As I was there, walking past the security gate, a security guard stopped and said "Pasaporte, Pasaporte" and pointed an M16 at me.

So I looked at him and said, "Passport, right?"

No need to show your passport. It's in the back of my pack.

I'm Dr. Francis. I am an Ambassador to the United Nations and I travel the world. ”

And I started walking.

What made me say this?

The road turned into a jungle.

I didn't get shot.

And I could -- I started saying, 'I'm free at last - thank God Almighty, I'm free at last.'

"What was that?" I say. what was it about?

It took me a hundred miles to realize in my heart, in myself, that I was a prisoner.

I was a prisoner and had to escape.

What kept me in prison was the fact that I didn't drive a car or use an electric vehicle.

Now how could that be?

Because when I started working, I thought it was very appropriate not to use electric vehicles.

But the difference is that every birthday I asked myself about my silence, I never asked myself about my decision to use only my legs.

I never thought that I would become an ambassador to the United Nations.

I never thought I would be able to get a PhD.

I realized that I was responsible for more than just myself, and that I had to change.

You know, we can do that.

It had to change.

And I was afraid to change because I was used to a man who just walked.

I was so used to that person that I didn't want to quit.

I didn't know who I would be if I changed.

But I know I had to.

I know I need to change because it's the only way I can be here today.

And so often we find ourselves in this wonderful place we've arrived at, but there's another place for us to go.

And we must abandon the security of who we have become and go to the place of who we have become.

So I would like to encourage you guys to go next and get out of any prison you may be in as comfortably as possible. Because we have to do something now.

we must change now.

As the former Vice President said, we have to be activists.

So if my voice can touch you, if my actions can touch you, if my being here can touch you, please leave me alone.

And I know you all touched me while I was here.

So let's go out into the world and bring this compassion, this love, this respect that we showed to each other here at TED.

Because we are the environment and how we treat each other becomes how we actually treat the environment.

I would like to thank you for being here and end with five seconds of silence.

thank you.

(applause)

This is a man named Bob McKim.

He was a creativity researcher in the 60's and 70's and headed the Stanford Design Program.

And in fact, my friend and IDEO founder David Kelley, somewhere, studied under him at Stanford.

And he liked to practice with his students to take a piece of paper and draw a picture of the person sitting next to him - his neighbor - as quickly as possible.

And actually, we're going to do that exercise now.

You have cardboard and paper.

There are actually many circles.

Please turn over that paper. You should see that the other side is blank.

And there should be a pencil.

And I want you to pick the person sitting next to you, and when I say "Let's go," draw the person next to you in 30 seconds, okay?

So are you all ready? OK. depart.

You only have 30 seconds, so you better hurry.

Now those masterpieces...

OK? stop. OK, come on.

(laughs) Yes, I had a good laugh. Yes, that's right.

A lot of laughter and a lot of embarrassment.

(laughter) Can you hear a few words, "I'm sorry"? I think I can hear you saying sorry.

Yes, yes, I think so.

And that's exactly what happens every single time you do this with an adult.

McKim noticed this every time he worked with his students.

He had the exact same reaction. There were a lot of "sorry" words.

(Laughter.) And he'll point to this as proof that we're afraid of being judged by our peers, and that we're embarrassed to show our ideas to our colleagues and others.

And it is this fear that causes us to be conservative in our thinking.

Therefore, we may have wild ideas, but are afraid to share them with others.

Well, kids are not at all embarrassed to try the same exercise on them.

They are happy to show their masterpieces to anyone who wants to see them.

However, as they grow older, they become so sensitive to the opinions of others that they lose that freedom and begin to feel embarrassed.

And research on children's play has repeatedly shown that children who feel safe and in some kind of trusting environment play the most freely.

And if you're starting a design company, for example, you probably want to create a place where people feel the same.

If you have the same kind of security to take risks.

They probably have the same kind of security.

Before starting IDEO, David said all he wanted to do was start a company where all the employees were my best friends.

Now, it wasn't just self-satisfaction.

He knew friendship was a shortcut.

And he knew it gave us a sense of trust and allowed us to take the creative risks that we need as designers.

And it was his decision to work with his friends (now 550) that inspired him to start IDEO.

And our studio, like many creative workplaces today, is designed to make people feel at home and comfortable with the people they work with.

Decor requires more than just decoration, but we've all seen how creative companies often put symbols in their workplaces that remind them of playfulness, and that it's a tolerant environment.

Whether it's in this microbus conference room in one of IDEO's buildings, or at Pixar, animators work in wooden huts and decorated caves. Or head to the Googleplex, famous for its [beach] volleyball courts and even a giant dinosaur skeleton with pink flamingos.

I don't know why there are pink flamingos, but they are in the garden anyway.

Or even Google's Swiss office, which has perhaps the strangest ideas.

And my theory is that the Swiss want to prove to their California colleagues that they're not boring.

There's also a slide and a pole for firefighters.

I don't know what they do with it, but they have it.

So all these places have these symbols.

Now, our big symbols at IDEO aren't really places, they're things.

And in fact it is something that we invented years ago or created years ago.

it's a toy It's called a "finger blaster".

Also, I forgot to bring another one.

So if someone can reach under the next chair, they'll find something taped underneath.

That is wonderful. If you can let me through. Thank you David, I appreciate it.

This is a finger blaster. Everyone will notice it taped under the chair.

And let's do a little experiment. Another little experiment.

But before we start, it's enough to put this on.

thank you. have understood.

Now what I'm going to do is how to see. I can't see out, okay.

We're going to see how many people in the back of the room can actually bring those things up on stage.

As a mechanism, just put your finger in and pull it back and it will come off immediately.

So don't look back. My only recommendation here.

I'd love to see how many people can pull it off on stage.

Come on, come on! I'm going, I'm going thank you. thank you. oh.

I have another idea. I wanted to go -- let's go.

(laughter) Let's go.

(laughs) Thank you, thank you, thank you.

Not bad, not bad. No major injuries so far.

(laughter) Well, they're still coming in from behind. they still come in.

Some have not yet been laid off.

Don't know how or what?

It's not that difficult. Most kids figure out how to do this within the first 10 seconds of picking it up.

have understood. This is pretty good. This is pretty good.

I get it. Let's -- I think it's better...

It's better to put these things away out of the way. Otherwise, you will stumble.

have understood. So save the rest of you for when I say something particularly silly, then shoot at me.

(Laughter) Okay. I think I'm going to take it off now, because when I take it off I can't see anything - okay, okay.

So, oh, it was fun.

(Laughter) Okay, okay.

(Applause) So, okay, so why?

So I prepared a finger blaster. Some people have dinosaurs.

why have them? Well, like I said earlier, we think playfulness might be important, so we have them.

But why is it important?

To be honest, we use this in a pretty practical way.

We believe that playfulness helps us come up with more creative solutions.

It helps you do your job better and makes you feel better when you are working.

Well, adults have encountered a new situation. When we encounter a new situation, we tend to want to sort it out as quickly as possible.

There's a reason for that. Because I want to find the answer.

Life is complicated. We want to be instantly aware of what is happening around us.

In fact, evolutionary biologists probably have many reasons why we want to classify new things quickly.

One of them might be, "Is that a tiger about to jump out and kill us?" when you see this funny striped object.

Or is it just some strange shadow on the tree?

You should figure it out pretty quickly.

Well, at least we did once.

I don't think most of us need that anymore.

This is aluminum foil, right? You use it in the kitchen.

I see. It is natural, of course.

Well, not necessarily.

(Laughter) Children are more interested in open possibilities.

Now, they will certainly ask, "What is it?" when they come across something new.

Of course I would. But they also ask, "What can you do with it?"

And you know, the more creative of them might come up with some really interesting examples.

And this openness is the beginning of exploration play.

Are there any parents with young children in the audience? There should be several.

Yes, I thought so. So we've all seen it, haven't we?

We've all heard stories about how on Christmas morning children play with the box much more than they play with the toys inside.

And from an exploration perspective, this behavior makes perfect sense.

Because you can do much more with boxes than toys.

For example, even something like Tickling Elmo, despite its ingenuity, can only really do one thing, but there are endless options in the box.

Again, this is one of those playful activities that we forget and need to relearn as we age.

Another of Bob McKim's favorite exercises is called the 30 Circle Test.

So back to work. You guys are back to work.

Flip the paper you sketched over and you'll see 30 circles printed on the paper.

So it looks like this: You should be seeing something like this.

So what I'm trying to do is give it a little time and I want as many of the circles as possible to adapt to some form of object.

For example, you can turn one into a soccer ball and the other into the sun. I'm only interested in quantity.

I want you to do as much as you can in the time I am about to explain.

So are you all ready? OK? depart.

have understood. As they say, put down your pencil.

So who found 5 or more circles?

Everyone if possible? More than 10?

Raise your hand if you can do it 10 times.

Anyone got all 15? 20? 30?

no? oh! someone did wonderful.

Has anyone made variations on the theme? Something like a smiley face?

smile? Sad face? sleepy face? Anyone do that?

Anyone using my example? Sun and Football?

wonderful. nice. So I was very interested in quantity.

In fact, I wasn't really interested in whether they were all different.

We wanted you to fill in as many circles as possible.

And one of the things we tend to do as adults is still editing.

We stop ourselves from doing anything.

Self-edit as you come up with ideas.

And sometimes our desire to be original is actually a form of editing.

And it's actually not always really playful.

So the ability to just be challenged and explore a lot, even if they don't seem all that different from each other, is actually what kids are good at, a form of play.

Well, Bob McKim did another version of this test in a fairly famous experiment in the 1960s.

Anyone know what this is? It's a peyote cactus.

It is a plant that can make mescaline, one of the hallucinogens.

If you were active in the 1960s, you might be familiar with it.

McKim published a paper in 1966 describing experiments he and his colleagues conducted to test the effects of psychedelic drugs on creativity.

So he chose 27 specialists—engineers, physicists, mathematicians, architects, furniture designers, artists, etc.—and asked them to come with him one evening and bring the problems they were working on.

He gave each of them mescaline and let them listen to some good relaxing music for a while.

And he conducted something called the Purdue Creativity Test.

You may know as, "How many uses are there for paper clips?"

It's basically the same as the 30 laps you did earlier.

Now, in fact, he did tests before and after giving people drugs to see how they differed in their abilities and how quickly they came up with ideas.

And he told them to go away and work on the problems they brought up.

And they've come up with a lot of interesting solutions to what they've been working on. It was actually a very effective solution.

So some of these people understood some of the things they understood. In one case, a new commercial building and residential design was accepted by a client. A plan for a solar space probe experiment. A redesign of the linear electron accelerator. Technological Improvements to Magnetic Tape Recorders -- I know this was a while ago. Completion of a series of furniture. And even a new conceptual model of photons.

All in all, it was a very successful evening.

In fact, this experiment is probably what got Silicon Valley off to a great start in innovation.

I don't know, but it could be.

I have to ask some of the CEOs if they were involved in this mescaline experiment.

But really, it wasn't the drugs that mattered. The idea was that the drug's effects would shock people, throw them out of their normal way of thinking, and help them forget adult behavior that got in the way of their thinking.

But our habits, adult habits, are hard to change.

At IDEO, the brainstorming rules are written on the wall.

Edicts such as "Defer Judgment" or "Pursue Quantity".

And somehow it seems wrong.

I mean, are there any rules about creativity?

Well, it turns out we need rules that help us break out of the old rules and norms that we might otherwise bring into the creative process.

And over time, I've found that brainstorming becomes more effective and produces more creative results when everyone follows the rules.

Of course, many designers, many individual designers, do this in a more organic way.

I think the Eames are a great example of an experiment.

And they've been experimenting with plywood for years without necessarily having a single goal in mind.

They were looking for something they were interested in.

I think they started out designing splints for wounded soldiers in World War II and the Korean War and moved on to chairs from this experiment.

Through constant experimentation with materials, they developed a wide range of iconic solutions as we know them today, ultimately leading to the legendary lounge chair of course.

If Mr. and Mrs. Eames had stopped at the first great solution, we wouldn't be benefiting from so many great designs today.

And of course, they were experimenting with every aspect of their work, from movies to buildings, games to graphics.

So I think these are great examples of exploration and experimentation in design.

Now, while the Eames were exploring those possibilities, they were also exploring physical objects.

And they were doing it through building prototypes.

And the next action I was going to talk about is construction.

This means that the average Western first grader spends as much as 50% of their playtime in so-called "construction play."

Building Play -- It's playful, but it's also a powerful way to learn.

Kids start learning a lot about towers when the play is to build a tower out of blocks.

And learning happens as a kind of by-product of play as you beat it over and over again.

The classical way is to learn by doing.

Now, David Kelley calls this behavior that designers do "thinking with their hands."

And usually you have to very quickly create multiple low-res prototypes by putting together the many elements found to find a solution.

In one of his early projects, the team got stuck and hacked a prototype made out of roll-on deodorant to come up with a mechanism.

This became the first commercial computer mouse for Apple Lisa and Macintosh.

So they learned how by building a prototype.

Another example is a group of designers working with several surgeons to develop surgical instruments.

they met with them. They were discussing with the surgeon what they needed for this device.

Then one of the designers ran out of the room and grabbed a dry erase marker, a film canister (now becoming an invaluable prototyping medium) and clothespins. He taped them all together, ran back to his room, and said, "Is that what you mean?"

And the surgeon grabbed it and said,

And suddenly there was a productive conversation about design centered around physical objects.

And it ended up being a real device.

This action is therefore aimed at bringing something into the real world quickly and consequently advancing your thinking.

IDEO sometimes feels like I'm back in kindergarten when it comes to the environment.

The prototype cart filled with colored paper, Play-Doh, glue sticks, etc. has a kindergarten-like atmosphere.

But the key idea is that everything is at hand and everything is around.

So when designers are working on an idea, they can start creating whenever they want.

You don't even necessarily have to attend any formal workshop to do it.

And we think it's very important.

And sadly, kindergarten has a lot of these kinds of things, but as kids progress to school they all get taken away.

They lose what drives this kind of playfulness and build-mode thinking.

And of course, by the time you get to the average workplace, perhaps the best construction tool we have might be a post-it. It's pretty barren.

But by giving the project team and the clients you work with permission to think for themselves, some very complex ideas are born that are easier to implement.

As you can see, it's a nurse using a very simple clay prototype explaining to a team of engineers and designers working together at a hospital what they want from a portable information system.

And just by having this very simple prototype, she will be able to talk about what she wants in a more powerful way.

And, of course, building a quick prototype allows you to get your ideas tested by consumers and users much faster than you can describe them in words.

But what if you're designing something that's not physical?

Like a service or experience?

Does it exist as a series of interactions over time?

Instead of building a play, you can tackle this with role-play.

So if you're designing an interaction between two people, like ordering food at a fast food restaurant or something, you need to be able to imagine what that experience will feel like over a period of time.

And I think the best way to achieve that and get a feel for design flaws is to actually perform.

So at IDEO, we do a lot of work to convince our clients of this.

They may be a little skeptical. Return the story.

But I think the real value of this effort is where people are grappling with some pretty serious issues like education, safety, finances, and health.

This is another example of doctors, nurses, and designers performing service scenarios around patient care in a healthcare environment.

But as you know, many adults are quite reluctant to participate in roleplays.

It can be disconcerting, and it's also because they don't believe that what's shown is necessarily valid.

They ignore interesting interactions saying, "It's just because they're acting."

In fact, research on children's behavior suggests that role-playing is worth taking seriously.

Because when children play their roles, they actually follow the social scripts they learn from us as adults very closely.

If one child is playing in the "shop" and the other is playing in the "house", the whole kind of play collapses.

As such, they get used to figuring out the rules of social interaction very quickly, and are quick to point out when they're actually being broken.

So when we roleplay as adults, we already internalize a huge set of these scripts.

We have many experiences in life that give us a strong intuition as to whether an interaction works or not.

So we are very good at finding out if something is unreliable when implementing a solution.

So when I think about experiences, I think role-playing is actually very valuable.

Another way we, as designers, explore roleplay is by putting ourselves in the experience we're designing and projecting ourselves into that experience.

So here are some designers trying to figure out what it feels like to sleep in the limited space of an airplane.

So they took some very simple material, as you can see, and did a roleplay like this. To see what it would feel like for a passenger to be trapped in a very tight space on an airplane.

This is Christian Simsarian, one of our designers. He has experience with ER patients.

Now this is a real hospital, a real emergency room.

One of the reasons he decided to bring this rather large camcorder was because he didn't want doctors and nurses to think he was actually sick and confront him with something he would later regret.

Anyway, he went there with a video camera, and it's kind of interesting to see what he brought back.

Because when he came back and watched the video, it was 20 minutes long.

(Laughter) And the amazing thing about this video is that as soon as you watch it, you project yourself into the experience.

And you know what it's like. While the doctors deal with more urgent cases in one of the emergency rooms, stranded in the hallway wondering what the heck is going on, the uncertainty of it all is felt.

So this concept of using role-play, or in this case living out that experience as a way to generate empathy, is very powerful, especially with video.

Or Altai Sendil, another designer, is doing chest waxing here, and not because he's so conceited. In fact, he sympathizes with the pain that chronic care patients experience when removing bandages.

So in some cases, these similar experiences, similar roleplays can also be very valuable.

So when a child dresses up as a firefighter, he or she is beginning to test that identity.

He wants to know what it feels like to be a firefighter.

We do the same thing as designers.

We are trying these experiences.

The role-play idea therefore serves not only as an empathy tool, but also as a tool for experience prototyping.

Anyway, we kind of respect people who do this at IDEO.

Not only because it leads to insight into the experience, but also because of their willingness to explore and their ability to subconsciously surrender to it.

In short, we admire their willingness to play.

Playful exploration, playful construction, and role-playing are just some of the ways designers use play in their work.

So far, I admit this may sound like a message to just go out and play like a kid.

To some extent, yes, but I would like to emphasize a few points.

The first thing to remember is that play is not anarchy.

Especially for group play, there are rules for play.

When children throw tea parties, cops and robbers, they follow an agreed-upon script.

And this code negotiation leads to productive play.

So, do you remember your first sketching task?

Such a small face, what kind of portrait did you draw?

Well, imagine doing the same task as your friend while drinking in the pub.

But we all agreed to play a game where the worst sketch artist buys the next drink.

With that rule framework, an embarrassing and difficult situation would have turned into a fun game.

As a result, we all felt completely safe and had a great time. But that's because we all understood the rules and agreed to them together.

But there are more than just rules about how to play. There are rules about when to play.

Of course, children are not playing all the time.

They are in and out of it, and good teachers spend a lot of time thinking about how to move children through these experiences.

As designers, we need to be able to transition in and out of play.

And if you run a design studio, you need to understand how you can transition your designers through these different experiences.

I think this is especially true when you think about things like: I think the big difference in terms of design is going through these two very distinct modes of operation.

We go through a kind of generative mode and consider many ideas. And then we come back together to look for that solution and develop that solution.

I think it's two completely different modes: divergence and convergence.

And I think it's probably the divergence mode that needs the most playfulness.

Perhaps in convergence mode you should be more serious.

So being able to move between these modes is very important. So I think a more nuanced version of the view of play is needed here.

Because it is easy to fall into the trap that these states are absolutes.

You can be playful or serious, not both.

But that's not true. You can be a serious professional adult, or you can be playful at times.

It's not an either/or. It is "and".

You can also play seriously.

In summary, you need trust to play, and you need trust to be creative. So there is a connection.

And there is a set of behaviors that we learn as children that are very useful as designers.

They include quests that pursue quantity. Assemble and think with your own hands. Role-playing allows you to empathize more with the situation you're designing and create seamless and authentic services and experiences by acting it out.

thank you very much. (applause)

The scent you smell will never smell like this again.

It's a fragrance called Beyond Paradise, and you can find it in any store across the country.

Except here, it's partly split by Estée Lauder and the perfumer Caris Becker who was responsible for it, and I'm most grateful to them for this.

And it is split into consecutive bits and codes.

So what you're sniffing right now is the top note.

And then comes what they call the heart, a rich heart note.

I will show you it.

The top note "Eden" is named after the Eden Project in the UK.

Rich heart notes, melaleuca bark notes -- Melaleuca bark is not included because it is completely prohibited.

And then the perfect scent.

Well, what you're sniffing is a combination of: I asked how many molecules there were, but no one told me.

So I ran it on the G.C., the gas chromatograph in my office, and it was about 400.

So what you're smelling is hundreds of molecules floating in the air hitting your nose.

And don't get the impression that this is highly subjective.

Everyone smells pretty much the same.

It has a reputation for smelling slightly different from person to person.

it's not true.

And perfume shows that it's not true. Because if it's like that, it's not art.

Now, while the smell is in the air, let me tell you the history of an idea.

Everything you're smelling here is made up of atoms that come from what I call the Upper East Side of the periodic table, the beautiful and safe region.

(Laughter) If you want a career in the perfume industry, you don't want to leave this job.

Some people tried to add bad parts to the 1920s, but it didn't really work.

These five atoms make up almost everything you smell in real life, from coffee to fragrances.

The first top note you sniffed, the green of the grass clippings, what the perfume industry calls - weird terminology - green notes. Because it smells something green like mowed grass.

This is cis-3-hexen-1-ol. And I had to learn chemistry on the fly in the last three years. A very expensive high school chemistry education.

It has 6 carbon atoms, so it is "hexa", hexen-1-ol.

It has one double bond and an alcohol at the end, making it an 'ol', which is why it is called cis-3-hexen-1-ol.

If you understand this, you can make a big impression on people at the party.

It smells like cut grass. Now, this is the skeleton of the molecule.

If you decorate this with atoms, hydrogen atoms, it looks like this on your computer, but in reality it's more like this in the sense that atoms have specific spheres that they can't penetrate. they repel.

okay now Why does this smell like cut grass?

Why doesn't it smell like potatoes or violets? Well, there are actually two theories.

But the first theory is that it must be a shape.

And in the sense that almost everything else in biology works by shape, this is a perfectly reasonable theory.

The chewing enzymes, the antibodies, it's all, you know, the compatibility between the protein and what it captures, in this case, the smell.

And I'll try to explain what's wrong with this concept.

And another theory is that we smell molecular vibrations.

Now, this is a totally insane idea.

When I first encountered this problem in the early '90s, I thought my predecessors, Malcolm Dyson and Bob Wright, had really lost their minds. I'll explain later why this happened.

But I slowly started to realize they might be right. And I have to convince all my colleagues that this is right, but I'm working on it.

Here's how shape works in a normal receptor.

A molecule comes in and it goes into a protein, and this is a schematic, which by binding at a specific part switches it on, it turns it on, it makes it move in some way.

And the attraction, or force, between molecules and proteins causes motion. This is a shape-based idea.

Well, the problem of shape is summarized in this slide.

The method expects you to memorize these compounds.

This is a page from a chemist's textbook, right?

I work for a fragrance company.

He's made 45 molecules and is looking for sandalwood, something that smells like sandalwood.

Because Sandalwood has a lot of money.

And of those 45 molecules, only 4629 actually smell like sandalwood.

And he puts an exclamation point, okay? This is a lot of work.

In fact, this translates to roughly $200,000 a person-year if you keep your wages low with no benefits.

So this is a very inefficient process.

And my definition of theory is that it's not just about teaching people. Labor saving.

Theory is what makes it possible to work less.

I love the idea of ​​working less. Now let me explain why. A very simple fact that shows why this shape theory doesn't work very well in practice.

This is cis-3-hexen-1-ol. It smells like cut grass.

This is cis-3-hexene-1-thiol and it smells like rotten eggs, okay?

Well, you probably noticed that vodka doesn't smell like rotten eggs at all.

If that happens, put your glass down and go to another bar.

This means that you never get O-H. You can't go wrong with S-H.

For example, if you sniff pure ethanol, even if it's unconcentrated, it doesn't smell like rotten eggs.

Conversely, there is no concentration of sulfur compounds that smells like vodka.

It is very difficult to explain this with molecular recognition.

Now, I showed this to a physicist friend who has a huge dislike for biology, and he said, "That's easy! Things look different!"

(Laughter) We have to go a little beyond that. Let me now explain why vibrational theory is of some interest. These molecules, as we saw at the beginning, have springs connecting them to each other.

In fact, molecules can vibrate at a set of frequencies very specific to each molecule and the bonds that connect them.

This is the sound of the O-H stretch translated into the audible range.

S-H, quite different frequencies.

Now, this is kind of interesting. It turns out that you need to look for certain facts. In other words, nothing in the world smells like rotten eggs other than S-H.

Now, Fact B: There is nothing in the world with that frequency, except S-H.

Imagine a piano keyboard when you see this.

The S-H stretch sits, so to speak, in the middle of a piece of damaged keyboard, with no adjacent notes and nothing close to it.

You have a unique smell, a unique vibration.

So when I started playing this game, I did some searching to convince myself there was some validity to this whole crazy story.

I searched for that vibration and the kind of molecule that has that property. The obvious prediction was that any molecule would definitely smell of sulfur.

If not, the idea is all over and you might as well move on.

After several months of research, I discovered that there is a class of molecules called boranes that have exactly the same vibrations.

Well, the good news is that you can get Bolanes.

The bad news is that they are rocket fuel.

Most of them spontaneously explode when exposed to air, and even if you call the company, they will only provide you with a minimum of 10 tons.

(Laughter.) I mean, this wasn't what you would call a lab-scale experiment, and it wouldn't have been favored at my university.

But in the end I managed to get my hands on Bolan. And here is the beast.

And it's really the same -- if you do the math and measure the vibrational frequencies, they're the same as S-H.

Now, do you smell sulfur? Well, going back in the literature, there was a man, Alfred Stock, who knew more about Bolanes than anyone alive then or after, and he put it all together.

And in a huge 40-page paper in German, one time--my wife is German and she translated it--one time he said it was "Ganz-Widerlich-Guelph," that is, "absolutely disgusting," and he said it was a good thing. Reminiscent of hydrogen sulfide.

So this fact that the Boran Islands smelled of sulfur was known since 1910, but was completely forgotten until 1997 or 1998.

Now, a small problem with ointments is that if you want to smell molecular vibrations, you have to put a spectroscope in your nose.

Well, this is the spectrometer on my lab bench.

And it's safe to say that if you look into someone's nose, you'll find very few things that look like this.

And this is the main objection to this theory.

Ok, I can smell the vibration. how? have understood?

Now, people who ask this sort of question ignore that physicists are really smart, unlike biologists.

(Laughter) This is a joke. I'm a biologist, okay?

So this is a joke to myself.

Bob Jacklovich and John Lamb of the Ford Motor Company discovered how to build spectrometers that are essentially nanoscale at a time when Ford Motor Company was spending huge amounts of money on basic research.

In other words, no mirrors, no lasers, no prisms, no nonsense, just a tiny device, he built this device. And this device takes advantage of the electron tunneling effect.

Well, you could do the electronic tunnel dance, but I made a video instead. This is much more interesting. Here's how it works:

Electrons are fuzzy creatures, they can jump across gaps, but only with the same energy. You can't jump if the energy is different.

Unlike us, they don't fall off cliffs.

OK. now. Electrons can move when something absorbs energy.

There's a system here, there's something, and there's a lot of that stuff in biology. A reaction occurs only when a substance gives up an electron, the electron tries to jump, and a molecule with the appropriate vibration appears.

This is the basis of the device that the two guys at Ford built.

And every part of this mechanism is actually plausible in biology.

In other words, we used off-the-shelf components to create a spectrometer.

If you're a philosophical thinker, the nice thing about this idea is that you can see that the nose, ears, and eyes are all vibrational senses.

Of course it might not, so it doesn't matter.

But there's a certain -- (laughter) -- resonance in this work that appeals to those who've read too much of nineteenth-century German literature.

