information is provided is provided by the companies themselves.

It's not stolen from the line.

But there is an important thing to remember here. I saw an article in The Washington Post last year that didn't get as much headlines as the PRISM article about the NSA intruding into data center communications between Google and Yahoo, even though the companies were pushing back and demanding let's do this through a warrant process, where there is indeed some legal review and some basis for handing over these users' data.

So even with these companies cooperating with the NSA in at least coercive but hopefully legal ways, the NSA isn't happy with it. As such, we must work very hard to ensure that companies represent their users' interests and defend their rights.

And last year, I think you've seen the companies named in the PRISM slides make great strides in making that happen. I encourage these companies to continue.

CA: What more should they do?

ES: To protect the rights of users around the world, the biggest thing American internet companies can do right now, without consulting lawyers, is to enable SSL web encryption on every page they visit.