And then something wonderful happened. I left academia and joined the real world of business. And a company was founded around my idea, and I was able to make new molecules my way. So it was like, "Let's put other people's money in your mouth."

And one of the first things that happened was that we started going around perfume companies and asking what they needed. Because, of course, if you could calculate the smell, you wouldn't need a chemist.

A computer is required. If you know how to program properly, you can do it on your Mac. So you can try 1,000 molecules in a weekend, or 10,000 molecules, and then just tell the chemists to build the right one.

And that's a direct route to making new odorants.

And one of the first things that happened was that we went to see the French perfumers. Here I'm quoting Charles Fleischer, and one of them said, "You can't make coumarins."

He says to me, "You can't make coumarins."

Now, coumarin is a very common flavoring ingredient that comes from South American beans.

It's a classic synthetic fragrance, right?

Precisely, this is the molecule that has made the scents of men's fragrances since 1881.

And the problem is that it is a carcinogen.

Therefore, no one particularly likes carcinogenic aftershaves.

(Laughter) Some people are reckless, but it's useless, right?

So they asked us to make a new coumarin. So we started doing the math.

And the first thing to do is calculate the vibrational spectrum of coumarin and smooth it. That way, you'll have a good idea of ​​what the Coumarin code looks like, so to speak.

Then it starts firing up the computer to find other molecules with the same vibrations, related or unrelated.

And indeed in this case, sorry, it happened by accident.

Because our chief chemist called me and he said, "Look, this is a very beautiful reaction, even if this compound doesn't smell like coumarin, I want to do it. It's a very nifty, step. I mean, chemists have weird brains. Step, you get this beautiful crystalline compound in 90 percent yield."

And I said, first of all, let me do the math on the bottom right compound. It is related to coumarin, but has an additional pentagon inserted into the molecule.

Calculate your vibration. Purple spectrum is newer people, white spectrum is older people.

And, as expected, it should smell like coumarin.

They made it...and it smelled exactly like coumarin.

Here is our newborn baby, Tonken.

As you know, scientists are always pitching ideas.

And people are very resistant to ideas, and that's understandable.

Why should new ideas be accepted?

But when you put a small 10-gram vial on the table in front of the perfumers and it smells like coumarin, but it's not coumarin, and three weeks later you find it, this wonderfully centers everyone's minds.

(Laughter) (Applause) And people often ask me, is your theory acceptable?

And I said, "By whom?" So in most cases there are three attitudes. "You're right, and I don't know why. Which one makes the most sense at this point."

You're right and I kind of don't care how you do it. you bring me molecules

And: you are totally wrong, and I am sure you are totally wrong.

OK? Now we are dealing with people who just want results, and this is the world of commerce.

And happy, they say, even if you do it with astrology.

But we don't actually do that by astrology.

But for the past three years, I have what I consider to be the best job in the entire universe. It's about my hobby - fragrances and awesome stuff plus a little bit of biophysics and a little bit of self-taught chemistry for something that's actually useful.

thank you very much.

(applause)

So, in June 2016, the day after the Brexit vote, when I woke up in shock to learn that the UK was leaving the European Union, I was asked by the editor of the British newspaper The Observer to write a report back in South Wales, where I grew up.

So I went to a town called Ebb Vale.

here it is.

This is a very special place in the South Wales Valley.

It has a very rich working-class culture and is famous for its Welsh men's choir, rugby and coal.

However, when I was a teenager, the coal mines and steel mills closed, and the whole area was devastated.

And I went there because it was one of the areas in the country with the most "leave" votes.

62% of the population here voted to leave the EU.

And I wanted to know why.

The last time I went to Ebb Vale was like this, so when I arrived I was a bit taken aback.

And now it looks like this.

This is a new £33million further education university, mostly funded by the European Union.

And this is a new sports center in the middle of a £350m revitalization project funded by the European Union.

This is a £77million new road improvement project with new rail lines and new stations, all funded by the European Union.

And with big signs like this everywhere, it's not as if this is a secret.

[EU Fund: Investing in Wales] (Laughter) Walking around the city, I felt a kind of strange unreality.

And that came to mind when I met this young man in front of the sports center.

And he told me he voted to leave because the European Union did nothing for him.

he was fed up with it.

And people all over town told me the same thing.

They said they wanted to regain control, one of the campaign's slogans.

And they told me they were most fed up with immigrants and refugees.

they've had enough.

It was strange.

I didn't meet immigrants or refugees while walking.

I met a Polish woman who said she was effectively the only foreigner in town.

And when I looked up the numbers, I found that Ebbw Vale actually has one of the lowest immigration rates in the country.

I was a bit perplexed because I had no idea where people were getting their information from.

Because it was right-wing tabloids that published all these stories about immigration.

However, after the article was published, this woman contacted me.

She is from Ebbw Vale and told me about everything she saw on Facebook.

I was like, "What are you talking about?"

And she said that immigration, especially Turkey, is very scary.

So I looked for it.

But there was nothing there.

Because there is no archive of the ads people have seen or been pushed into their news feeds.

There was nothing left and it was pitch black.

And this referendum will forever have a profound effect on Britain - and it has already had a profound effect: Japanese car makers, who came to Wales and the North East to replace mining jobs - have already left because of Brexit.

And because the referendum took place on Facebook, it took place in the dark.

And what happens on Facebook stays on Facebook. It's impossible to research anything because your news feed is only seen by you and then disappears.

So we don't know who saw what ads, what impact they had, or what data was used to target these people.

Or who placed the ad, how much money was spent, or even the nationality of that ad.

But Facebook does.

Facebook has these answers but refuses to provide them to us.

Our Parliament has asked Mark Zuckerberg many times to come to the UK and give us these answers.

And every time he is rejected.

And you have to wonder why.

Because what I and other journalists have revealed is that multiple crimes occurred during the referendum.

And they were done on Facebook.

The UK limits the amount of money that can be spent in elections.

That's because in the 19th century people literally walked around with wheelbarrows loaded with cash just to buy voters.

So we enacted these strict laws to prevent that from happening.

But those laws no longer work.

The referendum was almost entirely online.

And while you can spend unlimited amounts of money on Facebook, Google, and YouTube ads, they are black boxes and nobody knows.

And so this happened.

In fact, we have no idea of ​​the full extent of it.

What we do know, however, is that in the final days before the Brexit vote, an official 'withdraw vote' campaign laundered nearly £150,000 through another campaign group, which the Electoral Commission deemed illegal and referred to the police.

And with this illicit cash, "Vote Leave" unleashed a firehose of disinformation.

Ads like this.

[Turkey 76 million join the EU] This is a lie, a complete lie.

Turkey is not a member of the European Union.

There is even no discussion of joining the European Union.

And most of us never see these ads because we weren't the target.

"Vote Leave" identified a small percentage of people who found it persuasive, and they saw them.

And the only reason we're seeing these now is because Congress forced Facebook to turn them over.

And maybe you're thinking, 'Well, it was a bit of a waste.

That's some lies. ”

But it was Britain's biggest election fraud in the last 100 years.

A once-in-a-generation vote that cost just 1 percent of voters.

And that was just one of the crimes that happened in the referendum.

There was another group, led by a man named Nigel Farage, who was Trump's right group.

And his group, Leave.EU, was also illegal.

This violates UK elections law and UK data law and has been reported to the police.

And this man, Aaron Banks, funded this campaign.

And in an entirely different case, he is being referred to the National Crime Service (equivalent to the FBI) ​​because the Election Commission has concluded that his money is unknown.

Or if it was British.

And I'm not even going into the lies Aaron Banks told about his secret relationship with the Russian government.

Or the odd timing of Nigel Farage meeting with Julian Assange and with Trump's now-indicted sidekick Roger Stone just before two massive WikiLeaks dumps, both of which happened to benefit Donald Trump.

But let me tell you that Brexit and Trump were inextricably intertwined.

This man told me that Brexit was Trump's petri dish.

And we know it's the same people, the same companies, the same data, the same techniques, the same use of hate and fear.

This is what they were posting on Facebook.

And I don't want to call this a lie, because [immigration without assimilation equals aggression] feels like a hate crime to me.

It goes without saying that hate and fear are being instilled online all over the world.

Not only in England and America, but also in France, Hungary, Brazil, Myanmar and New Zealand.

And we know there is this dark undertow that binds us all around the world.

And it's flowing through technology platforms.

But what we see is only a fraction of what is happening on the surface.

And I learned something about this dark side only when I started researching the relationship between Trump and Farage at a company called Cambridge Analytica.

And I spent months tracking down former employee Christopher Wiley.

And he told me how the company that served both President Trump and Brexit has been politically profiling people in order to understand their personal fears and better target them with Facebook ads.

And it did this by illegally harvesting 87 million profiles from Facebook.

It took a whole year to put Christopher on record.

To do that, I had to make the transition from being a feature writer to being an investigative reporter.

And he was extraordinarily brave. That company is owned by Trump-financed billionaire Robert Mercer, who has repeatedly threatened lawsuits to stop us from publishing.

But we finally got there, one day before publication.

I also received legal threats.

This time it's from Facebook, not Cambridge Analytica.

I was told they would sue if we published.

I did it anyway.

(Applause.) Mr. Facebook, you were on the wrong side of history.

And you were on the wrong side of history in refusing to give us the answers we needed.

And that's why I am here.

God of Silicon Valley, I speak directly to you.

(Applause) Mark Zuckerberg...

(Applause.) Sheryl Sandberg and Larry Page, Sergey Brin and Jack Dorsey, and your employees and investors.

Because 100 years ago, gas was the biggest danger in the coal mines of South Wales.

Silent, deadly, invisible.

That's why they sent the canary in the first place to check the air.

And we in the UK are the canaries in this massive global online experiment that we are all going through.

We are like what happens to Western democracies when 100-year-old electoral laws are destroyed by technology.

Our democracy is broken and our laws no longer work. It's not me who's saying this, our Congress issued a report like this.

This technology you invented is great.

But now it's a crime scene.

and you have proof.

And it's not enough to say that it will be better in the future.

Because we have to know the truth in order to have hope that something like this will never happen again.

And maybe you're thinking, 'It was just a few ads.

And people are smarter than that, right? ”

In response, I say, "Well then, do your best."

Because the Brexit vote shows that liberal democracy is collapsing.

and you broke it

This is not democracy. Spread lies in the dark and God knows where the money will come from.

It is subversive and you are its accessories.

(Applause.) Our Congress was the first in the world to hold you accountable, and it failed.

You are literally beyond British law. There are nine parliaments, nine national representatives here, not just British law, but Mark Zuckerberg refused to attend and give evidence.

And what you don't seem to understand is that this is bigger than you.

And it's bigger than any of us.

And it's not a question of left or right, 'leave' or 'remain', or Trump or not.

The question is whether it is really possible to hold free and fair elections again.

Because I don't think that's the case at the moment.

So my question to you is is this what you want? about it.

Do you want history to remember you as the Handmaiden of a rising authoritarian government around the world?

Because you aim to connect people.

And you refuse to admit that the same technology is now separating us.

And my question to everyone else is this what we want. Do you want them to get out of this problem and just sit and play with their phones in the dark?

The history of the South Wales Valley is a history of fighting for rights.

And this is not a training, but a tipping point.

Democracy is neither guaranteed nor inevitable. We must fight and we must win. Technology companies cannot have this unbridled power.

It's up to us, you, me, and all of us.

We are the ones who have to take back control.

(Applause) (Cheers) (Applause)

So about three years ago, I was in London, and a guy named Howard Burton came to me and said, "I represent a group of people, and I want to set up a theoretical physics laboratory."

We have about $120 million and want to do well with it.

We want to be at the forefront, and we want to do things differently.

We want to get out of this situation where the young have all the ideas, the old have all the power and science decides what happens.

It took me about 25 seconds before I decided it was a good idea.

Three years later, the Perimeter Institute for Theoretical Physics was established in Waterloo, Ontario. It's the most exciting job I've ever had.

And this is the first time I'm scared to quit my job given everything that will happen this week while I'm here.

(Laughter) But anyway, what I'm going to do in a little bit of time is to briefly introduce some of the things we're talking about and thinking about.

So do we have a good idea of ​​what makes science really work?

The first thing that comes to mind for those who know science and have been involved in it is that what they learn in school as the scientific method is wrong. There is no way.

On the other hand, we manage to reason together as a community from incomplete evidence to conclusions we all agree on.

By the way, this is something that must be done in a democratic society as well.

So how does it work?

My belief is that it works because scientists are a community bound together by ethics.

Here are some of our ethical principles.

I'm not in teacher mode, so I'm not going to read everything.

I'm in amuse, amaze mode.

(Laughter) But one of the principles is that everyone who is part of the community should fight and argue with all their might for what they believe.

But we are all governed by the understanding that it is only the people of our community, the next generation, 30 years from now, 50 years from now, who will decide if I am right or someone else is right.

In short, the combination of respect for the traditions and communities we are in, and the rebellion that communities require to reach their destination, is what makes science work.

And I believe that being in a community that reason from shared evidence to conclusions teaches us about democracy.

Not only is there a relationship between the ethics of science and the ethics of citizenship in a democracy, but historically there has also been a relationship between how people think about space and time, what the universe is, and how people think about the society in which they live.

And I would like to talk about three stages in that evolution.

The first science of science-like cosmology was Aristotelian science, and it was hierarchical.

Earth is at the center, then there are these crystal balls, the sun, the moon, the planets, and finally the celestial sphere where the stars reside. And everything in this universe has a place.

And Aristotle's law of motion was that everything goes to its natural place. This, of course, was also the rule of the society in which Aristotle lived, and more importantly, the medieval society that accepted and blessed Aristotle through Christianity.

And the idea is that everything is defined.

Where anything is is defined in terms of this last sphere, the celestial sphere, and outside of it is this realm of eternal perfection, in which God, the Ultimate Judge of all, resides.

So it's Aristotle's cosmology and, in a sense, medieval society.

Well, the 17th century saw a revolution in Newton's way of thinking about space, time, motion, and so on.

At the same time, there was also a revolution in social thought by John Locke and his collaborators.

And they were very closely related.

In fact, Newton and Locke were friends.

Their ideas about space, time and movement on the one hand, and society on the other, were closely related.

And let me show you.

Newton's universe has no center. thank you.

Particles exist and they move about according to a fixed and absolute framework of space and time.

It makes sense to say absolutely where something is in space. For it is defined not in terms of where other things are, but in terms of this absolute conception of space that was divine to Newton.

Now, likewise, in Locke's society there are individuals with specific rights and property in a formal sense, defined in terms of absolute and abstract concepts such as rights and justice, independent of what else happens in society.

About who else is there, history, etc.

There are also all-knowing, all-knowing observers. who is god God is, in a sense, outside the universe. Because God has no part in whatever happens. But in some ways they are everywhere. Because, according to Newton, the universe is just a means by which God knows where everything is.

So this is the foundation of what is traditionally called liberal political theory and Newtonian physics.

Now, in the 20th century there was a revolution that started in the early 20th century and continues today.

It started with the invention of relativity and quantum theory.

The culmination of this work is to fuse them together to create a final quantum theory of space, time and gravity.

And nothing in this universe is fixed and absolute. Zilch, I see.

This universe is described as a network of relationships.

Space is only one aspect, and it makes no sense to say absolutely where something is.

There are only things that are relative to everything else.

And this network of relationships is constantly evolving.

Therefore, we call it the relational universe.

All the nature of things is based on this kind of relationship.

Also, if you are embedded in such a relationship network, your worldview is related to what information is available through the relationship network.

And there is no place for an all-knowing observer or an all-knowing, all-creating external intelligence.

This is general relativity, this is quantum theory.

According to legal scholars, it is also the basis for new ideas in legal thought.

they are thinking about the same thing.

Not only that, they often compare it to relativity and cosmology.

There is an interesting discussion going on there.

This last cosmological view is called the relational view.

So the main slogan here is that there is nothing outside the universe. This means that there is no room to explain anything outside the universe.

Therefore, in a world of such relationships, if you come across something that is orderly and structured or beautiful, like this device here or that device there, or all living things, everyone in the room, by the way, "man" in physics is a generic term for male and female.

(Laughter.) And you want to know, you're human, you want to know how it's made.

And in the world of relationships, the only possible explanation is that in some way it was made automatically.

There must be a mechanism for self-organization in the universe that makes things.

Because there is no place to put the maker outside like in the Aristotelian or Newtonian universes.

Therefore, the world of relationships requires a process of self-organization.

Well, Darwin taught us that there are enough processes of self-organization to explain all of us and everything we see.

That works. But more than that, when we consider how natural selection works, we see that it only makes sense in a world of such relationships.

In other words, natural selection affects traits such as fitness in relation to one species' relationship to other species.

Darwin makes no sense in Aristotle's universe, nor does it make any sense in Newton's universe.

A theory of biology based on natural selection therefore requires a relational conception of what the properties of a biological system are.

And this all boils down to making the most sense in the relational world where all properties are relational.

Not only that, but Einstein taught us that gravity is the result of the relationships the world has.

Without gravity, life would not exist. Stars are formed by gravity, they live for very long periods of time, and parts of the world, such as the surface of the Earth, are thrown out of thermal equilibrium for billions of years, allowing life to evolve.

Two major themes in science developed independently in the 20th century.

Biological sciences have studied the implications of the notion that order, complexity, and structure arise in a self-organized way.

It was a victory for Neo-Darwinism and others.

And the idea is gradually leaking into cognitive science, humanities, economics, and so on.

At the same time, we physicists have been busy understanding, building on, and synthesizing the discoveries of quantum theory and relativity.

And what we have figured out is the meaning of the idea that the universe is, in fact, made up of relationships.

Twenty-first century science will be driven by the integration of these two ideas. The triumph of the relational way of thinking about the world on the one hand, and the triumph of the self-organizing or Darwinian way of thinking about the world on the other.

And in the 21st century, I believe that our way of thinking about space-time, cosmology, and society will continue to evolve.

And what they're evolving is a union of two big ideas: Darwinism and relationalism.

Now, if we think about democracy from this perspective, the new pluralistic conception of democracy will be one that recognizes that there are many different interests, many different agendas, many different individuals, and many different perspectives.

Each of you is imperfect because you are embedded in a network of relationships.

Every actor in a democracy is embedded in a network of relationships.

And you understand some things better than others. So there are constant conflicts and give-and-takes. That's politics.

And in an ideal sense, politics is how we continuously work on our networks of relationships to achieve a better life and a better society.

And I also believe that science will never go away, and I'll end with this line.

(Laughter) Actually, it's over. Science never goes away.

Chris Anderson: What are you worried about now?

You've been very open about many issues on Twitter.

What are you most worried about about the current situation?

Jack Dorsey: Right now it's the health of the conversation.

So our goal is to help public discourse, and we've seen a lot of attacks against that.

We have seen abuse, harassment, manipulation, automation, human coordination, and misinformation.

So these are all moves that we didn't anticipate when we started the company 13 years ago.

But we are seeing them on a massive scale now, and what worries me most is our ability to understand exactly how we behave, to understand it with transparency, and to deal with it in a scalable and systematic way, with a rigorous appeals process for when we are wrong. because we are wrong.

Whitney Pennington Rogers: I am very happy to hear that it is your concern. I think a lot has been written about people feeling abused and harassed on Twitter, but I don't think anyone feels that way more than women, women of color, and black women.

And then there are the published data. Amnesty International released a report a few months ago that showed that some of Twitter's active black female users experienced some form of harassment in, on average, 1 in 10 tweets.

So when we think about the health of our community on Twitter, we like to hear the phrase “health for everyone,” but specifically, how do you make Twitter a safer place for some of it, women, women of color, and black women?

JD: Right.

So, ideally, you come to a service wanting to learn something about the world, but spending the majority of your time reporting abuse, being abused, or being harassed is a pretty awful situation.

Therefore, our deepest focus is on the incentives that platforms and services naturally offer.

The dynamics of the system now make it very easy to harass and abuse others through the service. Unfortunately, most systems to date have worked entirely based on people reporting harassment and abuse.

So, around the middle of last year, we decided to apply more machine learning, more deep learning to this problem, and be more aggressive where abuse is happening so that we can take the burden off the victim entirely.

And recently we've made some progress.

Today, about 38 percent of abusive tweets are positively identified by machine learning algorithms, so they don't actually need to be reported.

However, what is identified will still be reviewed by humans, so we will not remove any content or accounts without an actual human review.

But just a year ago it was zero percent.

So that zero percent means that everyone who has been abused must actually report it. This is a lot of work for them and for us, and ultimately unfair.

Another thing we do is, as a company, we represent all the communities we seek to serve.

You can't build a successful business if you don't have diverse perspectives within your company while experiencing these issues on a daily basis.

And that applies not just to the teams we work with, but to our leadership as well.

Therefore, we need to continue to build empathy for what people are going through and provide better tools to act on it, as well as better and easier approaches to addressing some of the things our customers face.

So a lot of what we do is around technology, but we also look at incentives around service. What will Twitter incentivize you to do when you first open the service?

And in the past, it has instigated many outrageous acts, instigated many mob actions, and instigated many group harassments.

And to make a bigger change, we need to look deeper into the fundamentals of what services do.

As I explained earlier, you can make a lot of small changes with technology, but ultimately you have to look deep into the dynamics of the network itself, and that's what we're working on.

CA: But what are your feelings? What are the things that you could possibly change that would actually fundamentally change your behavior?

JD: Well, one of them is that we launched the service with the concept of following accounts, as an example, but I don't think that's why people actually come to Twitter.

I believe Twitter is the best interest-based network.

People come with special interests.

Finding and following accounts relevant to those interests requires a huge amount of work.

What we can do instead is allow people to follow interests, follow hashtags, follow trends, follow communities. This gives you the opportunity to see all accounts, all topics, all moments, and all hashtags related to that particular topic or interest, opening up a real perspective.

But this is a radical shift in shifting the entire network from just account bias to topic and interest bias.

CA: Because one of the reasons there's so much content out there, isn't it the result of having millions of people around the world participate in this kind of gladiatorial competition for followers and attention?

For example, to people who just read Twitter, it doesn't matter, but to people who actually create Twitter, everyone says, "I wish I had a few more likes, followers, and retweets."

So they are always experimenting and trying to find a way to do that.

And what we've all discovered is that the best way to do that is to make statements that are in some way provocative, offensive, and eloquently offensive. Eloquent insults are a pipe dream on Twitter, quickly piling up into a process that fuels itself and fuels anger.

how do you unlock it?

JD: Well, I think you're right on point, but it goes back to incentives.

Similarly, one of the choices we made in the early days was getting this number of people following you.

We decided the numbers should be big and bold. The big, bold things on the page are important and you want to promote them.

Was it the right decision at the time?

Probably not.

If I were to restart the service, I wouldn't care so much about the number of followers.

I don't really care about the number of likes.

In the first place, I don't think I'll even make a "Like!" Because it doesn't really drive what we currently believe to be most important: healthy contributions to networks, conversations with networks, participation in conversations, and learning from conversations.

These aren't things we thought 13 years ago and we think are very important now.

So we need to consider how we display follower counts, how we display retweets, how we display likes, and ask the deep question, “Is this really the number we want people to increase?”

When you open Twitter, do you mean 'I have to increase this'?

And I don't think so now.

(Applause) WPR: I think we should also look at some of the tweets coming in from the audience.

CA: Let's see what you guys are asking.

So this is, in general, one of the great things about Twitter is that you can use it as the wisdom of the crowd. So there is more knowledge, more questions, more perspectives than you can imagine, and in some cases a lot of them are very sound.

WPR: I think what I've seen has spread here already very quickly. "What is Twitter's plan to combat foreign interference in the 2020 US election?"

I believe this is a problem seen all over the internet, with a lot of malicious automatic activity happening.

And on Twitter, for example, we actually have some work contributed by our friends at Zignal Labs. Perhaps a concrete example of what I'm talking about could be an example of where these bots reside, or coordinated automated malicious account activity being used to influence elections and such.

In this example, Zignal used and shared data from Twitter. In fact, in this case, we see that the white stands for humans, or human accounts, and each dot is an account.

The pinker the color, the more automated the activity.

And you can see how a few humans are interacting with the bot.

In this case, it has to do with the Israeli elections and the spread of misinformation about Benny Gantz, which, as you know, was ultimately won by Netanyahu by a narrow margin, possibly influenced by this.

And when you think about that sort of thing happening on Twitter, what exactly are you doing to ensure that misinformation like this doesn't spread like this and affect people in ways that could affect democracy?

JD: Going back a little bit, we asked ourselves. Can you really measure the health of your conversations? Also what does it mean?

And I believe we can find indicators of health in speech, just as you and us humans have indicators of health, such as body temperature and facial flushing.

And we worked with a lab at MIT called Cortico to propose four starter metrics that we ultimately thought could be measured by the system.

The first is what we call 'shared attention'.

This is a measure of how carefully conversations are conducted on the same topic and on different topics.

The second is called shared reality, which is the percentage of conversations that share the same facts. It's not about whether the facts are true or not, but are they sharing the same facts during the conversation?

The third is acceptability. How much of the conversation is receptive and polite, or vice versa and harmful?

And the fourth is the diversity of perspectives.

So are we looking at filter bubbles and echo chambers, or are we actually getting different opinions in conversation?

And implicit in all four of these is the understanding that the more you talk, the healthier the conversation becomes.

So our first step is to see if we can measure these online and we believe we can.

We have the most momentum when it comes to receptivity.

Our system has a Toxicity Score, or Toxicity Model, that can actually measure whether a conversation on Twitter feels so highly toxic that people are likely to walk away from it.

We are working on the rest of the measurements and the next step is to observe how these measurements trend over time and continue experimenting as we build the solution.

And our goal is to make sure these are in balance. This is because increasing one may decrease the other.

Increasing the diversity of perspectives can actually decrease the shared reality.

CA: I just picked up some of the questions that are pouring in here.

JD: They keep asking me.

CA: A lot of people wonder why it's so hard to keep Nazis out of Twitter.

JD: (Laughter) So, we have a policy on violent extremist groups, and much of our work and terms of service are based on behavior, not content.

In other words, we are actually asking for action.

Use the Service to repeatedly or intermittently harass anyone using hateful imagery that may be associated with the KKK or the American Nazi Party.

These are all things that we should act on immediately.

We are currently in a situation where the term is used fairly loosely and cannot be taken as an indication of the fact that any reference to the term denouncing others should be removed from the platform.

Therefore, many of our models are based primarily on Is this account associated with a violent extremist group?

If so, we can take action.

And we've done the same with the KKK, the American Nazi Party, and others.

And second, do they use images and actions that are associated with them?

CA: How many people are working on content moderation to see this?

JD: It varies.

We want to be flexible about this. Because we want to focus on building algorithms rather than just hiring lots of people. We have to make sure this is scalable, because not many people can really scale this.

This is why we've done a lot of work around proactive detection of abuse that can be reviewed by humans.

We want algorithms to constantly scrutinize all tweets, show the most interesting ones at the top, and make human action decisions based on terms of service.

WPR: But we don't have a scalable number, but how many people are currently monitoring these accounts? How do we know enough?

JD: They're completely flexible.

Sometimes we associate people with spam.

Sometimes we associate people with abuse and harassment.

We will give our employees the flexibility to work towards what is most needed.

Sometimes elections.

With a series of elections in Mexico and of course India with last year's elections and mid-term elections, we want to be flexible with our resources.

So, for example, if you go to our current Terms of Use and view that page and wonder about the abuse or harassment you just received and whether reporting it violates our Terms of Use, the first thing you see when you open that page is about intellectual property protection.

Scroll down to see abuse, harassment, and anything else you may be experiencing.

So, I don't know how that happened in the company's history, but we prioritized that over what people wanted most information and actually wanted to do.

And just by ordering we show the world what we believed was important.

So we are changing everything.

We're ordering the right way, but we're simplifying the rules to be human readable so people can really understand when something is against our conventions and when it's not.

And our primary focus is on taking the burden of work off the victim.

That means pushing technology more than humans do the work. This means that humans need to rethink their jobs at the same time that humans get abused.

So rather than just encouraging more work on the very, very negative things, we want to strike the right balance between technology and areas where humans can actually be creative. This is a rule decision, not just a mechanical thing to find and report a rule.

That's how we think.

CA: I'd like to dig deeper into what you said.

I mean, I loved that you said you were looking for ways to readjust the basic design of the system to curb some reactive behaviors and perhaps - to use Tristan Harris-esque language - encourage more introspective thinking in people.

how far is it going?

What would replace that "Like" button?

JD: Well, first and foremost, my personal goal with this service is that I fundamentally believe that public conversation is important.

There are existential problems facing the whole world, not specific nation-states, that would benefit from a global public conversation.

That's one of the unique dynamics of Twitter, Twitter is completely open, completely public, completely fluid, everyone can see and participate in other conversations.

So there are also topics like climate change.

There are conversations like the replacement of works via artificial intelligence.

There is also talk of economic inequality.

No single nation-state can solve the problem alone, no matter what any nation-state does.

That will require global coordination, and I think Twitter can play a role in that.

Second, when you visit Twitter, you don't necessarily walk away feeling like you've learned something.

Some do.

Some have very rich networks and rich communities from which they learn every day.

But it takes a lot of effort and time to make it happen.

So we want to get people onto those topics and interests sooner, and make sure they find something no matter how much time they spend on Twitter -- and I don't want to maximize their time on Twitter, I want to maximize what they actually get from Twitter and what they learn from it. And -- CA: Right, right?

Because that is the core question that many people want to know.

Sure, Jack, you're pretty constrained by the fact that you're a publicly traded company, you're under investor pressure, and the number one way to make money is through advertising, which relies on user engagement.

Are you willing to sacrifice the user's time for more introspective conversations when necessary?

JD: Right. More relevance means less time on the service. That's perfectly fine. Because we want people to go to Twitter and quickly find something they can learn from and push.

It is possible to serve ads that counteract this.

That doesn't mean you should spend any more time looking for more.

The second thing we look at -- CA: but just -- for that goal is daily active usage, but if you're measuring that, it doesn't necessarily mean what people value every day.

It could mean something that people are drawn to every day like a moth to a fire.

We are addicted because we see things that make us angry and add fuel to the fire. The result is more daily active usage, and more ad revenue from that, but we all make each other even more angry.

How would you define...

"Daily active usage" seems like a very dangerous term for optimization.

(Applause) JD: On its own, yes, but you didn't complete the other metrics. In other words, it monitors conversations and chains of conversations.

Therefore, we want to encourage healthy contributions to the network. And we believe in actually participating in healthy conversations, as defined by the four metrics I just mentioned.

Therefore, you cannot optimize around just one metric.

To really create a healthy contribution to the network and a healthy experience for people, we need to strike a balance and keep an eye on it.

Ultimately, we want to reach a metric where people can say, "I learned something from Twitter and I'm taking it home with me."

Ultimately that is our goal, but it will take time.

CA: I think you come to a lot of people like this mystery.

This may be unfair, but I woke up to this picture the other day and found myself thinking about you and the situation. We're on this wonderful voyage with you on this ship called the Tuitanic -- (Laughter) There are people at the helm who are expressing their displeasure, but you, unlike so many other captains, are saying, "Well, tell me, talk, listen, listen."

And they talk to you, and they say, 'We worry about the iceberg ahead.'

And you say, "That's a strong point, and frankly, our ships aren't properly built to steer as well as we thought they would."

And we say, "Do something about it."

And you go to the bridge and we're waiting, we're watching, and you're showing this insane composure, while we're all standing outside saying, "Jack, turn the fucking handle!"

Look?

(Laughter) (Applause) So -- (Applause) It's democracy at stake.

Our culture is at stake. It's our world at stake.

And Twitter is great and shapes a lot of things.

It's not as big as other platforms, but influential people use it to set the agenda and it's very hard to imagine a more important role in the world...

I mean, Jack, you're doing a great job of listening, but are you going to do that to actually add urgency and move this issue forward?

JD: Yes, and we're moving significantly.

So there have been some ups and downs in the history of Twitter.

One, when I came back to the company, it was pretty dire in terms of the future, not just from how people were using the platform, but from the company's story.

So we had to fix a lot of foundations, turn the company around, and go through two crazy layoffs. Because it got too big for what we were doing, we focused all our energy on this concept of serving the public conversation.

And it took some work.

And as I dug into it, I realized some of the basic issues.

A lot can be done superficially to address what you're talking about, but the change needs to be permanent. That means digging really deep, paying attention to what we started 13 years ago, and seriously asking what the world needs today, given how systems work, how frameworks work, and how fast everything moves, and how people use it.

So we work as fast as we can, but speed alone doesn't get the job done.

It's about focus, prioritization, understanding network fundamentals, building a scalable and resilient framework, and being open and transparent about where we are so we can continue to earn trust.

Therefore, I am proud of all the frameworks we have introduced.

We are proud of our direction.

You can obviously move faster, but all you have to do is stop doing stupid things in the past.

CA: Okay.

Well, I think there are a lot of people here who would like to help you with this transformational agenda that you're working on, given the chance. Whitney, Jack, thank you for coming here and speaking frankly.

It took courage.

I really appreciate your words. Good luck with your mission.

JD: Thank you. Thank you for inviting me.

(Applause.) Thank you.

I spent the better part of a decade observing America's response to mass atrocities and genocide.

First, I want to share with you a moment that summarizes what I need to know about America's and democracy's response to mass atrocities.

And that moment came on April 21, 1994.

So 14 years ago, we were almost in the middle of the Rwandan genocide, in which 800,000 people were to be systematically exterminated by the Rwandan government and some extremist militias.

On April 21, The New York Times reported that 200,000 to 300,000 people had already been killed in the genocide.

It was in the newspaper – not on the front page.

Much like the Holocaust coverage, it got buried in the newspapers.

Rwanda itself was not considered newsworthy, and surprisingly neither was the genocide itself.

But on April 21st, a surprisingly honest moment happened.

It was a US Congressman named Patricia Schroeder from Colorado who met with a group of journalists.

Then one of the journalists said to her, "What's wrong?"

What is going on in the US government?

In Rwanda, 200,000 to 300,000 people have just been exterminated in recent weeks.

It was two weeks into the genocide at the time, and of course at that point we didn't know how long it would last.

And journalists said, why is there so little response from Washington?

Why are there no hearings, denunciations or arrests in front of the Rwandan Embassy or the White House? What happened?

And she said - she was very honest - "That's a great question.

All I can say is that my congressional office in Colorado and my office in Washington have received hundreds of calls about Rwanda's endangered ape and gorilla populations, and no one is calling about them.

The phone about people is not ringing. ”

And the reason I dedicate this moment to you is because there is a deep truth.

And the truth is that in the 20th century, while the endangered species movement was beginning to develop, there was no endangered people movement.

Holocaust education was taking place in the school.

Most of us have grown accustomed to images and knowledge of the Holocaust as well as images of the nuclear catastrophe.

Of course, there's a museum right next to Washington's Mall, Lincoln and Jefferson.

So we've owned Never Again culturally, appropriately, and in an interesting way.

But the politicization of “never again,” the operationalization of “never again,” never happened in the 20th century.

I think that's what that moment with Patricia Schroeder shows. If we want to end the world's worst atrocities, we have to end them.

there must be a role. We need to create political noise and political costs in response to large-scale crimes against humanity and the like.

That was the 20th century.

Well, here - and at this point in the afternoon, it should be a relief for you - there is good news, amazing news for the 21st century. That is, almost out of nowhere, an anti-genocide movement, an anti-genocide constituency, and a movement that actually seems destined to last.

It grew in response to atrocities in Darfur.

made up of students. There are about 300 anti-genocide chapters on college campuses across the country.

It's bigger than the anti-apartheid movement.

There are about 500 high school chapters dedicated to stopping the massacre in Darfur.

Evangelicals also joined them. Jewish groups also joined them.

"Hotel Rwanda" watchers also participated. It's a cacophony of movements.

As with all exercise, calling it exercise can be a bit misleading.

it is diverse. There are various approaches.

Movement has its ups and downs.

But it has been surprisingly successful in some respects, in that it has merged with this endangered people's movement that was lacking in the 20th century.

It sees itself, for what it is, as what creates the impression that there is a political price to be paid, a political price to be paid, for condoning genocide, having no heroic imagination, and actually being a bystander rather than a defender.

Being a student-led movement, the movement has achieved some amazing results.

I believe they launched a sale campaign and have now persuaded 55 universities in 22 states to sell their stakes in companies operating in Sudan.

They have the number 1-800-GENOCIDE. It may sound very kitschy, but for someone who may be apolitical but interested in doing something about genocide, you can dial 1-800-GENOCIDE, enter your zip code, and you don't even need to know who your congressman is.

The sale bill is presented directly to pending lawmakers, U.S. senators, and governors.

They cut transaction costs to stop genocide.

I think the most innovative thing they have introduced recently is genocidal grade.

And it takes students to introduce genocide grades.

So what happens is that during parliamentary sessions parliamentarians call up young people aged 19 and 24 and say, "I was just told I was D-minus for genocide. I was told I was D-minus for genocide." What should I do to get C? I just want to get C . Help me.

And the students and others who are part of this incredibly energetic foundation need to be there to answer it and do something all the time.

Now, what this movement has done is to extract from the Bush administration in the United States a series of commitments to Darfur that no other country in the world has made, at a time of massive military, financial and diplomatic overstretch.

For example, referring crimes in Darfur to the International Criminal Court, which the Bush administration does not like.

Basically the Sudanese government spends $3 billion on refugee camps to keep people displaced by the so-called Janjaweed, militias, alive until something more durable is achieved.

And recently, or not so recently, about six months ago, 26,000 peacekeepers were approved for deployment.

That's what the Bush administration's leadership is all about, and it's all thanks to this bottom-up pressure and the fact that the phones have been ringing since the beginning of this crisis.

But the bad news for this question of whether evil will prevail is that evil lives on.

People in these camps are surrounded on all sides by so-called Janjaweed, who are on horseback and carry spears and Kalashnikovs.

Women who go for firewood to heat humanitarian supplies to feed their families - humanitarian supplies, the dirty secret of which is that they must be heated to be actually edible - are themselves targets of rape, which is used as a means of genocide.

And the peacekeeping forces I mentioned, that unit was sanctioned, but since sanction, very few countries on the planet have actually stepped forward to endanger their own armed forces and police.

I mean, we've accomplished so much compared to the 20th century, but still far too little compared to the gravity of the crimes unfolding as we sit here talking.

Why should exercise be restricted?

Why is what has been achieved, or what the movement has done, not sufficient to be necessary for crime?

I'm sure there are several reasons, but I'll briefly focus on a few.

The first is that the movement has stopped at the US border. It's not a global movement.

Not many of our compatriots abroad are themselves calling on their governments to do more to stop the genocide.

And I think that, in a way, Americans are more inclined to want to revive "Never Again" because of the Holocaust culture that exists in this country.

The guilt expressed by the Clinton administration, the guilt expressed by Bill Clinton against Rwanda, has created space in our society for a consensus that Rwanda is wrong and could have done more, which the movement has taken advantage of.

European governments, for the most part, deny responsibility and have nothing to protest or refute.

Therefore, for this movement to be enduring and global, it needs to cross borders and see other citizens in democracies not only comfortable with the assumption that their governments will do something in the face of genocide, but actually doing so.

Governments are never naturally or eagerly drawn to crime on this scale.

As we have seen, they are not even attracted to defending our ports or reigning with strewn nukes.

Why do we expect the bureaucracy to head for distant suffering?

One reason is that it is not widespread worldwide.

The second, of course, is that we have credibility issues, legitimacy issues in international institutions, especially at this point in American history.

To denounce genocide on Monday, foreshadow waterboarding on Tuesday, and show up on Wednesday to seek the dispatch of troops, as the Bush administration does right, is structurally really, really difficult.

Now, other countries also have their reasons for not wanting to get involved.

Let me be clear.

In a sense, they are using the Bush administration as an alibi.

But for us to be leaders in this field is, of course, essential to regain our standing and leadership in the world.

Recovery takes time.

we need to ask ourselves. how is it now? What should we do next as a country, as a people, in relation to the worst places in the world, the worst suffering in the world, killers and the kind of killers that may one day come back home to nest?

To answer that question, I turned to a man many of you may never have heard of. It's a Brazilian named Sergio Vieira de Melo who, as Chris said, was bombed in Iraq in 2003.

He was the first victim of a suicide bombing in Iraq.

It's hard to remember, but there was actually a time in the summer of 2003, even after the US invasion, when civilians were relatively safe in Iraq, aside from looting.

Well, who was Sergio? His name was Sergio Vieira de Melo.

In addition to being Brazilian, before I met him in 1994, he was described as a cross between James Bond and Bobby Kennedy.

And at the United Nations, there aren't many people who have really succeeded in blending these qualities.

He resembled James Bond in that he was inventive.

He was drawn to the flames, chased the flames, like a moth to the flames. Kind of like an adrenaline addiction.

He was successful in his relationships with women.

He looked like Bobby Kennedy. Because people always wondered that about Bobby Kennedy and John Kennedy.

He was a top ten nation-building, problem-solving, and trouble-shooting player in the worst and most broken places in the world.

Failed states, genocidal states, states under control, exactly where threats to this country are imminent, and exactly where most of the world's suffering tends to be concentrated.

These are the places he was drawn to.

He moved with the headline.

He has worked for the United Nations for 34 years. He entered the company at the age of 21.

It started in the 70's when the Permanent Wars were caused by the War of Independence and the War of Colonial Liberation.

He was handling an outflow of millions in Bangladesh – the largest refugee outflow in history up to that point.

He was in Sudan when the civil war broke out.

He was in Cyprus shortly after the Turkish invasion.

He was in Mozambique for the War of Independence.

he was in Lebanon. Amazingly, he was in Lebanon - a UN base was used - the Palestinians attacked from behind a UN base.

Israel then invaded and took control of the UN base.

Sergio was in Beirut when the US embassy was hit by the first ever suicide attack on the United States.

While people tend to trace the beginning of this new era back to 9/11, there is no doubt that the 1983 attacks on the US Embassy and Marine barracks – witnessed by Sergio – were, in some ways, the beginning of the era we are in today.

He went from Lebanon to Bosnia in the 90s.

The problem, of course, was inter-ethnic sectarian violence.

He was the first to negotiate with the Khmer Rouge.

Talk about pervasive evil. So he was in the room with the evil personification of Cambodia.

He negotiates with the Serbs.

In fact, he even ventures into the realm of interacting with evil, trying to convince evil that while living in the Balkans and conducting these kinds of negotiations, he doesn't need to convince evil to get the nickname Servio instead of Sergio.

Then he goes to Rwanda and Congo in the aftermath of the genocide, and it is he who must make a decision – oh, okay, the genocide is over. 800,000 people were killed. Those responsible have fled to neighboring countries, Congo and Tanzania.

I'm Sergio, I'm a humanitarian, and I want to feed them - well, I don't want to feed the killers, but I want to feed the two million people who are with them, so we're going, we're going to set up camps and supply humanitarian aid.

But alas, the killer is inside the camp.

Well, I would like to separate sheep and wolves.

Let's go door-to-door in the international community and see if anyone can send the police and the military to separate me.

And their response, of course, is that we only want to stop the genocide and endanger the military for it, not that we want to get in the way and drag the genocide out of the camps now.

So you have to make a decision.

Turn off international life support and risk the lives of 2 million civilians?

Or will they continue to feed civilians knowing that genocidal genocides are in camps, literally sharpening knives for future battles?

What is your occupation?

Not all bad terrain in these broken places.

Late 90's: Nation-building is the cause.

He is the man appointed to be in charge. First from Kosovo, then from East Timor, either Paul Bremmer or Jerry Bremmer. he rules the place.

he is the governor He has to make decisions about taxes, currency, border security and police enforcement. He has to make all these judgments.

Here he is Brazilian. He speaks seven languages.

He's been in 14 conflict zones before, so he's probably in a better position to make better decisions than people who haven't done that kind of work.

But nevertheless, he is again at the cutting edge of our experiment in doing good with scarce resources, in the worst place in the world.

And after 9/11 happened in Timor, he was appointed as a UN Human Rights Commissioner and has to think about the balance between freedom and security, and what to do when the most powerful country in the UN violates the Geneva Conventions and also international law. condemn?

Well, if you condemn it, you probably won't be able to go back to that room again.

Perhaps you remain reticent. Perhaps you're trying to charm President Bush, and that's what he did. And in doing so, he unfortunately won one last tragic appointment to Iraq, which resulted in his death.

One caveat about his death, which was so shocking, believe it or not, is that neither the Bush administration nor the aggressors had any plans or pre-war plans to respond to terrorism, despite predicting a war in Iraq in connection with Saddam Hussein and the 9/11 terrorism.

So Sergio was the vessel of everything he learned about how to deal with evil and how to deal with broken states, lying under the rubble for three and a half hours without being rescued.

stateless. A man who spent his life trying to help stateless people.

like refugees. Because he is a representative of the United Nations.

Even if you represent everyone, in a way you represent no one.

you are not owned

And it was these two heroic American soldiers who literally ran into a mine shaft that, believe it or not, were able to rally to his rescue. The building was shaking.

One of them participated in 9/11 and lost his companion on September 11th, but still risked his life to go inside to save Sergio.

But all they had was a women's handbag—literally one of those basket-shaped handbags. And then we tied it to a curtain rope from one of the offices at the United Nations Headquarters and made a pulley system to save this man, this shepherd, who we should be relying on most right now. At a time when many of us feel lacking guidance.

And this was the pulley system. This was what we gathered for Sergio.

The good news for value is that after Sergio and 21 others were killed in an attack on the United Nations that day, the military created a search and rescue force equipped with cutting equipment, shoring materials, cranes and other necessities for the rescue.

But it was too late for Sergio.

Finally, I would like to conclude with four lessons from Sergio's life on this issue of how to prevent the spread of evil. I framed the question like this.

Here's this guy who started thinking 34 years ago about the kinds of issues we're grappling with as a country and as a people today. what do you take?

First of all, I think his relationship with evil is something to learn.

He has changed a lot over the course of his career.

He had many flaws, but he was very adaptable.

I think that was his greatest quality.

He started out as a denouncer of harm, accusing those who violated international law, and said, "You are in violation, this is the Charter of the United Nations."

Don't you know that what you're doing is unacceptable?

And they would ridicule him, because he had no state power, no army, no police power.

He had rules, he had norms, and he just tried to use them.

And in 1982 in Lebanon, South Lebanon, he told himself, and others, that he would never use the word "unacceptable" again.

Never use. I will try to be that way, but I will never use that word again.

But he lunged in the opposite direction.

As I said earlier, he broke into rooms with evil and became non-blaming, almost servile when he earned the nickname Servio, for example, and black-boxed what happened before entering the room, even when negotiating with the Khmer Rouge.

But by the end of his life, I think he had struck a balance that we, as a nation, could learn from.

Stay in the room and don't be afraid to talk to your adversaries. But don't bracket what happened before you entered the room.

Don't black box history. Don't check your principles at the entrance.

Whether it's Nixon going to China, Khrushchev and Kennedy, Reagan and Gorbachev, I think that's what we have to be there for.

All the great advances of this country in our relations with our enemies have been brought about by entering this room.

And it doesn't have to be an act of weakness.

In fact, by being there and showing the world that that person, that regime is the problem, not the United States, we can do much more to build a United Nations coalition against the perpetrators and wrongdoers.

Let me briefly summarize the second take from Sergio's life.

What I learned, and this is in some ways the most important thing, was that he really, really stood for and showed a rare respect for dignity.

At the micro level, the people around him were visible.

he saw them

On a macro level, he thought, we are talking about promoting democracy, but sometimes doing so in ways that insult people's dignity.

We provide humanitarian aid to people and we brag about it because we spent 3 billion.

This is very important, if the US hadn't put that money into Darfur, for example, those people wouldn't be alive anymore, but that's not the way to live.

It would be a revolution if we could think about dignity in our actions as citizens, as individuals in our relations with others, and as a nation, and infuse consideration of dignity into our dealings with other nations.

Third point, very easy. He talked a lot about freedom from fear.

And I recognize that there are many things to be afraid of.

There are many real threats in the world.

But what Sergio was talking about is let's reconcile our relationship to the threat.

Stop exaggerating the threat. Let's see it really clearly.

There's a reason we fear melting ice sheets.

There is reason to be concerned about the lack of loose nuclear material in the former Soviet Union.

Focus on what the legitimate challenges and threats are. Don't let panic or fear make you make bad decisions.

For example, in times of fear, Sergio used to say, "Fear is a bad adviser."

We rush to extremes when we are inactive and trying to adjust our relationship with the world around us.

Fourth and final point: He had worked in the worst places in the world and all of the lesser evils, so somehow, of course, he had humility and an awareness of the complexity of the world around him.

I mean, I was keenly aware of how hard it was.

It was to restore how Sisyphus this work was, yet recognizing its complexity and being humbled by it, he was not paralyzed by it.

And I think, as citizens going through these kinds of experiences of crises of confidence, crises of competence, crises of legitimacy, there's a temptation to withdraw from the world and say, oh Katrina, Iraq, I don't know what we're doing.

We cannot withdraw from the world.

It is a matter of how we exist in the world.

And I think the lesson of the anti-genocidal movement I mentioned is that, while partially successful, it never achieved its goals – it will probably be decades before that happens – but if we want to see change, we have to be change.

We cannot rely on our institutions to do the work of necessitating dialogue with adversaries without creating the space for it, respecting dignity, and bringing a combination of humility and a certain sense of courageous responsibility to our dealings with the rest of the world.

So will evil win? is that the question?

I think the short answer is "no, not unless we allow it".

thank you.

(applause)

Chris Anderson: Shep, thank you so much for coming.

I believe your plane landed in Vancouver literally two hours ago.

It's such a wonderful treat.

So please explain how you get to the black hole from Einstein's equations.

Shepard Doleman: Over 100 years ago, Einstein came up with a geometric theory of gravity that deforms space-time.

Thus matter deforms space-time, which in turn tells matter how to move around it.

And enough matter can be trapped in a small area to pierce space-time, so that not even light can escape, and gravity can keep even light inside.

CA: So before that, the reason the Earth moved around the Sun wasn't because the Sun was pulling on the Earth as we think it was, but it literally changed the shape of the universe, so we kind of fell around the Sun.

SD: Indeed, the geometry of space-time tells the Earth how to move around the Sun.

It's almost like watching a black hole pierce through space-time, and when it reaches so deep, there exists a point where light orbits the black hole.

CA: So I think that's what's going on here.

It's not an image, but a computer simulation of what we've always thought, such as the event horizon around a black hole.

SD: Until last week, we didn't know what black holes actually look like.

We can only do this kind of simulation on a supercomputer, but even here we can see this ring of light, the trajectory of photons.

That's where the photons literally move around the black hole, and around it is this hot gas that is attracted to the black hole, making it hotter due to friction.

All this gas tries to get into a very small volume, so it heats up.

CA: A few years ago you embarked on this mission to try and visualize one of these things.

And I think you focused on this galaxy far, far away.

Please tell me about this galaxy.

SD: This is the galaxy. Zoom in on galaxy M87. 55 million light years away.

California: 55 million.

SD: It's a long road.

And at its center is a black hole of 6.5 billion solar masses.

It's really hard to understand, isn't it?

6.5 billion suns compressed into one point.

And it governs part of the energetics of this galaxy's core.

CA: But even though it's so huge, it's so far away that it's incredibly difficult to dream of actually having that image.

The resolution you need will be incredibly high.

SD: Black holes are the smallest objects in the known universe.

But they have a huge effect on the entire galaxy.

But the black hole we see emits so much radio waves that we need to build a telescope as big as the Earth to see it.

I'm glowing all the time.

CA: And that's exactly what you did.

SD: That's right. What we're seeing here is that we've used telescopes all over the world, synchronizing them perfectly with atomic clocks, to receive light waves from this black hole, and stitch all that data together to create an image.

CA: To do that, we needed good weather in all these places at the same time so that we could actually have a clear view.

SD: We had to get lucky in many ways.

And sometimes luck is better than luck.

In this case we were both, I think.

But the light had to come from a black hole.

It had to come through intergalactic space, through the Earth's atmosphere where water vapor could be absorbed, but all went perfectly well. The wavelength of that light, the size of the Earth at a wavelength of 1 millimeter, was just right to resolve that black hole 55 million light-years away.

The universe was telling us what to do.

CA: So you started collecting huge amounts of data.

I think that's half the data from one telescope.

SD: Yes, this is one of our team members, Lindy Blackburn. He archives half of the data recorded by the Large Millimeter Telescope atop a 15,000-foot mountain in Mexico.

And what he keeps there is about half a petabyte.

In terms we can understand, this equates to a lifetime selfie budget of about 5,000 people.

(laughs) CA: That's a lot of data.

All this was shipped and could not be sent over the internet.

All this data was sent to one place, and large-scale computational analysis began.

And I really had no idea what was going to happen from here.

SD: The mechanics of this technique we used is imagine taking an optical mirror and shattering it and putting all the pieces in a different place.

The way normal mirrors work is that the light rays reflect off the surface, which is perfect and at the same time focuses them to a specific point.

We take all these records and, with the accuracy of atomic clocks, we tune them to perfection later on our supercomputers.

And reproduce something like an earth-sized lens.

The only way to do that is to take the data back on the plane.

Nothing beats the bandwidth of a 747 full of hard disks.

(Laughter) CA: So, I think a few weeks or months ago, I started seeing this on a computer screen somewhere.

this moment.

SD: Well, it took a long time.

CA: I mean, look at this.

that was it.

That was the first image.

(Applause.) So tell us what we're actually seeing there.

SD: I still love it.

(Laughter) What you're looking at is the final trajectory of the photon.

We see Einstein's geometry laid bare.

The hole in space-time is so deep that light moves around in its orbit. So the light behind the black hole, which we will soon see, moves around and comes to us along parallel lines in its very orbit.

Its orbital turns out to be 27 times the square root of a handful of fundamental constants.

Come to think of it, it's an anomaly.

CA: When...

When I first thought of a black hole in my head, I thought it was an event horizon, with lots of matter and light swirling in its shape.

But it's actually more complicated than that.

OK, let's talk about this animation. This is because the light is shining around the lens.

SD: Here you can see that some of the light from behind is lensed and some of the light circles around the entire orbit of the black hole.

But if you can get enough light out of this hot gas swirling around a black hole, you'll see all these rays converging on this screen, and it stands in for where you and I are.

And I see this ring definition starting to take shape.

And that's what Einstein predicted over 100 years ago.

CA: Yeah, that's great.

So please elaborate on what you're actually looking at here.

First of all, why are some parts brighter than others?

SD: So what's happening is that the black hole is spinning.

And some of the gas will move towards us below and away from us above.

And just as the whistle of a train goes higher in pitch as it comes toward you, the gas has more energy coming toward us than it moves away from us.

The bottom part appears brighter because the light is actually being boosted in our direction.

CA: So how big is it physically?

SD: Our entire solar system would fit nicely into that dark region.

And that dark region, if you ask me, is characteristic of the event horizon.

You can't see the light from there because the light that should have come from there was swallowed up by the event horizon.

So- that's all.

CA: So when we think of a black hole, we think of a gigantic beam of light that erupts from it and is aimed directly in our direction.

why don't you see them?

SD: This is a very powerful black hole.

Although not by global standards, it is still strong and jets are believed to be coming from the north and south poles of this black hole.

Now, we're too close to really see the jet's entire structure, but it's the jet's base that illuminates space-time.

And that's why it's curved around a black hole.

CA: So if you're in a spaceship and you're orbiting around that thing, how long does it take to actually go around it?

SD: First of all, I'll give you anything to get on that spaceship.

(Laughter) Sign up.

It may be confusing for a moment, but there is what is called the innermost stable circular orbit. This is the innermost orbit that matter can travel around the black hole before spiraling.

And for this black hole, that would be anywhere from three days to about a month.

CA: Very powerful, but ridiculously slow at some levels.

In other words, even if you were there, you wouldn't even know you had fallen into that event horizon.

SD: So you might have heard of 'spaghettification' where you fall into a black hole and your body is torn apart because the gravitational field in your feet is much stronger than in your head.

This black hole is so big that it doesn't turn into a spaghetti noodle.

You just drift through the event horizon.

CA: So it's like a giant tornado.

Dorothy is hit by a tornado and ends up in Oz.

Where would you end up if you fell into a black hole?

(laughs) SD: Vancouver.

(laughs) CA: Oh my God.

(Applause) It's a red circle, it's scary.

No, really.

SD: Black holes are really the central mystery of our time. Because a black hole is where the quantum and gravitational worlds meet.

Inside is the singularity.

And all forces are united there because gravity eventually becomes strong enough to compete with all other forces.

But it is hidden from us, and the universe shrouds it in the ultimate invisibility cloak.

So I don't know what's going on there.

CA: So there are smaller ones in our galaxy too.

Will we be able to return to our beautiful galaxy?

This is the Milky Way, this is my hometown.

And somewhere in the middle there is another one, which you are also trying to find.

SD: We already know it exists, we already have the data.

And we are working on those data now.

Therefore, I would like to realize something in the near future, but I cannot say when.

CA: Pretty close, but pretty small. Maybe as big as the one we saw?

SD: Yes. In other words, it turned out that the black hole of M87, which we saw before, has a mass of 6.5 billion solar masses.

However, because it is too far away, it appears to be of a certain size.

The black hole at the center of our galaxy is 1,000 times smaller in mass, but is approaching 1,000 times less mass.

So they look the same angular size in the sky.

CA: Finally, I would like to salute an amazing group of people.

who are these people?

SD: So these are just part of the team.

We were amazed at the resonance this image had.

I don't know if you'd believe me if I told you this article would make the front page of every newspaper, but it did.

It's a great mystery and an inspiration for us, and I hope it inspires you as well.

But more importantly, this is just one part of the team.

We have 200 employees, 60 institutions and 20 countries and regions.

If you want to build a global telescope, you need a global team.

And the technology we use to link telescopes around the world easily sidesteps some of the issues that divide us.

And as scientists, we naturally band together to do things like this.

CA: Wow, this week has been exciting for the whole team.

Shep, thank you so much for being here.

SD: Thank you.

(applause)

Arcane tomes of forbidden lore, disturbing secrets hidden in the family lineage, and indescribable horrors that drive you crazy at the thought of it.

These are now standard elements of many modern horror stories.

But they were largely popularized by one author, whose name has become an adjective for the particular kind of horror he inspired.

Born in Providence, Rhode Island in 1890, Howard Phillips Lovecraft grew up fascinated by gothic horror novels written by Edgar Allan Poe and Robert Chambers.

But by the time he began writing in 1917, World War I had cast a long shadow over his art.

People have seen real horror and are no longer afraid of fanciful folklore.

Lovecraft sought to invent a new kind of terror that corresponded to the rapid scientific progress of his time.

Scientific elements were often used in his stories to give them an eerie power.

In "The Color out of Space," a strange meteorite falls near the farmhouse, turning it into a nightmarish hellscape.

Some incorporated scientific methodology into their format.

At the Mountains of Madness is written as the report of an Antarctic expedition that unearths things that are better left undiscovered.

Mathematics can also be a source of fear itself, as impossible geometric constructions wreak havoc on the viewer's mind.

Like the more recent discoveries of elementary particles and X-rays at the time, the forces in Lovecraft's novels were powerful, but often invisible and inexplicable.

The horror of "Lovecraftian" horror lies not in the recognizable monsters, the raw violence, or the shocking shock, but in what is not directly depicted and left in the dark depths of our imagination.

Dozens of Lovecraft's short stories, novellas, and poems often unfold within the same fictitious continuity, with recurring characters, places, and myths.

At first glance, they appear to be set in Lovecraft's modern New England.

But beneath the surface of this seemingly similar reality lurks the dark lords, to whom the inhabitants of Earth are mere playthings.

More like primal forces than mere gods, Lovecraft's Great Old Ones lurk in the fringes of our reality.

Beings like Yog-Sothoth "beyond the farthest outposts of space and time, bubble like primordial slime in nuclear chaos." Or the blind and foolish god Azathoth. Its destructive impulses are stopped only by "the maddening throbbing of vile drums and the thin monotonous rumble of cursed flutes." These beings exist beyond our conception of reality, and their true nature is as enigmatic as their motives.

Lovecraft's protagonists (often researchers, anthropologists, and antiquarians) encounter hints of their existence.

But even these indirect glimpses are enough to drive them crazy.

And if they survive, what remains in the reader is not a sense of triumph but only a cosmic indifference, a terrifying sense that we are but an insignificant speck at the mercy of an immense force.

But perhaps the greatest power these creatures possessed was their fascination with Lovecraft's contemporaries.

During his lifetime, Lovecraft corresponded with other writers and encouraged them to incorporate elements and characters from his stories into his novels.

References to Lovecraft's gods and esoteric writings can be found in many stories of his pen pals, including Robert E. Howard and Robert Bloch.

Today, this shared world is called the Cthulhu Mythos, after Lovecraft's infamous dragon-octopus mix.

Unfortunately, Lovecraft's fear of the unknown was a rather bland expression in his personal view.

The author holds strong racist views, and some of the work contains crude stereotypes and slurs.

But the rich world he created will survive beyond his personal prejudices.

And after Lovecraft's death, the Cthulhu mythos were adapted by different writers, often reinterpreting the myth from diverse perspectives beyond the author's prejudices.

Despite his literary achievements, Lovecraft failed to achieve financial success.

He died penniless at the age of 46, a victim of cosmic indifference.

However, his work has inspired numerous short stories, novels, tabletop games, and cultural icons.

And as long as humans fear the unknown future, Lovecraftian horror will remain in the darkest corners of our imagination.

I have something about sleep

i don't sleep much And after years of fighting as if not sleeping too much was a terrible evil or something, I realized that not sleeping too much was a great virtue.

And now I really like sitting.

But I've been sitting at work for years, and I think my creativity is greatly fueled by this kind of insomnia.

I'm awake and lying down I suppose. Sometimes I walk aimlessly.

I used to walk a lot at night.

I am walking during the day and I chase after people who seem interesting.

(Laughter) Sometimes, actually, once on "Page 6" of the "Post" I was patrolling this guy, whatever, actually, I was just chasing him because he had great shoes.

Then I took a picture of his shoes, thanked each other and left.

But I always do.

As a matter of fact, I think a lot of my design ideas come from mistakes and my eyes.

Because I think there are a lot of images in the world and a lot of clothes.

And the only things that look interesting to me, of course, are the ones that look a little wrong, or the ones that are very, very surprising.

And sometimes in a taxi you see holes in your shirt or something that looks very interesting, beautiful and functional like you've never seen before.

So I parked the car, got out and walked over to make sure there weren't actually any holes, but that was a prank for my eyes. it was a shadow.

Or, if there was a hole, I think, "Oh no."

In fact, someone had already thought of that idea.

Someone has already made that mistake and I can't do it anymore. ”

I don't know where the inspiration comes from.

For me, it doesn't come from research.

I don't necessarily get my inspiration from research.

In fact, one of the most fun things I have ever done in my life was at the Guggenheim Museum in New York this Christmas season.

I read "Peter and the Wolf" with this beautiful band from Juilliard. Read with a narrator.

And then I saw my favorite really bright critic, a woman named João Acocella, my friend.

And she came backstage and said, "Oh, Isaac, did you know? Tell me about Stalinism, and also about the Russian 30s."

So I thought, "How can we know about Stalinism?"

I know about wolves and birds, the wolves ate the birds, but at the end you hear a bird call or something.

(Laughter) So I don't really know that, actually, I do my own research, you know?

If I'm asked to dress for an 18th century opera or something, I do a lot of research. Because it's interesting, not because it's what I'm supposed to do.

I am very, very, very inspired by movies.

Color in movies and how light makes color.

Light from behind the projector, or even from the projector, makes colors look very impossible.

Anyway, round up this little clip. Let me show you.

I wake up at night to watch movies, and I often watch women in movies.

And I think about their roles and how they have to observe what they see.

Because I always look at how women are portrayed, whether they are glorified in this way, or ironically glorified, or kind of slandered, or ironically slandered.

I always go back to color.

Color is a great motivator for me.

We rarely find this color in nature, but when compared to man-made colors, natural colors are very beautiful.

that's what i do. I study colors a lot.

But most of the time I wonder how can I create something as beautiful as the image of Natalie Wood.

How can you create something as beautiful as Greta Garbo?

I mean, it's not possible. Look?

I think that's what causes me to get up and lie down at night.

I also go to astrologers and tarot card readers a lot, and that's another thing that motivates me a lot.

People say "do it". An astrologer tells me to do something, so I do it.

(Laughter) When I was about 21, an astrologer told me that I was going to meet the man of my dreams, and his name would be Eric.

So for years, I would go to a bar and if I met someone named Eric, I would immediately hum or something.

(Laughter) There was a time when I was so desperate that I walked into a room and asked, "Eric?"

And whoever turns around, I head straight for.

(laughs) And I did a very interesting tarot reading a long time ago.

The last card he drew showed my destiny, and this guy was a bard singer with a straw boater and a cane and looking like spats, right?

I want to show you this clip because I do the crazy thing of doing cabaret acts.

So check this out in action.

I'm so embarrassed.

(Video) (Applause) Thank you. We will do anything according to your request.

The name of the show is based on this story about my mother that I have to tell you.

You were dating this person, right?

And this has something to do with being happy, I swear.

I've been dating him and it's been going on for about a year and we started getting serious so I decided to invite my parents, all of them, to dinner.

We introduced them to each other.

My mother was, in a way, very sensitive to his mother, who seemed a little skeptical about the whole “alternative lifestyle” thing: homosexuality.

So my mother got a little pissed off and said to her, "Are you kidding? You two are having the best life together.

They go out to eat, watch shows..."

They go out to eat and watch shows.

(Laughter.) That's the name of the show, 'They eat out, they--' It will be engraved on my tombstone when I die: 'He dined out and saw the show.' Right?

(Laughter) I mean, when I was editing these clips, I didn't have the audacity to edit clips of me singing at Joe's Pub.

So you have to go check it out and come see me or something because it's frustrating.

Still, I feel like I don't know how to express it.

I think it's good to have as little comfort as possible. Look?

And at least for me, if I do one thing all the time, I don't know, I get very, very bored. I got bored very easily.

You know, I wouldn't say I'm doing everything right.

I'm just saying that we do a lot of different things.

And I try not to look back.

However, I think that waking up every night means looking back and thinking, "What a stupid thing I did."

Look?

(Laughter) Because when you do a lot of things, you feel bad about everything, not just one thing.

It's hard to get rid of having a bad feeling about one thing.

Yes, that's right.

Speaking of opera costumes, this is next.

I work with different choreographers.

I work a lot with Twyla Tharp, and I work a lot with one of my best friends, Mark Morris.

And I designed three operas with him. The latest work is "King Arthur".

I have been deeply immersed in the world of dance since my teenage years.

I went to a performing arts high school where I was an actor, and many of my friends were ballet dancers.

Again, I don't know where the inspiration comes from.

I don't know where it came from.

I started making dolls when I was a child.

Perhaps that's where all the inspiration started. it's a doll.

(laughs) Then I went to a performing arts high school.

There I was in high school, meeting dancers and acting.

From there, I became interested in design.

I attended Parsons School of Design and then started my career as a designer.

I don't really think of myself as a designer, nor necessarily a fashion designer.

And frankly, I'm not sure what to call myself.

I consider myself to be...

That's all.

(Laughter) But I have to say that being a little bored all the time is very important for a fashion designer.

Always have to be a little bored with everything.

If not, you have to pretend you're a little bored with everything.

(Laughter) But I'm really a little bored with the whole thing.

I always say to my partner, Marisa Gardini. She books everything, she books everything, she realizes everything, she makes all the deals.

And I always tell her that I spend a lot of time on computer bridge programs.

I spend too much time on the computer bridge, I mean, I mean, for some reason, about ten years ago, I thought the most boring place in the world would be a TV studio, a midday show, a midday talk show. Because it has everything I love in one place.

And if you get bored, you can watch different things, do different things, and talk about it, right?

So I had this TV show.

And it was a very, very big part of my process.

Actually, can you wind the paperclip?

This is one of my favorite Rosie O'Donnell clips.

(Video) Isaac Mizrahi: Back on set. Hello Ben!

Rosie O'Donnell: Hello Ben.

IM: Look how cute she looks with just a slender back.

Ben: As my grandmother would say, "Yummy!"

I want it out of the way. I don't want that -- well, let's go.

RO: Ashley, are you nervous?

Ashley: What are you doing? RO: Cutting your hair.

never. I don't think I've ever had a nervous day getting my hair cut.

IM: You are already very cute. Ro: Do ​​you like it? have understood.

IM: Is there a problem with looking cute? RO: Of course I want to be cute.

IM: I just checked. Because some people actively want to look ugly.

RO: No, not me.

IM: You've read stories about people who have a lot of money and have kids and their kids are always somehow really messed up, right?

And there must be a way to do it, Rosie.

Does that mean you shouldn't have kids just because you're ridiculously rich and ridiculously famous, because you know they're going to mess up eventually?

RO: No, but I think that means your priority must be their well-being first.

But you have to make your own decisions.

My kids are 7 years old, who knows?

They're about 14 and in rehab.

And they are going to play this clip. "I am a very good mother."

Whoa, this is the shortest I've ever experienced!

IM: Sounds good?

A: Have you ever had your hair this short? B: No! But it's okay, go crazy.

IM: I feel like this place needs to be closer.

A: It's just a stage. RO: We're just staging it.

IM: Are you crazy? it's so cute

RO: No, I love it. It's the new me. IM: Really great!

RO: A herd of Rosies. Wow!

(laughs) IM: By the way, isn't this the most boring thing in the world?

I mean, making someone who's naturally cute look like that -- (laughs) it's not boring. If it's not boring, it means nothing.

(Laughter) I actually read this wonderful quote the other day. He said, "Style makes me feel good because it takes my mind off the fact that I am going to die."

right?

(Laughter) And then I realized it was on my website. It said the quote was mine.

And I thought, "Oh, I said something in the interview. I forgot I said that."

Since this is the final goodbye, I would like to show you this final clip.

I also say that I cook well.

And I often see things as if they were food.

For example, "Could you pass me the rotten chicken?"

So how can you offer something like a tattered old dress?

How can you show off an old ragged dress? ”

(laughs) I think that's what it all boils down to.

it all comes down to that.

So check this out.

I keep doing this because I think it's the most fun thing in the world.

It's like this website with a variety of stuff.

It is a website of multidisciplinary studies.

We actually shoot corners such as TV show corners.

And it's my favorite thing in the world.

And it just started in early February. So who knows?

Again, I wouldn't say it's good, I just think it's not boring, right?

And here is the final part.

(music) IM: I always make buttermilk pancakes or buttermilk waffles.

Sarah Moulton: Really?

IM: Yes, but buttermilk is never found.

Not found in Citarella, not found.

SM: You can't? IM: Always low fat.

SM: But that's it. Im: Is that so? OK.

SM: Don't you know? Please tell me something interesting.

IM: Do you know? Uninteresting.

sorry. what?

SM: This is the deal. Back in the days of making butter -- Do you know how to make butter?

IM: Churn. SM: From cream.

IM: Yes, that's right.

SM: So take some creamy, heavy, high-fat milk and stir it until it separates into curds and water.

This liquid is actually buttermilk, for those who have ever overstirred whipped cream.

In the early days it was.

And that's what people used for bread making and all sorts of things.

Well, the buttermilk you get is actually low-fat or skim milk.

IM: Sorry, I didn't know. are you OK?

SM: The reason he thinks so is because buttermilk is so wonderfully rich and delicious.

IM: Yes, yes. that's right.

SM: So who would think it's low fat?

IM: Well, that's it. thank you very much.

Happy TED. It's so wonderful here. I love it. I love it. I love it.

thank you. good bye.

The most important gift your mother and father gave you was the two sets of 3 billion letters of DNA that make up your genome.

But like anything else with 3 billion components, the gift is fragile.

Sunlight, smoking, unhealthy diet, and even spontaneous mistakes by cells all cause genomic alterations.

The most common type of change in DNA is the simple exchange of one letter or base, such as C, for another letter, such as T, G, or A.

Cells in the body accumulate billions of such single-letter exchanges, also called "point mutations," in a single day.

Well, most of these point mutations are harmless.

Occasionally, however, point mutations destroy important capabilities of cells or cause them to malfunction in detrimental ways.

If the mutation was inherited from both parents or occurred very early in development, many or all cells would then contain the deleterious mutation.

And you, too, will be among the hundreds of millions of people who suffer from genetic diseases such as sickle cell anemia, progeria, muscular dystrophy and Tay-Sachs disease.

Serious genetic diseases caused by point mutations are especially frustrating because the exact single-letter change that causes the disease is often known and, in theory, could be curable.

Millions of people suffer from sickle cell anemia. Because they have a single A to T point mutation in both copies of the hemoglobin gene.

And children with progeria are born with a T at one position in the genome that normally has a C. As a result, these wonderfully bright children age rapidly, with devastating consequences, dying by about the age of 14.

Throughout the history of medicine, we have had no way of efficiently correcting point mutations in biological systems to convert disease-causing T back to C.

probably until now.

Because my lab recently succeeded in developing such a feature called "base editing".

The story of how we developed base editing actually started 3 billion years ago.

We think of bacteria as the source of infection, but bacteria themselves are particularly susceptible to viral infections.

Therefore, about 3 billion years ago, bacteria evolved defense mechanisms to combat viral infections.

That defense mechanism is now better known as CRISPR.

CRISPR's warhead is this purple protein, which acts like molecular scissors to cut DNA and break the double helix into two parts.

If CRISPR can't distinguish between bacterial and viral DNA, it's not a very useful defense system.

But the most surprising feature of CRISPR is that the scissors can be programmed to search, join and cut only specific DNA sequences.

So when a bacterium first encounters a virus, it can store a small piece of that viral DNA and use it as a program to instruct the CRISPR scissors to cut that viral DNA sequence during future infections.

Cleavage of the viral DNA disrupts the function of the cleaved viral genes and disrupts the viral life cycle.

Six years ago, prominent researchers such as Emmanuel Charpentier, George Church, Jennifer Doudna, and Fung Zhang demonstrated how CRISPR scissors could be programmed to cut DNA sequences of our choosing, including sequences within the genome, rather than viral DNA sequences chosen by bacteria.

But the results are actually similar.

Cleavage of DNA sequences within the genome usually causes insertions and deletions of random mixtures of DNA letters at the cut site and also disrupts the function of the cleaved gene.

Disrupting genes is now very useful for some applications.

However, for most point mutations that cause inherited diseases, simply truncating the already mutated gene does not benefit the patient. This is because the function of the mutated gene must be restored rather than further disrupted.

Therefore, truncating this already mutated hemoglobin gene that causes sickle cell anemia cannot restore the patient's ability to make healthy red blood cells.

New DNA sequences can then be introduced into the cell to replace the DNA sequences surrounding the break site, but unfortunately the process does not work in most cell types and the results of the disrupted gene still prevail.

Like many scientists, I dreamed of a future where we could cure, or even cure, genetic human diseases.

But I thought the big problem loomed was the lack of a way to correct the point mutations that cause most of the genetic diseases in humans.

As a chemist, I began working with students to develop methods to run chemistry directly on individual DNA bases to truly repair, rather than destroy, the mutations that cause genetic disease.

The result of our efforts is a molecular machine called "Base Editor".

The base editor uses the programmable search mechanism of CRISPR scissors, but instead of cutting the DNA, it directly converts one base to another without destroying the rest of the gene.

So, if we think of naturally occurring CRISPR proteins as molecular scissors, we can think of the base editor as a pencil, and actually rewrite one DNA letter to another directly by rearranging the atoms of one DNA base to another.

Well, basic editors don't exist in nature.

In fact, we designed the first base editor shown here from three separate proteins not from the same organism.

We started by using CRISPR scissors to disable their ability to cut DNA while retaining their ability to search and bind to target DNA sequences in a programmed fashion.

A second protein, shown in red, was attached to the disabled CRISPR scissors, shown in blue. This causes a chemical reaction on the DNA base C, converting it into a base that behaves like T.

Third, to the first two proteins we needed to add a protein, shown in purple, that prevented the edited base from being removed by the cell.

The end result is an engineered tripartite protein that allows for the first time a C to T conversion at a specific location in the genome.

But even at this point our job was only half done.

This is because the two strands of a DNA double helix must form base pairs in order to be stable within the cell.

And since C pairs only with G and T pairs only with A, simply changing a C to a T in one DNA strand creates a mismatch. This creates a mismatch between the two DNA strands and the cell must resolve by deciding which strand to replace.

We realized that this tripartite protein could be further manipulated to flag the displaced strand by nicking the non-edited strand.

This small nick tricks the cell into replacing the unedited G with an A in rebuilding the nicked strand, thereby converting what was a C-G base pair into a stable T-A base pair.

After several years of hard work led by Alexis Komor, a former postdoc in the lab, we have successfully developed this first-class base editor that converts C to T and G to As at selected target positions.

Of the over 35,000 known disease-associated point mutations, the two types of mutations that this first base editor can revert together account for approximately 14 percent, or about 5,000 pathogenic point mutations.

However, to correct the majority of disease-causing point mutations, we need to develop a second class of base editors that can convert As to G or T to C.

Led by Nicole Gaudelli, a former postdoc in the lab, we set out to develop this second class of base editors. Theoretically, nearly half of pathogenic point mutations could be corrected, including mutations that cause progeria, a disease of rapid aging.

We realized that we could borrow the targeting mechanism of the CRISPR pincers again and bring the new base editors to the right sites in the genome.

However, I soon ran into an unbelievable problem. That is, no known protein converts A to G or T to C in DNA.

Faced with such a serious obstacle, most students would probably seek out another project, if not another research advisor.

(Laughter.) But Nicole agreed to go ahead with what seemed very ambitious at the time.

Given that no natural protein exists that performs the chemistry we need, we decided to evolve our own proteins in the lab to convert A into a base that behaves like G, starting with a protein that performs the relevant chemistry on RNA.

We established a Darwinian selection system for survival of the fittest, surveyed tens of millions of protein variants, and were able to allow only the rare variants capable of carrying out the required chemistry to survive.

Finally, the protein shown here was completed. It is the first protein that can convert A's in DNA to G-like bases.

And binding that protein to disabled CRISPR scissors (shown in blue) creates a second base editor that converts As to G, and uses the same strand-nicking strategy used in the first base editor to trick the cell into replacing the unedited T with a C to recreate the nicked strand, thereby completing the conversion of A-T base pairs to G-C base pairs.

(Applause.) Thank you.

(Applause.) As an academic researcher in the United States, I am not used to being interrupted by applause.

(Laughter) We developed the first two classes of these basic editors just three and a year and a half ago.

However, even in that short period, base editing has become widely used in the biomedical research community.

More than 6,000 Base editors have been dispatched at the request of more than 1,000 researchers worldwide.

100 scientific research papers have already been published using base editors in organisms ranging from bacteria to plants to mice to primates.

Although base editors are too new to enter human clinical trials, scientists have achieved an important milestone towards that goal by using animal base editors to correct point mutations that cause genetic diseases in humans.

For example, a collaborative team of scientists led by two more students in my lab, Luke Cobran and John Levy, recently used a virus to deliver its second base editor into progeria mice, reverting the disease-causing T to a C and reversing the results at the DNA, RNA, and protein levels.

Base editors have also been used in animals to reverse the consequences of tyrosinemia, beta-thalassemia, muscular dystrophy, phenylketonuria, congenital deafness, and types of cardiovascular disease, in all cases by directly correcting point mutations that cause or contribute to the disease.

In plants, base editors have been used to introduce changes in individual DNA letters that may produce better crops.

Biologists then used base editors to investigate the role of individual letters in genes associated with diseases such as cancer.

Two companies I co-founded, Beam Therapeutics and Pairwise Plants, use base editing to treat genetic human diseases and improve agriculture.

All of these applications of base editing have been made within the last three years. On the historical time scale of science, it's just a blink of an eye.

More research awaits before base editing can realize its full potential to improve the lives of patients with genetic diseases.

Many of these diseases are thought to be treatable by correcting underlying mutations in a small subset of cells within an organ, but introducing molecular machines like base editors into human cells can be challenging.

Harnessing nature's viruses to provide a base editor in place of the molecule that causes the common cold is one of several promising delivery strategies that have been successful.

It is of great importance to continue developing new molecular machines that can perform all the remaining methods of converting one base pair to another and that minimize unwanted editing at off-target locations within the cell.

And working with other scientists, physicians, ethicists, and governments to maximize the chances of base editing being applied wisely, safely, and ethically remains an important imperative.

Despite these challenges, if you had told me just five years ago that researchers around the world would use laboratory-developed molecular machines to directly convert individual base pairs at specific locations in the human genome to other base pairs efficiently and with minimal other consequences, I would have asked, "What science fiction novels are you reading?"

Thanks to a relentlessly dedicated group of students with the creativity to design what they could and the courage to evolve what they couldn't, Basic Editing began to turn its sci-fi aspirations into an exciting new reality. In that reality, the most important gift we give our children may not only be our three billion letters of DNA, but also the means to protect and repair them.

thank you.

(Applause.) Thank you.

I thought I'd start by explaining or showing the people who started [Jet Propulsion Laboratory].

When they were kids, they were very imaginative and very adventurous at Caltech mixing chemicals to see which one exploded more.

Well, I wouldn't recommend trying it now.

Naturally, they blow up the shack, and Caltech, then, go to Arroyo and actually do all the testing there.

That's what we call the first five employees here during their tea break.

As I said earlier, they were adventurous people.

In fact, one of them was part of a cult of sorts not far from Orange Grove who kept mixing chemicals and figuring out which ones were the best, so unfortunately he blew himself up.

So it will give you a kind of taste of the kind of people we have there.

We try to avoid blowing ourselves up.

This is what I wanted to show you.

Guess it's a JPL employee at the center of this crowd.

I tried to come like him this morning, but when I left, he said it was too cold and I should put on my shirt.

But more importantly, this is why I wanted to show you this photo. See where the other person is looking and where he is looking.

Wherever others look, look somewhere else, do something different, and do it.

And that's kind of the spirit that we're doing.

And I would like to share with you the words of Ralph Emerson that one of my colleagues posted on the wall of my office. "Don't go where there is a road.

Go where there are no trails instead and leave a mark. ”

That is my advice to all of you. See what everyone is doing and what they are doing. Go do something completely different.

Don't try to improve what other people are doing. That's not much progress.

In the early days, we did a lot of Rocket work, but we also had a lot of parties.

As you can see, one of our parties was held several years ago.

But about 50 years ago, after Sputnik was launched, a big change happened. We launched the first American satellite, that's what you see on the left there.

And here we have made a 180 degree change. It changed from Rocket House to Exploration House.

And it has taken several years, and we are now the leading organization to explore the Universe on your behalf.

But even with that, I had to remind myself that sometimes there were setbacks.

So, on the bottom side, we know that the rocket should have gone up. It ended up sideways.

That's what we call a misguided missile.

Then, to commemorate it, we started a "Miss Guided Missile" event at JPL.

So, in the past, celebrations were held every year, and selections were made. In the past, competitions and parades were held here.

It's not very appropriate to do it now. Some people tell me to do so. These days, I don't think that's very appropriate.

So let's do something a little more serious.

And that's what we saw at the last Rose Bowl when we entered one of the floats.

It's more of a play aspect. And on the right is the rover just before finishing testing taking it to the cape for launch.

These are the rovers currently on Mars.

So you kind of know what's fun and what's serious about what we're going to do.

But I said I was going to show you a short clip of one of our employees to give you an idea of ​​some of the talent we have.

Video: Morgan Hendry: Beware of Safety is an instrumental rock band.

It branches out into the more experimental side.

Jazz has an improvisational side.

It has a heavy rock sound.

Being able to treat sound as an instrument and explore more abstract sounds and electronics and acoustics that can be played live.

Music is half of me, but the other half. I ended up with probably the best gig of all.

I work at the Jet Propulsion Laboratory. I'm building the next Mars rover.

Some of the best engineers I know have such artistic qualities.

You have to do what you want.

And whoever tells you you can't do it, don't listen to them.

Perhaps they are right - I doubt it.

Just tell it where to put it, and then do what you want it to do.

I'm Morgan Hendry. I'm NASA.

Charles Elachi: Now moving from playful to serious, people always ask, why do we explore?

Why are we doing all these missions and exploring them?

Well, my way of thinking is quite simple.

Somehow, 13 billion years ago there was a big bang and you've heard a bit about the origin of the universe.

But somehow the imagination of everyone, or the imagination of many people, somehow, from the first big bang, built this beautiful world we live in today.

you look outside There's all the beauty you see, all the life you see around you, and there are intelligent people here, like you and me, conversing here.

It all started with that big bang. The question, then, is how did it happen? How did it evolve? How was the universe formed?

How did galaxies form? How did planets form?

Why do some planets have evolved life?

Is it so common?

Do all the planets we see around our stars have life?

We are literally made out of stardust.

We started from those stars. We are made of stardust.

So the next time you're really down, you can look in the mirror and say, "Hi, I'm looking at the stars here."

You can skip the dust part.

But literally we are all made of stardust.

So what we're trying to do in our research is effectively write a book about how things got to be what they are today.

And one of the first or easiest places we can go and explore is heading to Mars.

The reason Mars gets special attention is because it's not that far from us.

See, it only takes 6 months to get there.

It takes 6-9 months at the right time of the year.

It's a planet that looks a little like Earth. Although slightly smaller, the land on Mars is about the same as the land on Earth, if you don't take into account the oceans.

It has a polar cap. It is somewhat thinner than our atmosphere, so we have weather. So this is to some extent very similar and we can see some features like the Grand Canyon of Mars, or what is called the Grand Canyon of Mars.

It is similar to Earth's Grand Canyon, except that it is much larger.

That is, it is about the same size as the United States.

There is a volcano on it. It's Mount Olympus on Mars, like a giant volcanic shield on Mars.

If you look at its height and compare it with Mount Everest, you know how big Mount Olympus is compared to Mount Everest.

So, Everest here on Earth basically looks smaller.

In other words, we can get an idea about the crustal movement and volcanic activity that occurred on that planet.

Recently, one of our satellites has shown that this is similar to Earth. We caught a landslide happening.

So it is a dynamic planet, and activity continues as we speak today.

And these rovers, people are wondering what they're doing today, so I thought I'd show you a little bit of what they're doing.

This is a very large crater. Geologists love craters. A crater is like digging a big hole in the ground without actually doing any work, so you can see what's under the surface.

So it's called Victoria Crater, and it's about the size of a few football fields.

If you look to the upper left you can see a tiny little black dot.

This photo was taken from an orbiting satellite.

If you zoom in, you can see that it's a surface rover.

So it was taken from orbit. When I zoomed the camera on the ground, I could actually see the rover on the ground.

And then they used a combination of satellite imagery and rovers to actually do the science. Because you can observe a large area and you can move the rover around and basically go to a specific location.

So what we're doing specifically now is the rover sinking into that crater.

As I said earlier, geologists love craters.

The reason is that when many of you go to the Grand Canyon, you see these layers on the walls of the Grand Canyon.

And what are these layers - it's a million, 10 million, 100 million year old surface, on which there are sediments.

So if you can read the layers, it's like reading a book and you learn the history of what happened in the past in that place.

Seen here are the layers of the crater wall, and the rover is now descending, measuring its properties and analyzing rocks on its way down the canyon.

Now, driving on a slope like this is a bit difficult.

If you were there you wouldn't do it yourself.

But we tested those rovers, or even the rovers, to make sure everything was in working order.

Now, the last time I was here, right after landing, I think 100 days after landing, I said I was surprised that the rover would last even 100 days.

Well, 4 years later they are still working.

Now you're saying, Charles, you're really lying to us, etc., but that's not true. We really believed they would last 90 or 100 days. Because they run on solar power, and Mars is a dusty planet, we expected dust to start accumulating on the surface, and after a while there wouldn't be enough power to keep them warm.

Well, I always say it's important to be smart, but it's good to be lucky once in a while.

And I get it. As you can see here, it turns out that sometimes Mars is visited by dust devils, and when they come over the rover, they clean it up.

It's like a true new car you own and literally that's why the car lasts so long.

And now we've designed them pretty well, which is exactly why it lasts this long and still provides all the scientific data.

Well, these two rovers are getting older.

One of them, one of the front wheels, is stuck and not working. So what we're doing is driving the rear wheels.

The other has arthritis in his shoulder joint and it doesn't work well so he can walk like this and move his arms like that.

But they still produce a lot of scientific data.

Well, during that period, many people, even outside the scientific community, were excited about these rovers. So I thought I'd show you a video to get you thinking about how these rovers are viewed by people outside the scientific community.

Now let's move on to the next short video.

By the way, this video is a fairly accurate recreation of what the landing looked like about four years ago.

Video: Well, the parachute adjustment is complete.

Now deploy the airbag. Open.

camera. Now I have a photo.

yes!

CE: That's what happened in the operating room in Houston. That's exactly right.

Video: Well, if there is life, the Dutch will find it.

what is he doing

what is that?

CE: Not too bad.

Anyway, let's continue with a little introduction to the beauty of this planet.

As I said earlier, it looks a lot like Earth and you can see the dunes.

You might believe me if I told you this was taken from the Sahara desert or somewhere, but these are from Mars.

But one region of particular interest to us, as you know, is the northern region of Mars, near the North Pole. It is very similar to northern Canada as we see ice caps shrinking and expanding.

And we wanted to know that - and you see all kinds of glacial features there.

So we wanted to know what the ice was actually made of, and whether there was some kind of organic material embedded in the ice.

There is a spacecraft called Phoenix that is heading towards Mars and it is scheduled to land 17 days, 7 hours and 20 seconds from now, so you can adjust your clock.

So here on the West Coast it's a little before 5pm on May 25th, but we're actually landing on another planet.

As you can see, this is a picture of a spacecraft launching to Mars, but in case you missed the show, I thought I'd give you a little peek at what happens in 17 days.

Video: This is what we call 7 Minutes of Horror.

So the plan is to dig some soil, take a sample, put it in an oven and actually heat it up to see what gases come out of it.

So this came out about 9 months ago.

Land at 12,000 mph. You have to stop and very gently touch the surface so as not to destroy the lander within seven minutes.

Ben Sissy: Phoenix is ​​the first Mars Scout mission.

It's the first mission to attempt a landing near the North Pole of Mars, and the first to actually reach out and touch water on another planet's surface.

Lynne Craig: At least on Earth, where water tends to exist, life tends to exist, and thus, where life may have existed on Earth in the past.

Eric Bailey: The main purpose of the EDL is to bring a spacecraft moving at 12,500 miles per hour to a silent screeching halt in a very short period of time.

BC: Entering the Martian atmosphere.

We are 110 miles above the surface of Mars.

And our lander is safely housed inside something called an aeroshell.

EB: It's more or less like an ice cream cone.

BC: And there's this heat shield in front of it. This saucer-like thing has about half an inch of essentially cork-like stuff on the front. This is our heat shield.

Now, this is a really special cork, and this cork will protect us from the violent atmospheric intrusions we are going to experience.

Rob Glover: Friction is really starting to build up in spacecraft, and we use that friction to our advantage to slow down when spaceships are in the atmosphere.

BC: From here, slow down from 12,500 mph to 900 mph.

EB: Outdoors can be nearly as hot as the surface of the sun.

RG: Heat shield temperatures can reach 2,600 degrees Fahrenheit.

EB: It doesn't get very hot inside.

It's probably room temperature.

Richard Cornfeld: There's a window of opportunity where you can deploy your parachute.

EB: If you fire the chute too early, the parachute itself can fail.

Fabric and stitching may come off.

And that's bad.

BC: For the first 15 seconds after deploying the parachute, it slows down from 900 mph to a relatively slow 250 mph.

We no longer need the heat shield to protect us from the forces of atmospheric entry, so we abandon the heat shield and expose the lander to the Martian atmosphere for the first time.

LC: Once the heat shields are removed and the legs are deployed, the next step is to have the radar system start detecting how far Phoenix is ​​actually off the ground.

BC: Entry velocity is lost by 99%.

In short, we are 99% of the way to our goal.

But as always, the last 1% is the hard part.

EB: Well, the spacecraft actually has to decide when to drop the parachute.

BC: We will separate from the lander at about 1 kilometer, or 3,200 feet, from the surface of Mars, traveling at 125 miles per hour.

It's like taking two Empire State Buildings and stacking them on top of each other.

EB: Then we separated from the rear shell and are now in free fall.

It's such a scary moment. A lot has to happen in a very short amount of time.

LC: So you're in free fall, but you're trying to use all the actuators to make sure you're in the right position to land.

EB: Then you have to start the engine, straighten yourself, slow down and land safely on the ground.

BC: Earth and Mars are so far apart that it takes more than 10 minutes for a signal from Mars to reach Earth.

The EDL itself is all finished in about 7 minutes.

So by the time you hear that the EDL has started from the lander, it will already be over.

EB: We need to build significant autonomy into spacecraft so that they can land safely.

BC: EDL is a huge technically very difficult problem.

It's about getting a spaceship hurtling through deep space and using a variety of tricks to figure out how to land it on the surface of Mars at 0 miles per hour.

This is a very exciting and challenging problem.

CE: I hope everything happens as you see it here.

So watching a spacecraft land on another planet is going to be a very tense moment.

Now let's talk about what we're working on next.

So we are now in the process of actually designing the next rover to send to Mars.

So I wanted to tell you a little bit about the steps we go through.

This is very similar to what you do when designing a product.

As we saw a little earlier, we have to consider the heat we're going to face when we're doing Phoenix.

So we have to research all kinds of different materials, shapes we want to make.

In general, we don't try to please our customers here.

What we want to do is make sure we get an effective, efficient kind of machine.

First, we want our employees to be as imaginative as possible.

And we love being so close to the art center. Because, in fact, one of the Art Center alumni, Eric Nyquist, had a series of displays, far-off displays, in what we call the Mission Design Room or Spaceship Design Room, just to make people think hard about things.

We have a lot of Lego at home. As I said earlier, this is a playground for adults, where you can sit back and play with different shapes and designs.

Then we take it a little more seriously. So we have what we call CAD/CAM. All the engineers and scientists involved in it know thermal properties, design, atmospheric interactions, parachutes, all of this, work in teams, and actually design spacecraft on computers to some degree. That is, to see if it meets the requirements we need.

On the right side, we also have to consider the environment of the planet we are going to.

If you go to Jupiter, you will be in a very radioactive environment. The radiation environment near Jupiter is about the same as in a nuclear reactor.

Please try to imagine. Suppose you take your PC out. Throw it in a nuclear reactor and it still has to work.

These are some of the smaller challenges we have to face.

If you enter, you must do a parachute test.

I saw a video of how a parachute breaks. If that happens, it will be the worst day ever. So we have to test it, because we are deploying this parachute at supersonic speed.

We are coming very fast and deploying them to slow us down. So you have to do all kinds of tests.

To give you an idea of ​​the size of the parachute compared to the people standing there.

The next step is to actually build some kind of test model in JPL's lab, the so-called Mars Yard, and test it in action.

We kick, hit, and drop them to see where and how they break.

And back off from that point.

And we will actually make a building and fly it.

And this next rover we fly is about the size of a car.

That big shield you see outside is a heat shield that protects it.

And it's basically going to be built over the next year and launch a year later in June.

Well, in that case, it was a very large rover, so airbags were out of the question.

And I know many of you said afterwards that you were glad you had an airbag at the end.

Unfortunately, this probe is 10 or 3 times larger than other probes in terms of mass.

Therefore, airbags cannot be used. So you have to come up with another creative idea of ​​how to land it.

And because we didn't want to pollute the surface, we didn't want to propel it to the surface. We wanted the rover to land on its feet immediately.

So we came up with this ingenious idea. It is used in helicopters on Earth.

In fact, the lander descends to an altitude of about 100 feet and hovers 100 feet above its surface. Then there's the Sky Crane that lands that rover on the ground.

I hope everything goes well, and if it does, it will.

And the rover will be more like a chemist.

What the rover does while running is analyzing the chemical composition of rocks.

So it will have an arm that takes the sample, puts it in the oven, crushes it and analyzes it.

And if there's something too high up on the cliff to reach, there's a little laser system that actually zaps the rock, vaporizes some of it, and actually analyzes what's coming out of that rock.

A bit like "Star Wars", but this is the real deal.

It's real.

Also, to help you and support the community to advertise on that rover, we're going to not only actually train that rover, but actually train it to serve cocktails on Mars as well.

This gives us an idea of ​​what kind of fun things we do on Mars.

I thought I'd go to "Lord of the Rings" now and show you some of the stuff there.

Now, there are two things at play in The Lord of the Rings.

First of all, this planet is a very attractive planet. Only beauty, such as a ring.

But even for scientists, rings have a special meaning. Because I believe the rings represent how the solar system actually formed, albeit on a smaller scale.

Some scientists believe that the way the solar system formed, that the sun actually collapsed to form the sun, lots of dust around it formed a ring, particles in that ring gathered together to form larger rocks, and that's how the planets formed.

The idea is that by observing Saturn, we can actually observe the formation of our solar system on a smaller scale in real time, and it will be a kind of test bed.

So let me show you a little bit of what the Saturn system is like.

First, it flies you over the ring.

By the way, this is all real.

This is not animation or anything.

This was actually taken from Cassini, a moon in orbit around Saturn.

And then you see how much detail is in those rings, or particles.

Some of them aggregate together to form larger particles.

These gaps are due, as you know, to the formation of small satellites in those places.

Now, you think those rings are very large objects.

Yes, they are very large in one dimension. In another dimension they are paper thin. very, very thin.

What you see here is the shadow of Saturn's own rings.

And it's actually one of the moons that formed on that moon.

So think of a vast area that is paper-thin and hundreds of thousands of miles wide and spinning.

And the types of satellites that form are many and varied, and each one looks very different and very strange. So scientists have been busy trying to explain this for decades, telling NASA that more funding is needed to explain what these things are like or why they formed the way they do.

Well, there were two satellites that were particularly interesting.

One of them is called Enceladus.

This is an all-icy satellite, measured from orbit. made of ice.

But there was something strange about it.

Look at the stripes here, the stripes we call tiger stripes. As we flew over the stripes, we saw a sudden rise in temperature. This indicates that these stripes are warmer than the rest of the Earth.

So when we flew away from there, we turned around. And what do you think?

I saw a geyser coming out.

So this is Saturn's Yellowstone.

We are seeing geysers of ice emerging from the planet, possibly indicating that there is an ocean beneath the surface.

And somehow, through some dynamic effect, geysers are being emitted from it.

The reason I put the little arrow there is probably 30 miles, but we decided a few months ago to actually fly the spacecraft through the plume of the geyser and actually measure the material of the spacecraft.

It was also [opaque]. We were worried about that risk, but it worked out pretty well.

We flew to the top and found that a fair amount of organic matter was being released along with the ice.

And over the next few years, as we continue to orbit Saturn, we'll get closer and closer to the surface to make more precise measurements.

Now, another satellite is also attracting a lot of attention. That's Titan. What makes Titan particularly interesting is that it is larger than its moon and has an atmosphere.

And its atmosphere is as dense as our own atmosphere.

I mean, if you were on Titan, you would feel the same pressure that you feel here. However, it is much colder, and its atmosphere is composed largely of methane.

Well, methane excites people because it is an organic substance. When there is a lot of organic matter, people quickly start to think that life might have evolved there.

As such, people now believe that Titan is most likely a so-called pre-biological planet. That's because Titan hasn't reached the stage where very cold organic matter becomes biological matter, so life could have evolved on it.

So the Earth may have frozen three billion years ago, before life actually arose.

This is of great interest. So here are some examples of what we've done. We actually dropped the probe. It was developed by a European colleague who dropped the rover while we were orbiting Saturn.

We dropped a probe into Titan's atmosphere.

Here is a photo of the area we were descending from.

It looked like the California coast to me.

You can see the river running along the shore, and you can see the white areas that look like the ocean, like Catalina Island.

And with our on-board radar equipment, we've learned that there are lakes here, like the Great Lakes, and they're very similar to Earth.

It looks like there are rivers, it looks like there are oceans and lakes, and it turns out that there are clouds. It looks like it's raining too.

So it's very similar to the Earth's cycle. It's just so cold that it can't be water. Because the water freezes.

It turns out that everything we see, this liquid, is made up of hydrocarbons, ethane, and methane, just like the stuff in your car.

Here we have a planetary cycle similar to Earth, but all made up of ethane, methane and organic matter.

So if you're on Mars, sorry, but if you're on Titan, you don't have to worry about $4 gas.

Just drive to the nearest lake, plug the hose into it and fill the car.

Conversely, if you light a match, the whole earth will be blown away.

So in the end I said I wanted to finish with some pictures.

And just to put it in perspective, here is a picture of Saturn taken from a spacecraft looking towards the Sun from behind Saturn.

Since the Sun is behind Saturn, we see so-called "forward scattering", highlighting all the rings. and zoom in.

I don't know if you can see it very well, but there is a small dot in the top left corner around 10 o'clock. That's the Earth.

We can barely see ourselves. So what I did, I thought, let's expand on that.

If you zoom in, you can see the Earth right in the middle. So I zoomed in on the art center.

Thank you very much.

“New medicine may cure cancer.”

"Aspirin may reduce the risk of heart attack."

"Eating breakfast helps me lose weight."

Health headlines like this abound in the news, often contradicting each other.

So how do we know what's a real health concern, what's a really promising treatment, and what's less definitive?

In medicine, there is often a disconnect between news headlines and the scientific research they cover.

Headlines are designed to grab attention and are most effective when making a big statement.

In contrast, many scientific studies produce meaningful results when focused on narrow, specific questions.

The best way to fill this gap is to look at the original research behind the headlines.

We've come up with simplified research scenarios for each of these three headings to test your skills.

Stay tuned for a description of the first study. Then stop at the headline to find flaws.

Assume that it contains all the information necessary to identify the defect.

Let's start with this hypothetical scenario. It's a study that uses mice to test new anticancer drugs.

The study included two groups of mice, one treated with drug and the other with placebo.

At the end of the trial, mice receiving drug were cured, but mice receiving placebo were not.

See what's wrong with this headline: "Study Shows New Drug May Cure Cancer" Because the study was done in mice, no conclusions about human disease can be drawn based on this study.

In real life, early research on new drugs and treatments is not done on humans.

If initial results are promising, clinical trials will follow to determine if it works in humans.

Now that we've warmed up, let's try a more tricky example. A study of the effect of aspirin on heart attack risk.

In this study, the male population is randomly divided into two groups.

Members of one group will take aspirin daily and the other group will take a placebo daily.

By the end of the trial, the control group had significantly more heart attacks than the group taking aspirin.

Given this situation, what's wrong with the headline 'aspirin may reduce heart attack risk'? In this case, the participants were all men, so the study provides evidence that aspirin reduces heart attacks in men.

However, the conclusion that "aspirin reduces the risk of heart attack" is too broad. It is unlikely that the results found in men would hold true for women.

Studies often limit participants based on geographic location, age, gender, and many other factors.

Similar studies should be performed on other groups before these findings can be generalized.

If a headline makes a general claim, the evidence should be drawn from a variety of studies, not just one study.

Can the first two questions take your skills to the next level?

Try this example of how eating breakfast affects weight loss.

Researchers gathered people who had always skipped breakfast into groups and asked them to eat breakfast every day.

Participants include men and women of various ages and backgrounds.

Over the course of a year, participants lose an average of 5 pounds.

So what's wrong with the headline is: "Eat breakfast to lose weight." People in the study started eating breakfast and lost weight, but we don't know if they lost weight because they started eating breakfast. Perhaps tracking my weight inspired me to change my diet in other ways.

To exclude the possibility that other factors caused the weight loss, these participants should be compared to a group who did not eat breakfast before the study and who continued to skip breakfast during the study.

The headline should not claim that the findings of this study are generally applicable.

And if the study itself made such a claim without a comparison group, one would have to question its credibility.

Now that you've tested your skills on these hypothetical studies and headlines, it's time to test your skills on real-world news.

Even if the full paper is not freely available, a summary of the experimental design and results can be found in the freely available abstract or the body of the news article.

Individual studies yield results that don't always align with compelling headlines.

It takes a lot of evidence accumulated over time to draw any big conclusions about human health issues.

But in the meantime, skipping the headlines will keep you abreast of the latest in science.

Recently, I had an epiphany.

I realized that I could actually play a role in solving one of the biggest problems facing humanity today: climate change.

I also realized that I had been working for over 30 years just to get to this point in my life, just to be able to make a real contribution to a bigger issue.

And all the experiments that I've done in my lab in the last 30 years, and all the experiments that the people that work in my lab have done in the last 30 years, have been geared towards doing a really big experiment, this is the last big experiment.

So who am I?

I am a plant geneticist.

I live in a world where there is an excess of carbon dioxide in the atmosphere due to human activity.

But I have come to realize that plants are wonderful machines whose job really is only to absorb carbon dioxide.

And they're doing it very well, because they've been doing it for over 500 million years.

And they're really good at it.

Such ...

I also have something urgent to tell you.

As a mother, I want to give my two children a better world than the one I inherited from my parents. Better to keep going in the right direction instead of the bad.

But I also...

I've had Parkinson's for the last 15 years and I feel good enough to be part of this team, but at the same time I feel a sense of urgency to do this now.

And I have a great team.

I want to cooperate with everyone and do it because it's fun.

And if it's just five people trying to save the planet, they're going to spend a lot of time together, so it's better if they like each other.

(Laughter) Okay, okay. But enough about me.

Let's talk CO2.

CO2 is the star of my story.

Now, most people probably think of CO2 as a pollutant.

Or do you see CO2 as the villain of the novel?

That's always the dark side of CO2.

But as a plant biologist, I really see another side of CO2.

And I think the CO2 that we see, as plant biologists, remembers something you might have forgotten, so we look at it differently.

And it's that plants actually do this process called photosynthesis.

And when they perform photosynthesis, all carbon-based life on our planet is thanks to the carbon dioxide that plants and other photosynthetic microorganisms draw from atmospheric carbon dioxide.

Basically, almost all of the carbon in your body comes from the air.

So you're coming from the air, and it's through photosynthesis, because plants use the energy of the sun, absorb that carbon dioxide, and fix it into sugars.

That is wonderful.

And the other thing that's really important for me to talk about today is that plants and other photosynthetic microbes have a great ability to do this. This is more than 20 times the amount of CO2 emitted by human activity.

So even if we're not doing a good job of reducing our carbon footprint and such, plants, as photosynthetic organisms, have the ability to help.

So we expect them to do so.

But there are pitfalls here.

Plants like to convert most of their carbon dioxide into sugar, so we need to help them a little too.

And when the growing season comes to an end, the plants die and rot, and basically all the work they've done to suck CO2 out of the atmosphere and create carbon-based biomass comes back into the atmosphere as CO2.

So how can we redistribute the CO2 taken up by plants into something a little more stable?

And it turns out that the plant makes this product, it is called suberin.

It is a natural product found in the roots of all plants.

Suberin is really cool. As you can see, wherever you see a black dot, I'm assuming it's carbon.

This molecule contains hundreds of them.

And where you see some red dots on them, they are oxygen.

And oxygen is what microbes like to find to decompose plants.

Now you can see why this is the perfect carbon storage device.

And in fact, it can stabilize the carbon that is fixed by the plant and make it a little better for the plant.

So why now?

Why is now the right time for a biological solution to this problem?

I know it's been a long time, the last 30 years or so, but you're asking, "Why now?" -- But 30 years ago, we began to understand the function of all genes in living things in general.

Among them were not only humans, but also plants and many other complex eukaryotes.

So what started in the 1980s?

What started then is that we now know the functions of many of the genes in plants that direct them to grow.

And it now converges on the fact that genomics can be done in a faster and cheaper way than before.

What this tells us is that all life on Earth is indeed related, but plants are more interconnected than other organisms.

And we can predict that the same thing will happen when we put a trait we know from one plant into another.

And it's also important.

And finally came a little genetic trick like the one you heard this morning. Kind of like CRISPR, you can make edits to make the gene a little different than the normal state of the plant.

Well, now biology is on your side.

As a biologist, I am proposing a solution to the climate change problem that actually involves plants, the most evolved organisms on the planet.

So how do we do it?

Biology can help.

please.

OK。

Remember 3 quick tidbits from my talk.

The plant needs to produce more suberin than normal. Because the plants need to be a little better than they are now.

It has to make more roots. Because the more roots you make, the more suberin you can make. Now there are even more cells that like to accumulate suberin.

And the third is for plants to take deeper roots.

And what it does is, in fact, we're asking the plants to say, "Okay, make more stable carbon than you've ever had and bury it in the ground for us."

So instead of meandering on the surface of the soil, they can grow deep roots.

Those are the three characteristics we want to change. Increases suberin, increases roots, and the last property is deep-rooted.

Now we want to combine all these traits into one plant. It's easy to do, and I've actually done it on a model plant, Arabidopsis thaliana. This allows us to do these experiments much faster than we can do with other large plants.

And once we have plants where all the traits add up and we find that we can get more of those traits and more suberin from those plants, we're going to move it all -- we can move it to the crop plants and we're going to, we're starting this -- move it to the crop plants.

And I'll tell you why we choose crops that do the work when we get to that part of the story.

I see, I think this is the science behind it all.

So we are confident that we can make science a reality.

The reason is that just in the last year, we were able to find a single gene that affects each of these three traits.

And some of them, 2 out of 3, have more than one way to get there.

So you can see that you can potentially get even more suberin by combining within traits.

This shows one result. The plant on the right produces more than twice as many roots as the plant on the left. This is simply because one gene, which is normally present in plants, is expressed in a slightly different way than plants normally do by themselves.

Well, this is just one example I wanted to show you.

And now I want to tell you that there is still a lot of work to do before we get to this problem.

We need farmers to actually buy seeds, or at least have seed companies buy the seeds they want.

Therefore, it is unlikely that the yield will actually decrease when conducting the experiment. Because while we're doing the experiment, let's say about 10 years from now, the planet will be much more populated than it is today.

And it's still growing rapidly.

So by the end of the century, we'll have 11 billion people, and we've wasted an ecosystem that can't really handle the full load of agriculture.

And there is also competition for land.

Therefore, it is conceivable that a substantial area of ​​land would actually be required to conduct this carbon sequestration experiment.

Until we get through this great crisis, we cannot take it out of our food because we have to feed people on the planet as well.

And climate change is actually causing yield declines across the globe.

So why would a farmer want to buy seed if it can affect yields?

Therefore, we don't expect it to affect yield, and we will always have a check and balance to decide whether or not to run that experiment.

And the second is that when plants actually produce more carbon and bury it in the soil that way, almost all the soils on earth are actually depleted of carbon because of the agricultural load trying to feed the 8 billion people currently living on the planet.

And it's also a problem.

As plants produce more carbon, the soil becomes richer in carbon.

And carbon-rich soils actually contain nitrogen, sulfur, and phosphate—all the minerals your plants need to grow and get good yields.

It also retains water in the soil.

Therefore, suberin breaks down into small particles and gives the whole soil a new texture.

And since you've shown that you can get more carbon in that soil, the soil will darken.

So hopefully we'll be able to measure all of this and help solve the problem.

That's fine.

So we have the challenge that we have a lot of land that we need to use, and we have to get farmers to buy it. I think it will be difficult for us. Because we're not real salespeople, people who would rather google people than meet people, you know what I mean?

(Laughter) That's what most scientists do.

But we now know that no one can deny it. The climate is changing and we all know it.

And here it is, it's bad, it's serious, and we need to do something about it.

But I feel pretty optimistic that I can do this.

So I am here today as a botanical character witness.

And my point is that plants do that for us. All we have to do is give the plants a little help. Then they will go get a gold medal for humanity.

thank you very much.

(Applause) (Cheers) Thank you.

(Applause) It's finally out.

Chris Anderson: Wow.

Joanne, you are a very special person.

Just to make sure we're hearing it right, we believe you could be giving the world a staple crop seed variety within the next decade. -- Could wheat, corn, and perhaps rice provide similar yields to farmers and sequester 3x, 4x, or more carbon than today?

More than that?

Joan Chory: Actually, we don't know the number.

But they will do more than that.

CA: At the same time, does it make the farmer's soil more fertile?

JC: Yes, yes.

CA: That's amazing.

And the genius to do it, and a solution that scales where it already scales.

JC: Yes, thank you for saying that.

CA: No, no, you said, you said.

But it seems too good to be true.

Your bold project is to pave the way for us to expand research in your lab and initiate some of these pilots to make this amazing vision possible.

JC: Yes, yes, thank you.

CA: Thank you very much, Joanne Chorley.

Godspeed.

(Applause) JC: Thank you.

So I have a very enjoyable job of figuring out what makes people happy.

It's so much fun that it might seem a little flirtatious, especially now that we're facing some pretty depressing headlines.

But it turns out that studying happiness could be the key to solving some of the toughest problems we face.

It took me almost ten years to figure this out.

Very early in my career, I and my collaborators published a paper in Science entitled "Spending Money on Others Promotes Happiness."

I was very confident in this conclusion, but it didn't seem to apply to me, except for one thing.

(Laughter) I almost never donated money to charity. And even when I donated, I didn't get the warm glow I expected.

So I started to wonder if there was something wrong with my research, or maybe there was something wrong with me.

My own lackluster emotional response to donations was particularly puzzling. Because my follow-up research has revealed that even toddlers show joy in giving to others.

In one experiment, my colleagues Kylie Hamlin, Lara Akunin, and I took children under the age of two into the lab.

Now, as you can imagine, we needed to deal with a resource that toddlers would really be interested in, so we used the gold equivalent for toddlers: goldfish crackers.

(Laughter.) We gave the children the chance to give themselves this unexpected goldfish and give part of it to a doll named Monkey.

(Video) Researcher: I found more treats, so I'll give you all of them.

Toddler: Oh. thank you.

Researcher: Well, I don't see any more snacks.

Would you like to give one to the monkey?

Toddler: Yes. Researcher: Really?

Toddler: Yes.

here.

Researcher: Oh, it's delicious. Hmm.

Toddler: It's all gone, I ate it.

Elizabeth Dunn: Well, we trained research assistants to watch these videos and encode the emotional responses of young children.

Of course, we didn't tell them the hypothesis.

The data show that toddlers were pretty happy when they got this pile of goldfish for themselves, but in reality, they were even happier when they got their own goldfish as a gift.

And the glow of this warm donation persists into adulthood.

An analysis of surveys from more than 200,000 adults worldwide found that nearly a third of the world's population reported having given at least some amount of money to charity in the past month.

Remarkably, in every major region of the world, people who donated money to charity were happier than those who didn't, even after accounting for their personal financial circumstances.

And this correlation has not been an easy one.

Giving to charity appeared to make about the same difference in happiness as doubling your income.

Now, as a researcher, when I am fortunate enough to encounter effects that replicate around the world in children and adults alike, I begin to wonder, "Is this part of human nature?"

We know that pleasure reinforces adaptive behaviors such as eating and sex that help our species survive, but it seemed to me that giving might also be one of those behaviors.

I got really excited about these ideas and wrote about it in The New York Times.

One of the people who read this article was my accountant.

(Laughter) Right.

When it was time to pay taxes, I sat across from him and watched as he tapped slowly over the charitable donations section of my tax return with a well-concealed look on his face.

(Laughter) Even though I've built my career on showing how great it is to donate, I haven't really contributed much.

So I decided to give more.

Around that time, the tragic news about the Syrian refugee crisis was everywhere.

I really wanted to help, so I took out my credit card.

I knew my donation would probably make a difference for someone, somewhere, but just going to an effective charity's website and entering my visa number still didn't feel like enough.

That's when I learned about Group of Five.

The Canadian government allows five Canadians to personally sponsor a refugee family.

You must raise enough money to support your family during your first year in Canada. And they literally get on a plane to your city.

One of the great things about this program is that no one is allowed to do it alone.

And instead of a group of 5, we ended up partnering with a community organization to form a group of 25.

After about two years of paperwork and waiting, we found out that our family would be arriving in Vancouver in six weeks.

They had four sons and a daughter, so we hurried to find a place for them to live.

We were very lucky to find them a home, but it required a lot of work.

So my friends came in the evenings and weekends to paint, clean and assemble the furniture.

When the big day came, we filled the fridge with milk and fresh fruit and headed to the airport to see our family.

It was a little overwhelming for everyone, especially the 4 year old.

His mother reunited with his sister, who had come to Canada earlier on the same program.

They hadn't seen each other in fifteen years.

When we hear that more than 5.6 million refugees have fled Syria, we are confronted with a tragedy in which the human brain has not evolved enough to comprehend.

It's very abstract.

In the past, if we were asked to donate 15 hours a month to help the refugee crisis, we probably would have said no.

But as soon as we took the family to our new home in Vancouver, we all had the same perception. I mean I'm going to do whatever it takes to make them happy.

This experience made me think a little more deeply about my research.

Back in my lab, I've seen the benefits of giving spikes when people feel a real connection to the people they're helping and can easily imagine the change they're making in their lives.

For example, one experiment gave participants the opportunity to donate a small amount of money to UNICEF or Spread the Net.

We deliberately chose these charities because they are partners and share the same very important goal of promoting the health of children.

However, UNICEF is such a large and wide-ranging charity that it can be a little difficult to imagine how your own small donation can make a difference.

In contrast, Spread the Net offers tangible promises to donors. For every $10 donated, we provide one mosquito net to protect a child from malaria.

It turns out that the more money people donated to Spread the Net, the more satisfied they reported afterwards.

In contrast, this emotional return on investment was completely eliminated when people donated money to UNICEF.

So this suggests that donating money to worthy charities is not always enough.

You need to be able to imagine exactly how your money makes a difference.

Of course, the Group of Five program takes this idea to a whole new level.

When we first started working on this project, we used to discuss when the refugees would arrive.

Now we simply call them family.

I recently took the kids ice skating, and later that day, six-year-old Oliver asked me, "Mommy, who's the oldest in the family?"

I thought he was talking about a lot of cousins, and not just about them, but about our Syrian family.

Since our family arrived, so many people and organizations have offered to help, offering everything from free tooth fillings to summer camps.

I started to see the goodness that exists in our community.

Thanks to one donation, the children were able to go to a bike camp and every day members of our group tried to come there to cheer them on.

I happened to be there the day the training wheels were due to come off, and let me tell you, a 4-year-old didn't think this was a good idea.

So I went to see him and we talked about the long-term benefits of riding without training wheels.

(Laughter) Then I remembered that he was four years old and spoke very little English.

So I went back to two words he definitely knew: ice cream.

If you try it without training wheels, I'll buy you an ice cream.

I'll explain what happened next.

(Video) ED: Yes. yes!

Child: I'll try.

ED: Whoa! Look, go!

(shrieks) Look, here we go! You're doing it all yourself!

(audience) (laughter) (video) ED: Great!

(audience) (laughter) (applause) ED: So this is the kind of aid that humanity has evolved to enjoy, but for 40 years Canada was the only country in the world that allowed civilians to sponsor refugees.

Come on, Canada!

(Applause) That's great.

Australia and the UK are now launching similar programs.

Imagine how different the refugee crisis would be if more countries made this possible.

Forging meaningful connections between individuals like this gives us the opportunity to deal with challenges that can feel overwhelming.

One of those challenges is on the downtown East Side of Vancouver, just a few blocks from where I'm standing now.

By some standards, this is Canada's poorest urban postal code.

We actually debated whether we should bring refugee families over. Because there are many people here who are already suffering.

My friend Evan told me that when he was a kid, he would squat in the back seat when his parents drove through the neighborhood.

But Evan's parents never imagined that when he grew up, he'd open the doors of a local restaurant and invite people inside to enjoy a three-course dinner.

The program Evan helped build is called Plenty of Plates, and its goal is not only to provide free meals, but to create moments of connection between people who would otherwise never see eye contact.

Each evening, local businesses sponsor dinners and dispatch a team of volunteers to help prepare and serve the meals.

The leftovers are then distributed to people on the streets, and importantly enough funds remain to provide the community with 1,000 free lunches in the days that follow.

But the benefits of this program extend beyond the food.

For volunteers, it provides an opportunity to engage with people and sit and listen to them.

After this experience, one volunteer changed the way he commute, instead of avoiding the neighborhood, passing by smiling and making eye contact with familiar faces.

We can all find joy in giving.

But you shouldn't expect this to happen automatically.

Spending money to help others does not necessarily promote happiness.

Rather, how you do it matters.

And if we want people to give more, we need to flip the way we think about charitable giving.

We need to create opportunities to give so that we can recognize our shared humanity.

If you have someone working for a charity, don't reward donors with pens or calendars.

(Applause.) See the tangible impact their generosity is having and give them the opportunity to connect with the individuals and communities they support.

We are used to thinking that giving is something we should do.

And yes.

But in thinking this way, we miss one of the best parts of being human: we evolved to take pleasure in helping others.

Stop thinking of giving as just a moral obligation and start thinking of it as a source of joy.

thank you.

(applause)

First of all, Houston, we have a problem.

We are entering a second generation of human spaceflight where no progress has been made. In fact, we have fallen behind.

We are very likely to lose our ability to encourage young people to go out and continue doing this very important thing that we have always done as a species.

I mean, we instinctively went out, got through the tough spots, went to the more hostile places, and, perhaps to our surprise, later learned that that's why we survived.

And I feel strongly that it's not enough that there are generations of kids who think it's okay to expect an improved cell phone with video in it.

They should look forward to exploring. They should look forward to colonization. They should expect breakthroughs.

We need to inspire them because they need to guide us and help us survive in the future.

What worries me most is what NASA is doing now over the next decade and a half with this new Bush doctrine. Alas, I failed.

There are specific instructions here not to talk about politics.

(Laughter) What we're looking forward to -- (Applause) We're not just looking forward to inspiring children. The current plan doesn't even allow the most creative people in the country — space engineers from Boeing and Lockheed — to go out and take risks and try new things.

We're going back to the moon... 50 years from now?

And we're going to do it with a very specific plan so that we don't learn anything new.

It really bothers me. But anyway, that's the foundation of what I want to share with you today is to get back to where we inspire the people who go on to become great leaders.

That's the theme for the next 15 minutes.

I think inspiration starts at an early age, from 3 to 12 or 14 years old.

What they see is most important.

Let's take a snapshot of the aviation industry.

And there was a wonderfully short four-year period in which great things happened.

It started in 1908 when the Wright brothers flew to Paris and everyone said, "Oh, dear, I can do that." Only a few people flew in early 1908. In four years, there were hundreds of planes and thousands of pilots in 39 countries. Airplanes were invented by natural selection.

We can now say that intelligent design designs airplanes today, but intelligent design did not actually design early airplanes.

It probably tried at least 30,000 different things, but if it crashes and kills the pilot, don't try it again.

There were no problems flying and landing, as there were no trained pilots with good flying ability by definition.

So it took us four years and thousands of iterations to invent the concept of the airplane we fly today. That's why it's so safe because you've given yourself a good chance of finding a good one.

None of that happened in spaceflight.

Only two concepts have been attempted so far. Two in the United States and one in Russia.

So, who inspired you during that era?

Aviation Week asked me to create a list of the people who I believe moved and rocked the first 100 years of aviation.

and wrote them down. And later I learned that every one of them was a little kid in the great renaissance of aviation.

Well, what happened to me when I was a kid was also pretty heavy.

The age of jets has begun, the age of missiles has begun. Von Braun was teaching there how to get to Mars, which predates Sputnik.

And this was a time when Mars was much more interesting than it is now. We thought there would be animals there. We knew there were plants there. It changes color, right?

But, as you know, NASA messed it up by sending these robots to land only in the desert.

(Laughter) If you look at what happened, this little black line is the fastest mankind has ever flown, the red line is the best military fighter plane, and the blue line is civil air transport.

You may have noticed that I made a big leap here when I was young. I think it has a lot to do with giving me the courage to try things that other people don't dare to try.

Well what was I doing as a kid?

I wasn't doing hot rods or girls or dancing, and there were no drugs at the time. But I made a model airplane for competition.

During the Vietnam War, I spent about seven years flying test aircraft for the Air Force.

Then I went in and had a lot of fun building airplanes that people could build in their garage.

About 3,000 of them are in flight. One of them, of course, is Voyager Around the World. In 1982 I started another company and that is what I have now.

And since 1982, we have developed several new types of aircraft each year.

There are a lot of things that this chart can't really show you.

I believe the most impressive aircraft ever designed was designed just 12 years after the first jets entered service.

Continued operation until it rusted and could not fly, and stopped operation.

We stepped back in '98 and went back to what was developed in '56. what?

I think the most impressive spacecraft ever is the Grumman lunar lander. It, you know, landed on the moon, took off from the moon, and required no maintenance personnel. That's great in a way.

We have lost that ability. Abandoned in 1972.

The object was designed three years after Gagarin made his first space flight in 1961.

It will take 3 years, but I can't do it now. crazy.

Talk very briefly about the cycle of innovation, what grows, and how active it is. Disappears when replaced by something else.

These things tend to happen every 25 years.

40 years of overlap. This statement can be applied to all kinds of different technologies. Interesting, by the way, speed here, excuse me, fast travel is the title of these innovation cycles. There is nothing here.

These two new planes have the same speed as the DC8 built in 1958.

This is the key point, if the government develops it and the government uses it, there is no innovation cycle.

A good example, of course, is the DARPA net.

Computers were first used by artillery and then by the IRS.

But once we got it, we now have every level of activity and enjoy all its benefits. The private sector has to do it.

Keep that in mind. I stopped innovating -- I've been looking for cycles of innovation in space. Nothing found.

Beginning when Gagarin went into space, and a few weeks later when Alan Shepard went into space in his first year, there were five manned space flights in the world.

In 2003, everyone the US sent into space died.

In 2003 there were only 3-4 flights.

In 2004, there were only two flights to the international manned station: Russian Soyuz flights. And a small group of a few dozen people had to fly three flights out of Mojave to reach a total of five flights, which was the figure for the same year in 1961.

No growth. No activity. Nothing.

This is a photo taken from SpaceShipOne.

This is a picture taken from orbit.

Our goal is for you to really enjoy looking at this photo.

We now know how to do sub-orbital flight, making it safe enough, at least as safe as the early airlines.

And I want to talk a little bit about why we, as a small company, had the courage to try it.

Well, first of all, what will happen from now on?

The first industry will be the one with the most volume and the most players.

Just last week, another announcement was made.

And it becomes a sub-orbital. And the reason it has to be sub-orbital is that there are not enough safe solutions to fly ordinary people into orbit. Governments are doing this. Three governments have been doing this for 45 years, and 4 percent of those who leave the atmosphere still die.

It's just that you don't want to run a business with that kind of safety record.

It has a very large capacity. We expect 100,000 people to fly by 2020.

I can't say when it will start because I don't want my competitors to know my schedule.

But if it does, I think we'll find a solution and soon we'll have a resort hotel in orbit.

And the really easy thing to do is swing around the moon and take in this amazing view. And it's going to be really great.

Because the moon has no atmosphere. If you're so inclined, you can draw an elliptical orbit and fly 10 feet.

Oh, it's going to be so much fun.

(laughter) Okay. My critics say, "Hey, Rutan is just spending millionaires' money for millionaires' fun.

What is this? This is not a transportation system. it's just for fun. ”

I used to be annoyed by it, but now I'm thinking wait a minute. I bought my first Apple computer in 1978. I bought it because I can say, "I have a computer at home, you don't."

'What are you using it for? 'come over. it's a frogger. ”

(Laughter) It wasn't a bank computer, it wasn't a Lockheed computer, but home computers were for gaming.

For a whole decade it was for fun. We didn't even know what it was for.

But what happened was that we had this big industry, big developments, big improvements and features, and the fact that they were in enough homes that the time was ripe for new inventions.

And the inventor is in this audience.

Al Gore invented the Internet. It turned out to be everything that we used for a year, excuse me, a full decade for fun. Our commerce, research and communication. Give the guys at Google a few more weeks to think about it, and they could add 10 more to the list. (Laughter) And it won't be long before we can't convince our kids that we didn't always have computers in our homes.

Fun is therefore defensible.

OK, I'd like to show you a bit of a busy chart, and it contains my predictions of what might happen.

And in that, another point is also raised here.

There is a group of people who have come forward -- and I don't know all of you -- but those who did have been inspired by us to orbit and go to the moon at a very young age, between the ages of 3 and 15, right around this time.

Paul Allen, Elan Musk, Richard Branson, Jeff Bezos, the Ansari family now funding Russia's suborbital program, private space station Bob Bigelow, and Carmack.

These people are taking money and putting it into interesting fields. I think that's a lot better than putting it into the realm of a better phone or something. But they're putting in quite a bit of space. This will lead us to this kind of functionality, to the next really big thing, to explore. And ultimately, I think it will allow us to colonize and prevent extinction.

They were inspired by great progress. But look at the progress since then.

Here were some examples.

Military fighters had the highest performing military aircraft, the SR71. It went through its entire life cycle, becoming too rusty to fly and out of use. Concorde doubled the speed of air travel.

A service has been terminated after going through its entire lifecycle without conflict. And we're stuck here with the same kind of military fighter and civil air travel capabilities that we had back in the late '50s.

But now there is something out there to inspire kids.

And what I'm talking about is if you have a baby or a 10 year old.

Something really interesting is about to happen here.

Relatively soon, you will be able to buy a ticket and fly higher and faster than even the best military aircraft. It's never happened before.

The fact that they're sticking around here with this kind of performance is, well, win the war in 12 minutes. Why do you want something better?

But as soon as you buy your ticket and start sub-orbital flight into space – wait a minute, what's going on here, there will be military fighters with sub-orbital capabilities, and I think soon.

But what's interesting is that commercial actors act first.

OK, I'm looking forward to a new "capitalist space race," let's call it that.

Remember when the 60's space race was about national prestige? Because we missed the first two milestones.

We didn't technically lose them. Some would argue that the fact that when I let von Braun fly it had the hardware to put something into orbit, it's not a technical loss.

Sputnik was not a technical loss, but a loss of prestige.

America -- The world saw America as not the technology leader, but it was very strong.

And we flew Alan Shepard not months, decades after Gagarin, but weeks after. So we had that ability.

But America lost. lost. So we took a giant leap to get it back.

Now, what's interesting here is that we've already lost to the Russians in the first few milestones.

You can't commercially buy a plane ticket to go to space in America -- you can't. You can buy it in Russia too.

It can fly on Russian hardware. This is available because the Russian space program is starving, and it would be nice for them to be able to raise $20 million from here and there to get one of the seats.

it's commercial. It can be defined as space travel. They also propose a trip around the moon on the whip, much like Apollo 8 did.

If you have $100 million, you can go to the moon.

But in the space race of the 60s, did you think that the first commercial capitalist thing to buy a ticket to the moon would be in Russian hardware?

And when the Russians went to the Moon for the first time with hardware they developed, did they think there weren't any Russians inside? Maybe it would be a Japanese or an American billionaire? Right, that's weird. As you know, it really is.

But anyway, I think we need to beat them again.

I think what we do is make the commercial spaceflight industry successful and very successful. It doesn't really matter if we are first.

In fact, the Russians flew a supersonic transport before the Concorde.

It then skipped several cargo flights and grounded them.

I think there are similar similarities when it comes to commercial offerings.

Now let's talk a little bit about commercial development for manned spaceflight.

This little thing is saying here. That's five times what NASA is doing by 2020. What I mean is that there is already about 1.5 billion to 1.7 billion investments worldwide in private spaceflight, which is not government at all. If you read it, if you google it, you will find about half of that money, but twice that amount has actually been put in, not yet spent, but put in and planned for the next few years. Huh, that's pretty big.

But I predict the industry will be as profitable as it gets. If you're spending $200,000 to fly people to something that actually costs less than a tenth of that to operate, it's certainly more profitable. This will be very profitable.

And I predict that the investment that will go into this will be about half of what US taxpayers spend on NASA's human spacecraft research.

And every dollar that flows into it will be spent 10 to 15 times more efficiently. And that means, before we know it, tax free advances in human spaceflight will be at a level about five times the current NASA budget for human spaceflight.

Because it is us. It's a private industry.

We shouldn't rely on the government to do this sort of thing. And we have been doing so for a long time. Prior to NASA, NACA had never developed an airliner or operated an airline.

However, NASA has developed a Spaceliner and has always owned and operated the only Spaceliner. And we've been avoiding it because we're afraid of it. But that all changed since June 2004, when I showed that even a small group could actually do it and get started.

Yes, thank you.

(applause)

Nature is my muse and my passion.

As a National Geographic photographer, I have painted this landscape for many.

But five years ago, I embarked on a personal journey.

I wanted to visualize a life story.

It's the hardest thing I've ever tried, and there were many times when I wanted to give up.

But there was also a revelation.

I would like to share one of them with you today.

I wanted to go to a remote Australian lagoon and see what the Earth looked like 3 billion years ago, before the sky turned blue.

It contained stromatolites (the first organisms to perform photosynthesis) and is the only place where stromatolites still occur today.

Going down there was like entering a time capsule, and a different sense of myself emerged over time.

The oxygen exhaled by these stromatolites is what we breathe today.

Stromatolites are the main characters in my story.

I hope that it is a story that can sympathize even a little with our times.

It's a story about you and me, about nature and science.

That being said, I would like to invite you on a short, short journey through life through time.

Our journey begins in space, where matter condenses into spheres over time...

It sticks to the surface and is formed by fire.

The fire extinguished and the earth appeared, but this was an alien planet.

The moon is approaching. Things were different.

The heat from within erupted geysers, and the sea was born.

Water froze around the poles, forming the edges of the earth.

Water is the key to life, but in its frozen state it becomes a latent force.

And when it disappears, Earth becomes Mars.

But this planet is different. It's a mess inside.

And when that energy touches water, something new is born: life.

It occurs around cracks in the earth.

Mud and minerals are the substrate. I have bacteria.

Learn to multiply and thicken in places...

Grow living structures under an alien sky...

Stromatolites were the first to exhale oxygen.

And they changed the atmosphere.

Breath fossilized as iron now.

Meteorites brought chemicals and possibly membranes.

Life needs a membrane to contain itself so that it can replicate and mutate.

These are diatoms, single-celled phytoplankton with a skeleton of silicon.

Futuristic circuit board.

Shallow oceans harbored life in its early stages, and life transformed into more complex forms there.

It grew as light and oxygen increased.

Life hardened and became defensive.

It learned to move and became visible. The first eye grew into a trilobite.

The first horseshoe crabs to emerge from the sea had sophisticated vision.

They are still doing what they have been doing for years, even though their enemies are long gone.

Scorpions chase prey out of the sea. The slug became a snail.

Fish tried amphibian life. A frog adapted to the desert.

Lichens originated as cooperatives. Fungi married algae...

Cling to a rock, eat it... transform the barren land.

A true land plant arose, initially without leaves.

When I learned how to maintain an upright posture, my body grew in size and shape.

The rudimentary morphology of the fern followed and laid spores that foreshadowed seeds.

Life flourished in the marshes.

Life took a turn on land. The Jaws were first formed. Teeth came later.

Leatherback turtles and tuatara are echoes of that era.

It took a long time for life to leave the water, but it still beckons.

Life got tougher and adventures into the interior became possible.

And the dragons that occurred are still among us today.

Jurassic Park still shines in parts of Madagascar and central Brazil where the plant called 'cycad' remains rock-hard.

A forest sprouted and grew something with wings.

One of the early forms left a trail as if it had died yesterday.

And some fly away today like echoes of the past.

In birds, life has acquired new mobility.

Flamingos covered the continent. Migration has begun.

Birds witnessed the emergence of flowering plants.

The water lily was the first of them.

Plants began to diversify and grow, turning into trees.

In Australia lilies turned into grass trees, and in Hawaii daisies became silver swords.

In Africa, Gondwana formed the protea.

But when that ancient continent collapsed, life became richer.

A rainforest arose, creating a new layer of interdependence.

Bacteria grew. Orchids appear and genitals are shaped to lure insects...

A trick common to the biggest flowers on earth.

Coevolution has forever involved insects, birds and plants.

Birds become vulnerable when they cannot fly.

So are kiwis, and these hawks are also being caught near Antarctica.

Extinction can come slowly, or it can come quickly.

An asteroid collided and the world was engulfed in flames.

But there were eyewitnesses, those who survived in the dark.

When the skies cleared, a new world was born.

A world fit for mammals. Tenrec was born from a small shrew accustomed to the dark.

The new form became a bat. palm civet.

A new predator, the hyena, is getting faster and faster.

Grasslands created opportunities.

Herd security was provided by a heightened sense.

Going bigger was another answer, but size always comes at a price.

Some mammals have returned to the water.

The walrus has adapted with a layer of fat. Sea lions smoothed out.

And cetaceans have ventured into a world without limits.

There are many ways to become a mammal. Lou hopping in Oz. Horses run in Asia. And in Brazil, wolves evolved stilts.

Primates first emerge from the jungle as tarsiers, and not so long after they become lemurs.

Learning enhanced. A herd of monkeys has ventured into the field.

And the forest has dried up again. Standing upright has become a lifestyle.

So who are we? A masculine chimpanzee brother, a feminine bonobo sister? We are all of them and more.

We are shaped by the same life force.

The veins on our hands mirrored the trajectory of water on Earth.

And our brains—our famous brains—reflect the drainage of tidal swamps.

Life is a power in itself. New element.

And it changed the planet. It covers the earth like a skin.

And even in places that aren't, like Greenland in winter, Mars is still not too far away.

But that possibility disappears as long as the ice melts again.

And when water is a liquid, it becomes a womb of cells green with chlorophyll, whose molecular wonders bring change and power everything.

The entire animal kingdom today lives on a reservoir of bacterial oxygen that is constantly circulated through plants and algae, the waste product of which is our breath and vice versa.

This earth is alive, making its own membrane.

We call it "atmosphere". This is the symbol of our journey.

And everyone here today can imagine and shape where we go next.

(Applause.) Thank you. thank you.

My name is Ursus Veri. This morning I would like to talk to you about my project "Organizing Art".

First things first -- do you have any questions so far?

First of all, I'm not from around here.

Did you notice that I come from a completely different culture?

First of all, I'm wearing a tie. Second, I am a little nervous because I speak in a foreign language. I would like to apologize in advance, as there may be mistakes.

I'm from Switzerland, so I don't want you to think that I'm speaking Swiss German now. This is exactly what it sounds like when we Swiss try to speak Americans.

But don't worry. I have no problem with English itself.

So it's not my problem, it's your language problem after all.

(laughs) I'm fine. After my presentation here at TED, I can only go back to Switzerland, but you have to keep talking like this.

(laughter) So the organizer asked me to read my book.

It's titled "The Art of Tidying Up," and as you can see, it's almost a picture book.

Therefore, the reading ends quickly.

But since I'm here at TED, I decided to give my talk in a more modern way, in the spirit of TED here, and made some slides here.

I'd like to show them around, and that's what -- (Laughter) I actually have some zoomed-in pictures -- even better.

In other words, I have to say that "art organization" is a relatively new term.

You will not be familiar with it.

I mean, it's a hobby I've been into for the last few years, and it all started with this photo by American artist Donald Beckler that I had hanging in my house. I had to watch it every day, but after a while I couldn't stand the mess this guy was seeing all day.

Yeah, I kind of felt sorry for him.

And even he seemed to find it really painful to face this disorganized red square day after day.

So I gave him a little help and brought order to the neat stacking of blocks.

(Laughter) Right. And I think he's less miserable now.

And it was great. This experience led me to take a closer look at contemporary art. It was then that I realized that the world of contemporary art was changing at a particularly dizzying pace.

I can give a very good example here.

It's actually simple, but it's a good way to start.

A painting by Paul Klee.

You can see it very clearly here, it's a color mess.

(Laughter) Right. The artist doesn't seem to really know where to put the different colors.

The different pictures here represent different elements of photography, but the whole thing is unstructured.

We don't know, but maybe Mr. Klee was probably in a hurry, so -- (laughter) -- he had to catch a plane or something.

Here you can see he started with an orange, but then he already ran out of oranges. And here we see that he decided to take a break for squares.

And I'd like to show you a cleaned up version of this photo here.

(Laughter) I see things now that were barely recognizable in the original. There are 17 red and orange squares next to only 2 green squares.

yeah, that's great.

In other words, tidying up for beginners.

Here I would like to show you some more advanced images.

(laughter) What can I say? What a mess.

That is, everything seems aimlessly scattered in space.

If my room in my hometown looked like this, my mom would have locked me out for three days.

So I want to - I wanted to reintroduce some structure to that picture.

That's really advanced tidying up.

(Applause) Yes, that's right. Some people applaud at this point, but in fact there are more applause in Switzerland.

(Laughter) We Swiss are famous for chocolate and cheese. Our trains run on time.

We are happy only when things are going well.

But go on, here's a very good example.

This is a painting by Joan Miro.

And yes, you can see that the artist drew some lines and shapes and dropped them into the yellow background the old fashioned way.

Yep, that's the sort of thing that's generated when you're scribbling on your phone.

(Laughter) Here's mine -- (Laughter) -- As you can see, the whole thing takes up a lot less space.

It's more economical and more efficient.

Using this method, Milo could have saved the canvas for another painting.

But I can tell by looking at your faces that you're still a little skeptical.

I've brought you some patents and specs for these pieces to give you an idea of ​​how serious I am about all this. Because my working method is patented by the Museum of Education and Science in Bern, Switzerland.

(Laughs) I will quote from the specifications.

"According to Art Examiner Dr. Albrecht—" It's not over yet.

“According to Art Examiner Dr. Albrecht Goetz von Orenhusen, this procedure is legally protected and allows art to achieve new effects through a particularly neat regularity of treasures in general form.”

Well, I could have translated it too, but you weren't so smart.

I'm not quite sure what that means, but it looks good anyway.

I just realized how important it is to introduce new ideas to people. That is why these patents are sometimes necessary.

I would like to do a simple test with you.

We are all sitting here orderly this morning.

I would like everyone to raise their right hands. yes.

Unless we are left-handed, we write with our right hand.

Now count to three. I mean, it still looks very orderly to me.

Now count to three. After counting to three, shake hands with the person behind you. OK?

1 2 3。

(Laughter) This is a good example. It turns out that even acting orderly and systematic can sometimes lead to complete chaos.

So you can see that very clearly in this next picture as well.

This is a painting by artist Niki de Saint Phalle.

In other words, it is completely unclear in the original work what this entanglement of colors and shapes expresses.

But in the pared-down version, it's pretty obvious that it's a tanned woman playing volleyball.

(Laughter) Yes, this one is much better than this one.

A painting by Keith Haring.

(Laughter) I don't think it matters.

I mean, this photo doesn't even have a proper title.

It's called "Untitled", but I think that's appropriate.

So, in a decluttered version, it's kind of like a Keith Haring spare parts shop.

(Laughter) This is Keith Haring statistically.

You can see it very clearly here. You can see that there are 25 pale green elements, one of which is in the shape of a circle.

For example, here are 27 pink squares and only one pink curve.

I mean, it's interesting. This kind of statistical analysis could be extended to all of Haring's various works to establish at what period the artist favored pale green circles and pink squares.

And artists themselves can also benefit from this kind of listing procedure by using it to estimate how many pots of paint they may need in the future.

(Laughter) Of course you can combine them.

For example, Keith Haring's circle or Kandinsky's point.

Can be added to all squares of Paul Klee.

In the end you will have a list that you can organize with it.

Then sort it out, file it, put the file in a filing cabinet, put it in the office, and you can make a living out of it.

(Laughter) Yes, from my own experience. So I -- (Laughter) There are actually some artists here that are a little more structured. Not too bad.

It's Jasper Jones. You can see him practicing with a ruler here.

(Laughter.) But I think we could still benefit from more discipline.

I think it makes the whole thing better if you do it this way.

(Laughter) And this is one of my favorites.

Cleaning up Rene Magritte -- This is really fun.

You know, there's -- (laughter) I'm always asked what inspired me to start doing this.

Back in the days when I used to stay in hotels.

Once there, I had the opportunity to stay in a luxurious five-star hotel.

You see, there was a small sign there. I put this little sign outside my door every morning that said, "Please clean up your room." I don't know if it's here.

So, in fact, my room there is tidied up three times a day instead of once a day.

So after a while, I decided to have a little fun and scatter a few things around the space before I left the room each day.

Books, clothes, toothbrushes, etc. And it was great.

By the time I got back, everything was back in place.

But one morning I hung the same little sign over a Vincent van Gogh painting.

(Laughter.) And I have to say that this room hasn't been tidied up since 1888.

And when I came back, it looked like this.

(Laughter) Yes, at least it's now possible to vacuum.

(Laughter) Well, I know that there will always be people who like to react to photos not being properly organized. So we can do a simple test with you.

This is a painting by Rene Magritte, but I would like you all to organize it in your heart, that is, in your head. So some people might do it this way.

(laughs) Is that so? I would actually like to do more this way.

Some even make apple pie out of it.

However, this is a very good example of how the whole work was a handicraft endeavor that involved cutting out various elements and pasting them into new arrangements, which was very time consuming.

And it's not done on a computer, as many imagine. Otherwise:

(Laughs) So I was able to put away the photos that I wanted to put away for a long time.

Here is a very good example. Consider Jackson Pollock, for example.

It's--oh no, it's--it's really hard.

But after a while, I decided to take the plunge and put the paint back in the can.

(Applause.) Or you could go into 3D art.

This is a fur cup from Merett Oppenheim.

This is just restored.

(Laughter) But yes, that's great. you can go too As you know, we have a pointillism exercise for those who are interested in art.

Pointillism movement is a kind of painting in which everything is broken down into points and pixels.

And I—this is the best way to clean up.

(Laughter) So I once applied myself to the work of Georges Seurat, the inventor of the method, and collected all his points.

And now they are all here.

(Laughter) You can count later if you want.

As you can see, that's the great thing about decluttering art ideas. it's new. So there is no existing tradition there.

Anyway, there are no textbooks, that is, not yet.

It is "the future we create".

(Laughter) But there's one last thing I want to show you.

This is the village square by Pieter Bruegel the Elder.

This is how I feel when I send everyone home.

(laughter) Well, you are probably asking yourself where the old people of Bruegel went?

Of course, they are not gone. everybody's here

(Laughter) I just piled it up.

(Laughter.) So I was -- well, I think it was over at that moment, actually.

I have my book in the bookstore downstairs for those who want to learn more.

And I would be happy to sign any artist's name.

(Laughter) But before I leave, I want to show you that I'm working on something else right now. That's an area related to my decluttering skills. I work in a related field.

And I started to bring order to some flags.

This is my new proposal for Union Jack.

(Laughter) And then, maybe before I leave you...

Well, after you see it, I think I'll have to leave anyway.

(Laughs) Yes, it was difficult. I couldn't find a way to organize it properly, so I decided to keep it a little simpler.

(laughs) Thank you very much.

(applause)

On April 26, 1937, Fascist forces bombed the Basque village of Guernica in northern Spain.

It was one of the worst civilian casualties in the Spanish Civil War between the Democratic Republic and the fascist forces led by General Franco.

For Pablo Picasso, this tragedy sparked a frenzied period of work to create a giant anti-war mural aptly titled 'Guernica'.

This painting is a powerful piece of historical documentation and political protest.

But while Picasso's artistic motives are clear, the painting's symbolism can be as confusing and chaotic as war itself.

How do we make sense of this overwhelming image? And what makes this work a masterpiece of anti-war art?

Painted in the abstracted Cubist style pioneered by Picasso, this monumental canvas is disorienting from the start.

Cubism deliberately emphasized the two-dimensionality of the canvas by flattening the objects being painted.

This allowed viewers to get multiple, and often impossible, perspectives on the same object. This technique was also considered shocking in Picasso's domestic scenes.

But in this context, the style offers a very overwhelming perspective of violence, destruction and victims.

Having multiple perspectives only adds to the horror on display, making your eyes fly around the frame in a futile quest for peace.

On the far left, a woman screams while holding a dead child. Her eyes slid down on her face in the form of tears, and her head bent back unnaturally like that of a baby.

Below is a statue of a soldier, but he cannot protect women and children.

Instead, his mangled body lies in pieces, his arms clutching a shattered sword as a signal of maximum defeat.

The tip of his sword hits a woman's leg as she flees the devastation.

Her other leg, however, is rooted in place and appears to be fixed in the corner of the canvas, even as she stretches to move it.

Another victim appears behind this hunched figure.

She, too, is caught in a desperate sight as flames lick around her.

Each of these figures flanking the painting is terrifyingly confined, giving the piece a deeply claustrophobic feeling.

And while one might expect the enormous size of the canvas to counteract this feeling, its scale only accentuates the near-life-size atrocities on display.

A lamp held tightly by a ghostly woman reaching out through a window suggests a possible salvation.

But does the hopeful light of her lantern really illuminate the scene?

Or is it the jagged lightbulb, thought to represent the art of modern warfare, illuminating the chaotic landscape below her?

From the confines of a coffin-like window, her arms lead the viewer into the fray and to perhaps the most controversial symbol, two ghostly animals caught in the destruction.

Does the Screaming Horse represent the threat of Franco's military nationalism? Or are the spikes penetrating the body conveying a sense of victimhood?

Does the white bull represent Spain, the country of bullfighters, a common theme in Picasso's work, or the brutality of war?

In this scene of conflict, these animals pose more questions than answers.

And additional elements hidden throughout the frame offer even more secrets to the careful observer.

At the top of the canvas flashes a bird desperately trying to escape the carnage.

And the sheer number of animals on display could suggest the day the bombing took place—the day of the market, when the streets were flooded with villagers, animals, and other potential victims.

Like the bombing of Guernica itself, Picasso's painting is densely packed with destruction.

Beneath this chaotic image, however, hides carefully crafted scenes and symbols that carry out this painting's multifaceted attack on fascism.

Decades after its creation, "Guernica" still retains the power to shock audiences and stir controversy, and is often referenced at anti-war rallies around the world.

Hundreds of viewers have grappled with its harsh imagery, subversive symbolism, and complex political messages.

But even without a good understanding of its complex breakdown, Picasso's work is a powerful reminder of the true victims of violence.

My name is Hannah.

And it's a palindrome.

This is a word that, if you can spell it, can be spelled the same from front to back.

But the problem is -- (laughter) my whole family has palindromic names.

It's a bit of a tradition.

There's a mom and a dad -- (laughter) Nan pop.

(Laughter) And my brother's Kayak.

(laughs) Yes, please.

It's just a joke.

(Laughs) I'm a comedian, so I like to start things off with jokes.

Well, you already know two things about me. That's it, my name is Hannah and I'm a comedian.

you're wasting your time

The third thing I want you to know about me is that I don't think I'm qualified to speak my mind.

That's a bold statement, yes, but it's true.

I always had a very hard time putting my thoughts into words.

So it seems a bit paradoxical that someone like me who's bad at small talk can be something of a stand-up comedian.

But that's it. Here you go.

That's what it is.

I first tried my hand at stand-up comedy, comedy... you get it?

look? look?

(Laughs) I first tried stand-up comedy in my late twenties. Morbidly shy, low self-esteem, and despite having never held a mic before, I knew right away when I walked in front of an audience. Before I even made my first joke, I realized that I really liked standup and they liked me.

But for the life of me I could never figure out why.

Why am I good at something I'm not good at?

(Laughter) I didn't understand it at all, I didn't understand it.

In other words, until you can.

Now, before I explain why I'm good at what I'm not good at, let me throw another spanner of contradiction into this work by telling you that not long after I figured out why, I decided to quit comedy.

And before I describe the little rebellious cat I tossed into the dove I'm thinking of now, I'll also say this. Quitting started my career as a comedian.

(Laughter) After quitting comedy, I became the most talked about comedian on the planet. Apparently, I'm worse at planning my retirement than I am at speaking my mind.

Now, all I've done so far besides throwing in some biographical details is indirectly telling you that I have three ideas I'd like to share with you today.

And I did it by sharing three contradictions. One, I'm not good at speaking, and I'm good at speaking. I quit, I didn't quit

Three ideas, three contradictions.

Now, if you're wondering why there are only two on my so-called three-list -- (laughter) let me tell you, this is literally a list of contradictions.

keep up.

(Laughter) Well, the people at TED advised me that in a talk this long, it's best to just share one idea.

I said no.

(Laughter.) What do they know?

To explain why I chose to ignore what is clearly very good advice, I want to go back to the beginning of this story, specifically my palindromic joke.

Well, this joke uses one of my favorite tricks in the comedy industry: make a statement and back it up with a list.

My family all have palindromic names: Mom, Dad, Nan and Pop.

The first two ideas on that list create patterns, and those patterns create expectations.

And the third is bang! -- Kayak what?

Those are the three laws.

1, 2, surprise! Hahaha.

(Laughter) Now, the rule of three is not only fundamental to how I craft, but it's also fundamental to how I communicate.

Therefore, I am not going to change anything for anyone. Even TED. He points out that TED represents three ideas: technology, entertainment, and fools.

(Laughs) It works every time.

But it takes more than just jokes to pass as a professional comedian.

You need to be able to walk the fine line between being attractive and being vulnerable.

And I've discovered that the most effective way to create the charm I need to offset my anxiety-relieving personality is through stories, not jokes.

As such, my standup routine is full of stories. It's a story about growing up, a story about coming out, a story about the abuse I've been dealing with for not just being a woman, but a big woman, and a man-centered woman.

If you see my work online, check out the examples of abuse in the comments below.

(Laughter) That's when I shift into second gear in the talk. I will now tell you all the stories I have told.

My grandmother was surrounded by many people during the last few days of her life. Because my grandmother was the loving patriarch of a large loving family.

For those of you who haven't been in a relationship yet, I am part of that family.

I was lucky enough to say goodbye to my grandmother the day she died.

But she was already trapped inside herself then, so it was like a one-sided breakup.

So I thought about a lot of things I hadn't thought about in a long time, such as the letters I used to write to my grandmother when I was new to college, and the letters filled with funny stories and anecdotes to entertain her.

And I remembered how I couldn't put into words the anxiety and fear that filled me as I tried to carve my little tiny life into a world that felt too big for me.

But I remember taking comfort in that letter. Because I wrote the letter with my grandmother in mind.

But as the world became more and more overwhelming and my ability to negotiate it got worse instead of better, I stopped writing letters.

I never thought I would have the kind of life my grandma would want to read.

My grandmother didn't know I was gay, but about six months before she died, out of nowhere, she asked me if I had a boyfriend.

Now, I remember making the conscious decision not to come out to my grandmother at that moment.

And I did it because her life was coming to an end, and my time with her was finite, and I didn't want to talk about our differences.

I wanted to talk about how we were connected.

So I changed the subject.

And at the time, I felt it was the right decision.

But as I watched my grandmother's life dwindle toward its inevitable end, I couldn't help but feel that I was wrong not to share such an important part of her life.

But I also knew I missed my chance, and as Grandma always said, 'Oh, well, it's all part of the soup.

It's too late to take the onions out now. ”

(Laughter.) And I thought about it, and I thought about how I had grown up gay in a state where homosexuality was illegal as a kid and had to deal with too many onions.

Thinking about it made me realize how tightly I was wrapped up in the tentacles of internalized shame.

Along with that, I thought about all my traumas: violence, abuse, rape.

And in that mass of thoughts, a thought, a question kept popping into my mind, but without an answer. "What is my purpose as a human being?"

In my family, I felt most like my grandmother.

So we have the most in common.

Not so much these days.

Death really changes a person.

But that's (laughs) my grandmother's sense of humor.

But the person I felt most like in the world was my mother, my grandmother, my great-grandmother, my great-grandmother.

myself? I represented the last branch of the family tree.

And I wasn't entirely sure if it was still connected to the trunk.

What was my human purpose?

The year after my grandmother's death was the most creative time of my life.

I think it's because, after all, my thoughts gather more than they disperse.

My thought process is not linear.

I am a visual thinker. I can see my thoughts.

I have no photographic memory, nor is my mind a static gallery of sensibly collected thought fragments.

It means I have an ever-evolving hieroglyphic language that I can develop, understand fluently, and think deeply.

But I'm having trouble translating it.

I can't paint, I can't paint, I can't sculpt, I can't make haberdashery. As for the written word, it's fine, but it's a tortuous process of translation that doesn't feel like it's doing the job.

And when it comes to speaking my mind, like I said, I'm not very good at it.

Speech always felt like an inappropriate freeze frame for my life.

With all this said, I have always understood more than I have ever been able to communicate.

Well, about a year before my grandma died, I was officially diagnosed with autism.

Well, for me it was mostly good news.

I'm depressed and anxious, so I always thought I wouldn't be able to organize my life like a normal person.

But I found that I couldn't organize my life like a normal person and was depressed and anxious because I wasn't a normal person and I didn't know it.

Now, this is not to say I haven't struggled yet.

To be honest, every day is a bit of a struggle.

But at least now I understand what my conflict is. And isn't that what standing on the normal starting line is all about?

My struggle is not to escape the storm.

My struggle is finding the eye of the typhoon as best I can.

Now, apart from the usual ways we Spectrum types find peace: repetitive behaviors, routine obsessive thoughts, I have another amazing gateway into the eye of the storm. It's stand-up comedy.

And if you want further proof that I'm neurodivergent, yes, I do things that scare most people out of the blue.

I'm almost dead here.

(Laughter) Diagnosis gave me a framework to hang on to parts of me that I would never understand.

My nonconformist suddenly had a fit, and for a while I felt dizzy with my new-found confidence in my way of thinking.

But that confidence plummeted after Grandma died. Because thinking makes me sad.

And in the sadness of that thought, I was suddenly able to see very clearly just how deeply and always isolated I had been.

What was my human purpose?

I've come to think a lot about how autism and PTSD have a lot in common.

And I started to worry because I had both.

Can it be untangled?

I have always been told that the way out of trauma is through a coherent story.

I had a coherent story, but I was still at the mercy of trauma.

They're all part of my soup, but the onions still hurt.

And at that point I realized I was telling my story for laughs.

I have carved out the darkness to comfort the audience, carved out the pain, and continued to carry the trauma.

I connected with other people through laughter, yet I remained deeply disconnected.

What was my human purpose?

I didn't have the answer, but I did have an idea.

I intended to speak all my truth, not to share a laugh, but to share the literal visceral pain from my trauma.

And I thought the best way to do that was through comedy shows.

And that's what I did.

I wrote a comedy show that doesn't respect the punchline, the punchline that comedians are expected and trusted to turn into punches and tickles.

It didn't stop.

I pierced the audience's metaphorical gut with that line.

I didn't want to make them laugh.

I wanted to take their breath and shock them. Then they will hear me and take my pain as an individual, not as an ignorant laughing crowd.

That's what I did and named the show "Nanette."

Now, a lot of people -- (applause) Now, a lot of people are arguing that "Nanette" isn't a comedy show.

And while I agree that "Nanette" is definitely not a comedy show, those people are still wrong — (laughter) because they frame their arguments like a way to say I failed to do comedy.

I never stopped doing comedy.

I took all the tricks, tools and know-how I know about comedy and thereby destroyed comedy.

If comedy fails, comedy cannot break comedy.

Relax, thy hammer.

(Laughter) (Applause) That wasn't what I meant.

The point wasn't just to break the comedy.

The point was to break the comedy so that it could be rebuilt and rebuilt, reformed into something that could better hold everything it needed to share. That's what I meant when I said I quit comedy.

At this point, you're probably thinking, "All right, but what exactly are those three ideas?"

It's kind of vague. ”

I'm glad I pretended to ask.

(Laughter) Well, I'm sure many of you have already identified three ideas.

I wouldn't be surprised at all, as they are obviously smart people.

But you might be surprised that I don't have three ideas.

I said I had three ideas, but I lied.

It was pure misdirection. I'm very funny

What I did instead was collect my ideas as seeds and sprinkle them throughout the talk.

And why did I do that?

Well, shit and giggles aside, it comes down to what my grandmother used to say all the time.

"It's not the garden that matters, it's the gardening."

And "Nanette" taught me the obvious truth.

I fully expected that breaking the comedy contract and telling my story in all its truth and pain would push me further into the fringes of both life and art.

I expected it, and I was willing to pay the price for telling the truth.

But what happened is not.

The world didn't push me away. It brought me even closer.

Through the act of disconnection, I found connection.

And it took me a long time to understand that what lies at the heart of that contradiction is also at the heart of the contradiction of why I am so good at what I am not good at.

As you know, in the real world, I have a hard time talking to people because my neural diversity makes it difficult to think, listen, speak, and process new information at the same time.

But you don't have to think about anything on stage.

I prepare my thoughts well in advance.

No need to ask. that's your job.

(Laughter) Technically, I'm reciting, so I don't have to actually speak.

So all that's left for me is to do my best to make a real connection with my audience.

And if the "Nanette" experience has taught me anything, it's that the connection doesn't just depend on me.

You play a role too.

"Nanette" may have started in me, but she now lives and grows in other minds, whole worlds of minds that I don't share.

But I believe we are connected.

And in that respect she is much greater than I am. Just as the purpose of being human is much greater than all of us.

Make it what you want.

Thank you and hello.

(applause)

Welcome to 10,000 feet.

Let me explain why we are here and why some people have pine cones nearby.

A long time ago, I published a book called "How Buildings Learn".

Today's event might be called "How Mountains Teach".

A quick background: For ten years, I've been trying to figure out how to hack civilization so that long-term thinking can be automatic and common, or even non-existent, rather than hard and rare.

It would be helpful if humanity could get into the habit of thinking about the next 10,000 years and the past 10,000 years, basically the story of previous civilizations, rather than just the next week or next quarter.

So we founded the Long Now Foundation in San Francisco.

This is an incubator for about a dozen projects related to long-term continuity.

I think our core project is a rather ambitious folly, a mythical undertaking. It's about building a 10,000-year clock that can actually keep accurate time over that long period of time.

And the design issues for such projects are downright delicious.

Please go to the clock. What you see here is what many of you saw here three years ago.

This is the first working prototype of the watch.

It is approximately 9 feet tall.

Designed by Danny Hillis and Alexander Rose. It is now in London, where it ticks the clock very carefully in the Science Museum there.

Now, the question of design today is how to house such an ultimately monumental clock in such a way that it actually ticks and is beautifully time-saving for 100 centuries.

Well this was the first solution.

Alexander Rhodes came up with the idea of ​​a spiral tower with a series of inclined ramps.

And that seemed like the way to go until I started thinking about what deep time would bring to the building.

Well, here is the effect of deep time on buildings.

This is the Parthenon. It's only 2,450 years old, but let's see what happened since then.

You have a beautiful project here. They really knew it would last forever, because they build it out of absolutely huge stones.

And now it's a pitiful ruin, and no one knows what it was used for.

That happens to buildings too. they are vulnerable.

Even the most durable and unbreakable buildings, such as the Pyramids of Giza, look terrible up close.

They are looted inside and out.

And they are made to protect things, but they don't protect things.

So we started thinking about where we can safely put things if we can't safely put them inside a building. We thought, "Okay, underground."

How about a basement with a nice view?

A really solid place in the basement.

So the obvious answer is that we need mountains.

Not all mountains are good.

If your watch is going to last 10,000 years, you definitely need the right mount.

This is a long-term image of the search problem.

Then, for a variety of reasons, I thought it should be a desert mountain, so I started looking for dry areas in the southwest.

We observed Mesa, New Mexico.

We were observing an extinct volcano in Arizona.

Then Roger Kennedy, director of the National Park Service, took us to eastern Nevada, the Great Basin National Park, one of America's newest and oldest national parks.

It's right on the eastern border of Nevada.

The highest reach in the state is over 13,000 feet.

And you will notice that the left side, left side, west side is very steep and the right side is gradual.

This place is remote. Over 300 miles away from any major city.

It's not near any interstate or railroad.

And it only runs through -- Route 50, the loneliest highway in America.

Now, inside the yellow line here, on the right side, are all national parks.

National forest is inside the green line.

And on the left is Land Management Land and some private property.

Now, as it happens, the two-mile long strip in the middle of it, this vertical section, was privately owned and was available.

And thanks to Jay Walker and Mitch Kapor, who were here to start the process, Long Now got that two-mile-long strip of land.

And now let's see the grand truth of what's out there.

We are in Pole Canyon looking west on the Western Escarpment of Mount Washington at 11,600 feet.

Those white cliffs are dense limestone from the Cambrian period.

It's a 600-meter-thick stratum and could be a beautiful place to hide a watch.

Getting there would be like a pilgrimage. It will be quite a hike to get to where the clock is.

So last June, the Long Now board of directors and some staff, some donors and some advisors made a two-week expedition to the mountain to explore and research it. One, whether it's the right pile, and two, if it's the right pile, how does it actually work for us.

Well, it looks like Danny Hillis framed the problem.

He has theories for how the overall watch experience should work.

That's what he calls the seven stages of a mythical adventure.

It starts with an image. The image is the image of the goal in your head at the end of the journey.

In this case it could be an image of a clock.

And then there is the point of departure, the point of transition from ordinary life to pilgrim on a journey of inquiry.

And then -- this is a nice image, there's a labyrinth.

A labyrinth is a concept, like the Twilight Zone, a place that is difficult, disorienting and possibly scary. But if you want some sort of deep social reintegration, you have to go through it.

That way the draw should always be in sight. So it's kind of a signpost that pulls you through the maze to complete the process of getting there.

Brian Eno, who is currently in the middle of the Long Now process, spent two years making the CD. It's called "January 7003" and is a "study of bells for old clocks".

Based on -- partly based on an algorithm developed by Danny Hillis, 10 bells ringing a different bell every day for 10,000 years.

Hillis algorithm. 10 factorial gives you that number.

And in fact, you'll be able to hear it soon.

January 7003. There is.

OK, back to Danny's list.

The fifth out of seven is rewards. This is it. climax.

the goal. The main thing you are trying to achieve.

And Danny said that there is a secret reward for a really great trip.

Something you didn't expect, subverting what you expected.

Then return.

You should gradually return to the everyday world to give yourself time to absorb what you have learned.

Also, how about souvenirs? Number seven.

At the end of it there is something physical, something like a reward that you will receive.

It may be a fragment of the mountain core drill.

something just for you.

How do we study mountains for the kind of things we're talking about?

This is no ordinary building project.

what do you want

What factors influence your ideas and decisions the most?

Start with the perimeter. If you look to the left of the cliff here, that's the national park. It is a sacred act and nothing can be done about it. To the right of it is a national forest.

It is possible. Boundaries are important.

Other factors include mines, weather, approaches, and elevation.

And especially trees. Look what's up there.

It turns out that Mount Washington is covered in bristle pine.

They are the world's oldest living creatures.

People think they are about the size of a shrub, but they really aren't.

There is a tree on that mountain that is over 5,000 years old and still alive.

The wood is as hard as stone, so it will last a long time.

Therefore, when we examine tree rings on trunks in mountains, some of them date back to 10,000 years ago.

The stone itself is truly beautiful, sculpted by thousands of years of very harsh winters.

A tree-ring analyst from the University of Arizona was also on the expedition.

Now, if you have a pine cone handy, now is a good time to put it in your hand and feel it, especially the edges.

That's interesting.

You can see why it is called Igamatsu. A little sensory experience.

This is Danny Hillis in the middle of a pine forest on Long Now land. It should be said that the era of bristlecones was discovered by theory.

In the 1950s, Edmund Shulman was studying trees under great stress at Timberline and noticed that he had published an article in the journal Science, "Life Under Adversity in Conifers."

And on that principle, he began observing the various trees of Timberline and realized that he had found a pine tree in the White Mountains that was over 4,000 years old.

Longevity in adversity is a very interesting design principle in itself.

All right, to the mine. The initial asking price when we looked at the property in 1998 was $1 billion for 180 acres and several mines.

Because the owner said, "There's a billion dollars of beryllium in that pile."

And we said, "Wow, that's great. Listen, we're going to fight back. What about Zero?"

(Laughter.) And because we're a non-profit foundation, if you donate your property to us, you'll get an outrageous tax credit.

(Laughter.) All you have to do is prove to the government that it's worth a billion dollars. ”

Well, it's been a few years and a few back and forth, but thanks to Mitch and Jay, we were able to purchase the entire property for $140,000.

This is one of mines. Does not contain beryllium.

It's called Paul Addit. It has a little bit of tungsten left in it, but that's what mine was.

But it goes 1.5 miles in a straight line due east of the mountains and enters very interesting territory. However, as you will soon see inside, I was expecting limestone, but there is only shale there.

And shale is not a fully functional rock.

A capable rock is one that can sustain itself without any support.

The shale wants some shoring, some of which has sunk into it.

It's Ben Roberts. He is an expert on bats in national parks.

But there are many wonders out there, such as strange fungi growing on some of the fallen wood.

OK, here's another mine on the site. Its origins date back to 1870.

That's what this land was originally built around, and it was a series of mining claims. It was a very productive silver mine.

In fact, it was the busiest mine in Nevada, operating year-round.

You can imagine what winter at 10,000 feet was like.

You may recognize some of the miners there.

On the right is Jeff Bezos and on the left is Paul Saville looking for galena, a lead-silver thing. Nothing found.

Both of them continued their day jobs. This is the last mine.

It is called Bonanza Addit. It's deep inside the canyon.

And Alexander Rhodes on the left worked with a large group of people in the National Park to survey the entire mine. It is 1 mile deep.

And four species of bats were also found there.

By the way, most of these mines meet underground in the mountains.

Not an exact match, but something to think about.

We don't see each other very often.

Let's go to the weather forecast. Mountains specialize in interesting weather.

It's still a lot more interesting than Monterey.

And we were there one Tuesday morning last June.

When I woke up in the morning, the mountains were covered with snow.

It was the perfect time for us to visit the weather station being built there, thanks to Mitch Kapor.

And it's a pretty funny scene.

Here, the happy lady on the left is Pat Irwin, the Regional Director of the National Forest Service, and they gave us a temporary permit to be there.

We need a Temporary Use Permit for watches, eventually a 10,000 year Temporary Permit.

(Laughter) Weather stations are very interesting.

Kurt Bolacker and Alexander Rose designed the radical radio station.

Powered by solar power, it transmits a signal on its antenna that is reflected off of micrometeorite trails in the atmosphere and transmitted to a location in Bozeman, Montana. There the data is deleted and transmitted via a landline phone to San Francisco, where we post the data to our website in real time.

Shows weather for a week on Mount Washington at an altitude of 9,400 feet.

Let's go to the approach.

Coincidentally, there are no trails anywhere on Mount Washington, just a few old mining trails like this one, so everywhere you have to push through bushes.

But there are no bears, no poison oaks, and this place has been vacant for a long time, so it's basically deserted.

Sometimes I hike for days and see no one.

Well, here's a potential approach.

You have to climb Lincoln Canyon.

It's a beautiful world of its own surrounded by cliffs, and while it's an easy hike down the valley floor until you reach this dam, it's actually a problem.

So you can scratch Lincoln Canyon as an approach.

Another possible approach is just above the west front of the mountain.

You can see why we call it Long Mountain.

And from the valley's 6,000-foot elevation, it's an easy hike through the 7,600-foot front hills to mature pinion and juniper forests.

And while you can make your way through meadows and steep forests to the base of 10,500-foot cliffs, there's a bit of a problem.

Well, Jeff Bezos told us when we were leaving at the end of the expedition, 'Make sure you don't have access to the clock.

The more difficult it is to obtain, the more people will appreciate it. ”

And check it out, there's a vertical wall that's 600 feet high.

So Alexander Rhodes wanted to explore this route and set out from his pick-up truck at 8,900 feet above sea level to the left of here towards the mountains.

Now, as you go up in altitude, your IQ goes down (laughs), but your emotional clout goes up. It's perfect for a mythical experience, whether you want it or not.

In fact, Danny Hillis can estimate altitude by how much you can't calculate in your head.

(Laughter) Well, I happened to be on the radio with Alexander when he arrived at this point at the base of the cliff and he said, "There's a hidden notch. I think I'll manage to crawl out."

Now he's a rock climber, but as you know, he's the managing director of our company.

I don't want him killed. I know he will love the cliffs.

It says, "Be careful, be careful, be careful."

Then he started climbing, and then I heard, "I'm half way up. It's like climbing stairs. It's 60 degrees up."

It's a secret passage. It's like something out of Tolkien. ”

And they say, "Be careful, be careful. Be careful."

And, of course, the next thing you hear is, "We've reached the top. From here we can see all of creation."

And he ran over the top of the mountain.

In fact he is there. That's Alexander Rose.

First ascent of the West Face on Mount Washington, and solo ascent there.

This discovery changed everything about how we feel about these cliffs and what to do with them.

We realized we had to name this thing that Alexander discovered.

What about Xander Rift? no.

(Laughs) So in the end, I decided on Alexander's Siq.

Zander's Siq is named after some of you who have been to Petra. The great slot canyon that leads to Petra is called Siq and this is Siq.

And it's really hidden. I can't find it in this image, and I don't know if I will.

Only when there is fresh snow can you see it along the edges and it becomes more pronounced.

Well, one day, Danny and I were in this same spot, and Danny looked to his right and saw something on the side of a cliff. I imagined it would be a sort of porch or cliff ledge with pine trees on which people who climbed up to the clock in the mountains could step out onto the ledge and look down on the scenery.

And those who struggled up the mountain could see the tiny little people on the cliffside, unbelievably.

how did they get there? Should I?

And maybe that's part of the charm, part of the labyrinth.

On Danny's porch, you can see it from a different angle by going around south and looking north at all the formations there.

And you should know that Danny's clock is kept accurate by the sun's rays, that noon always hits on a clear day, and that a pulse of heat from it activates the solar trigger, resetting the clock to perfect accuracy.

Therefore, even if the rotation of the earth slows down, the clock will continue to keep accurate time.

Let's look from south to north here.

This is all Forest Service land. Climb up the cliffs and you're part of Long Now Land in the trees.

And when you climb there and look back, you can see what the view will be like from the top of the mountain.

That's the long-term perspective. 80 miles to the horizon.

And that too is the forest line, and those bristle are actually shrubs.

it's a different place. Elevation is 11,400 feet, which is great.

Now, if you go to the right of this image and look at the edge of the cliff, it's 600 feet high and 600 feet down to the left, exactly one yard from Kurt Bollacker's feet. He is strolling to Xander's Seek.

It looks like this from the bottom.

It might be better to install a rail or something.

As you can see, the east side is gentle.

And it's not snow - it's what white limestone looks like.

You can also see bighorn sheep.

Their herd was reintroduced from Wyoming.

They're doing pretty well, but they have a little problem.

This is Danny Hillis. He solves design problems.

He is trying to determine if the part of the land in Long Now where he is looks like an actual mountain top when viewed from below the valley.

Because the real summit is hidden around the corner.

This is what the infantry used to call the military crest.

And in the end, the answer is "yes, it certainly looks like a crest when viewed from below the valley, and may be reminiscent of that."

Over time, we've realized that there are three key design areas to address.

One is mountain experience.

Another is the mountain experience.

And the third is the experience from the mountain. The Spring Valley lookout behind Danny dominates, and if you look to your right, there's 15 miles to the Shell Creek Mountains.

In front, there are 10 farms along the foot of the mountain that use mountain water.

In fact, there are spouting wells where water springs into the air.

One of the ranches is called Kirkeby Ranch. Let me guide you there.

It's a very nice ranch.

The atmosphere is very idyllic with alfalfa and cows owned by Paul and Ronnie Blenheim. It's also hard work.

And most of these ranches are having trouble keeping up.

This is the western view of the Shell Creek Mountains.

And if you step out into the row of trees at the edge, you can see what the valley used to be like.

This is the Rocky Mountain Juniper that has been there for thousands of years.

And plans surfaced that Long Now is considering whether it's possible to buy the entire valley. Because these 10 ranches of 17,000 acres dominate a 500-square-mile valley with grazing land and more, if you took them all for $5 million, gradually returned them to wild conditions, and returned them to the national parks somewhere along the way, the Great Basin National Park could double in size. it will be a blast.

Now let's look at the mountain itself again.

The watch experience should be profound, but invisible from the outside.

Well, at the foot of a high cliff lies this natural cave.

It's only about 12 feet deep, but what if it got even deeper from the inside?

I dug it up from somewhere, came out from within, and deepened it.

And the entrance, which is very rough and narrow when you first enter, gradually becomes more sophisticated and actually very sophisticated.

And this stone is perfectly polished.

There will be a sophisticated series of corridors and rooms that will eventually lead to the 10,000 year clock.

And it's not mine. This is a subtle reminder of the basic structure of the mountain, and you will appreciate it from the inside as much as you see it from the outside.

This is architecture that is not made by building, but by what is carefully taken away.

That's what the mountains have taught us.

Much of the magnificence of watches can be borrowed from the magnificence of mountains.

All we have to do is highlight its wonderful features and blend in with them.

It's not a mountain clock, it's a mountain clock.

Well, the Tewa Indians of the Southwest have a saying about what to do when you want to think long term about something.

They say 'pin peya obe' - welcome to the mountains.

thank you.

(applause)

Black holes are among the most destructive objects in the universe.

Any asteroid, planet, or even star that gets too close to a black hole's central singularity risks being torn apart by its extreme gravitational field.

And if an approaching object happens to cross the black hole's event horizon, it disappears and never reappears, increasing the black hole's mass and expanding its radius in the process.

You can't throw anything at a black hole that does minimal damage to it.

Not even another black hole will destroy a black hole. The two simply merge into a larger black hole, releasing a small amount of energy as gravitational waves in the process.

Some theories suggest that in the very distant future, the universe may eventually consist entirely of black holes.

Still, there may be a way to destroy, or "vaporize," these objects after all.

If this theory is true, all we have to do is wait.

In 1974, Dr. Stephen Hawking theorized a process by which black holes could gradually lose mass.

What has come to be known as Hawking radiation is based on a well-established phenomenon called vacuum quantum fluctuations.

According to quantum mechanics, a given point in spacetime fluctuates between multiple possible energy states.

These fluctuations are caused by the continuous creation and destruction of virtual particle pairs consisting of a particle and its oppositely charged antiparticle.

Usually the two collide and die shortly after appearing, conserving their overall energy.

But what if they appeared just on the edge of the black hole's event horizon?

If they are well positioned, one of the particles can escape the gravitational pull of the black hole while the other falls into the black hole.

It then annihilates another oppositely charged particle within the black hole's event horizon, reducing the black hole's mass.

On the other hand, to an outside observer, it would appear that the black hole emitted an escaped particle.

Therefore, unless the black hole continues to absorb additional matter and energy, it will evaporate particle by particle at an excruciatingly slow rate.

how late?

A branch of physics called black hole thermodynamics provides the answer.

When everyday objects and celestial bodies emit energy into the environment, we perceive it as heat and we can use that energy emission to measure temperature.

Black hole thermodynamics suggests that the 'temperature' of a black hole can be similarly defined.

It is theorized that the greater the mass of a black hole, the lower its temperature.

The largest black hole in the universe emits a temperature on the order of 10 to the -17 Kelvin, very close to absolute zero.

On the other hand, an asteroid with the mass of asteroid Vesta has a temperature close to 200 degrees Celsius, so it releases a large amount of energy into the cold external environment in the form of Hawking radiation.

The smaller the black hole, the faster it appears to burn and burns out completely.

how soon?

Well, don't hold your breath.

First, most black holes accrete or absorb matter and energy faster than they emit Hawking radiation.

But even if a black hole with the mass of the Sun stopped accreting, it would still take 1067 years (much longer than the current age of the universe) to completely evaporate.

When a black hole reaches a mass of about 230 tons, it has only one second left to live.

In the last second, its event horizon becomes smaller and smaller until it finally releases all its energy into space.

Hawking radiation has never been observed directly, but some scientists believe that certain gamma-ray flashes detected in the sky are actually the last-minute imprints of tiny primordial black holes that formed eons ago.

Ultimately, in the almost unthinkably distant future, the universe may be left behind as a cold, dark place.

But if Dr. Stephen Hawking is correct, the usually terrifying and otherwise impenetrable black hole will end its existence in its final glorious glow before that happens.

I have a story I would like to share with you.

And I'm talking about Africa.

It's a story of hope, resilience, and glamour.

There was Hollywood.

Then came Bollywood.

It is now home to Nollywood, the third largest film industry in the world.

In 2006 alone, about 2,000 films were made in Nigeria.

Now imagine 40 to 50 rolls of film being wrapped and distributed each week in the streets of Lagos, Nigeria or West Africa.

Some estimates place the value of this industry at $250 million.

It created thousands, if not tens of thousands of jobs.

And it's expanding.

But remember, this is a grassroots movement.

This has happened without foreign investment or government assistance, and indeed against all expectations during one of the most difficult times for the Nigerian economy.

This industry is 15 years old.

So perhaps you're now wondering why and how the Boston-based Italian filmmaker is so interested in this story?

So I think I have to tell you a little bit about my personal life because I think it's relevant.

My grandfather lived most of his life and is buried in Zambia.

My father also spent most of his adult life in East Africa.

And I was born in Zambia.

Although I left home when I was only 3 years old, I realized that Africa was a big part of my life.

And that was really where I learned to walk.

I think I uttered the first words and my family bought their first home.

So when we got back to Italy, one of the things I remember most is how my family had such a hard time sharing their stories.

To our neighbors and friends, Africa seemed to be either this exotic place, an imaginary land that perhaps only exists in their imagination, or a place of terror, a place of hunger.

And we've always been caught up in this stereotype.

And I really remember this desire to talk about Africa as a place where we live and where people live and live and dream like we all have.

So when I read the Nollywood story on the business side of the newspaper, I really felt like this was a great opportunity to tell a story that defies all these preconceived notions.

Here I can tell the story of an African who makes films like me. I actually found this to be an inspiration for me.

I was fortunate enough to work as a resident filmmaker at the Digital Imaging Arts Center at Boston University.

And we take a hard look at how digital technology is changing and how young independent filmmakers can make movies at a fraction of the cost.

So when I suggested this story, they really helped me make this movie.

And not only did I get support, but I found two great partners in crime on this adventure.

As Amy Corrigan, a very talented young photographer, and Robert Caputo, a National Geographic veteran, friend and mentor, told me: "Franco, I've been covering Africa for 25 years and I don't know if I've come across such a hopeful and joyful story."

So we went to Lagos in October 2005.

And so we went to Lagos to meet Bond Emelwa, a wonderfully talented filmmaker who is with us tonight.

The plan was to follow Bond in his quest to make an action film about corruption called Checkpoint and give you this great Nollywood portrait of the film industry.

police corruption.

And it took 9 days to achieve it.

We thought this was a good story.

During that time, we had to cover Nollywood and talked to many filmmakers.

But I don't want to get your hopes up too much.

I would like to show you six minutes.

These are the six minutes they actually prepared for the TED audience.

The documentary has several themes, but they are re-edited and made for you.

So I think it's a world premiere.

(Video) Man: Action.

Milverton Nuwokedi: You could make a great movie here in Nigeria for just $10,000.

And shoot within 7 days.

Peace Piberesima: We make movies for the masses.

We're not making movies for the elite or people in glass houses.

They can afford to watch "RoboCop" or something like that.

Mahmoud Ali Balogun: I think filmmaking in Nigeria is a kind of self-sufficient filmmaking for the people who work there, like they are doing it for a living.

It's not some big-budget flashy filmmaking where you say, "Oh, I want to have all that Hollywood glitz and glamor."

It's about making these films, selling them, and then jumping back into the set to make the next one. Because if I don't make the next movie, I won't be able to eat.

Bond Emelwa: So we should be able to both entertain and educate.

I believe in the power of audiovisuals.

So 90 percent of the population will see Nollywood.

I believe that transmitting information via a dedicated cable is the most feasible means at this time.

So if you're making a movie, whatever the theme is, put a message in it.

Woman: I still have to report the incident.

He needs proper treatment.

PP: I keep trying to explain to people that it's not about quality now, it's about to come.

I mean, some movies are made by people looking for quality, but the first thing to remember about this society is that there are still people in Africa who live on a dollar a day and they really watch these movies.

Sonny McDonald W: Nollywood is a great nascent industry in this part of the world.

Because no one believed that Nollywood would come from Africa.

Lancelot Immasen: But our films are stories that our people can relate to themselves.

These are stories about our people and for our people.

And consistently, they keep me glued to the screen every time I watch the story.

Narrator: Suspense, fun and intrigue.

It's a hit comedy.

I have cracks in my ribs.

Bernard Pinayong Agbaoshi: We are very into foreign films.

It's all about foreign movies.

But there are things we can do too.

We can do something, something that the world can look at and say, "Wow, this is Nigeria."

Man: Arrest me, sergeant.

don't be shy.

come. don't run away come back. come back.

SMW: Now you can walk down the street and see role models.

It's not just what you see in the photos.

You can see the person live.

I see how he speaks. I see how he lives.

He has a really good influence on you.

It's not just what you see in the photos.

That's not what you heard from the Western press.

Man: See you soon. good bye.

action.

Saint Obi: I was so fascinated by that cowboy movie.

But then when I found out about the situation in my country, there was a lot of corruption at that time.

For a young man to really succeed here, he has to think about some negative and everything else, or some kind of vice.

And I didn't want that.

And I realized that if you don't commit crimes, don't cheat anyone, don't lie, you can succeed in life as an actor.

Just me and my God-given talent.

Man: Let's go.

Now, it's time to get serious.

I will cover this. it is your own.

move it.

Robogar Animadu: In big countries, all these things are properly prepared when you make a movie.

But here we improvise items such as gunshots.

As they go, I see guns here, now, there, but I don't see guns shot, we use knockouts.

Kevin Booksuikedaba: The only thing that scares me is the explosion in my face.

Woman: That's why I use a lot of masking tape.

Secure it with masking tape.

Whoa, wait. Please keep this.

KBI: I'm just telling her to place it properly so it doesn't affect my face -- a blast.

But she is professional. she knows what she's doing

I try to protect my face too.

This won't be my last movie.

As you know, this is Nollywood where magic comes to life.

RA: So you're going to see how we make our films here, with or without someone's help.

Man: Action.

cut.

(Applause) Franco Sacchi: So much to say, but so little time.

This story has many themes.

I just can't tell you -- there's one thing I want to tell you.

I spent several weeks with the actors and producers, and the challenges they had to go through were unimaginable for a Western filmmaker working in America or Europe.

But always with a smile, always with enthusiasm, it's incredible.

German filmmaker Werner Herzog said, "I need to make films like I need oxygen."

And I think they are breathing.

Nigerian filmmakers are really, really doing what they love.

So it's very important to them and to their audience.

A woman told me: "Watching Nollywood movies relaxes me. It really helps me breathe easier."

There is one more very important thing that I hope will resonate with this audience.

It's technology. I'm very intrigued by this and really think digital non-linear editing has been greatly reduced and cost a fraction of what it used to be.

The incredible camera is priced under $5,000.

And this unleashed a tremendous amount of energy.

And what do you think?

I didn't have to tell the Nigerian filmmakers.

They understood it, they embraced the technology, they used it and they succeeded.

I hope the Nollywood phenomenon goes both ways.

I hope this inspires other African countries to embrace this technology, take the Nigerian model as a reference, make films, create jobs, and create stories for their nations, something to be aware of, something positive, something truly psychologically comforting and something that is part of the culture.

But I really think this is a phenomenon that can inspire us.

I really think it goes both ways.

Filmmakers friends of mine look at Nollywood and say, 'Wow, they're doing what we really want to do and they're making money and making a living out of this job.

So I really think this is what we're really learning from them.

And there is one small challenge that makes us think about the importance of storytelling.

And I think this is exactly the theme of this session.

Imagine a world where the only goals are food and shelter, and no stories.

No talk around the campfire.

No legends, no fairy tales.

none.

No novels.

Difficult, right? it's pointless.

This is what I really think.

I believe that the key to a healthy society is a thriving community of storytellers. I think the Nigerian filmmakers have really proven that.

I want their voices to be heard.

just for a moment.

This is not an added sequence, but an added part of the voice from Nollywood.

(Video) Toin Arousa: Nollywood is the best thing that could happen to them.

If there's one industry that puts a smile on people's faces, it's Nollywood.

SO: I believe that soon there will be not only better films but original Nigerian films.

BE: The basic theme is still the same.

love, action.

But we tell it our own way, our own Nigerian way, our African way.

We are a diverse culture, we are diverse, and there are so many, I don't think we will run out of stories we have in our lifetime.

FS: My job is done, and the Nollywood filmmakers really have to work now.

And I sincerely hope that there will be many collaborations that teach each other something.

And I sincerely hope that it will come true.

thank you very much.

(Applause) Chris Anderson: Please stop. I have two questions.

Franco, you described this as the third largest film industry in the world.

What does that actually translate into the number of movies?

FS: Oh yeah. I think I mentioned it briefly, but there are nearly 2,000 movies.

There is scientific data on this.

CA: 2,000 movies a year?

FS: 2,000 films per year. Between 2005 and 2006, the censor board censored 1,600 films alone.

We know there are more.

So it's no exaggeration to say that there are 2,000 movies.

So imagine watching 45 movies a week.

There are also challenges. There are also challenges.

The film is overkill, needs to be improved in quality, needs to be taken to the next level, but I am optimistic.

CA: And aren't these movies primarily seen in theaters?

FS: Oh, of course. This is very important.

Imagine this, perhaps. These are movies that are distributed directly on the market.

Buy at a video store.

You can rent one for a penny.

CA: What format?

FS: Ah, the format -- thank you for your question. Yes, it's a VCD.

Since it's a CD, it's a slightly more compressed image.

They started with VHS.

In fact, they didn't wait for the latest technology.

They started in '92 or '94.

In other words, there are 57 million VCRs capable of playing VHS and these VCDs in Nigeria.

It's basically a CD. It's a compact disc.

CA: So there are movie performers on the streets...?

FS: You can buy movies, bananas and water even if you're stuck in traffic in Lagos. yes.

(Laughter) And I have to say this really proves that storytelling is a commodity and a staple.

There is no life without stories.

CA: Thank you very much, Franco.

I thought I'd change your perspective on the world a bit and show you some of the designs we have in nature.

So, on the first slide, I'm going to talk about Dawn of the Universe and what I call Space Scene Survey. That is, looking at the relics of creation, deducing what happened in the first place, and trying to track it down and make sense of it.

So one of the questions I asked you is, when you look around, what do you see?

Now, this space is created by the work of designers and people, but what we are really seeing is that a lot of the materials that were already here have been reshaped in a certain way.

So the question is, how did that material get here?

How did you get it to look like it did before plastic surgery?

The question is what is continuity?

So my focus is on how the universe began and was formed.

What was the overall process of the creation and evolution of the universe that led to the existence of this kind of matter?

It's kind of part. Now let me show you the Hubble Ultra Deep Field.

Looking at this photo, you can see that it contains some bright objects even though it is quite dark.

And four of these light objects are stars, and everything but being able to see there is a small plus.

This is a star, this is a star, everything else is a galaxy, okay?

So there are thousands of galaxies here that can be easily seen with the eye.

And looking specifically at this galaxy, which looks a lot like ours, I wonder if there's an art design college meeting going on. The intelligent life out there, you know, is thinking about what kind of design to do. There may also be some cosmologists trying to understand where the universe itself came from. And there may even be people in that galaxy looking at our galaxy and trying to understand what's going on here.

But there are plenty of other galaxies, some closer and the color of the Sun, some farther away, a little bluer, etc.

But one question, as it should be for you, is why are there so many galaxies?

because it represents a very clean part of the sky.

That's just 1,000 galaxies.

We believe there are about 100 billion galaxies. If you have time to observe it with the Hubble Space Telescope, you can see it. right?

There are so many galaxies.

And that's about as many stars as there are in our galaxy.

But it's kind of a conundrum, because looking at some of these regions this way means you'll see more galaxies than stars.

What I am curious about is what kind of design and what kind of creative process went through to create this kind of world.

And I'll show you that it's actually more complicated than that.

We will try to track it down.

We have tools that really help us with this research. It's the fact that the universe is, in a way, a time machine because it's so incredibly large.

Draw this set of nested spheres clipped for easy viewing.

Place the globe in the center of the nested sphere. Because that's where the observations are made.

And since the moon is only 2 seconds away, if you take a picture of the moon using normal light, it will be the moon 2 seconds ago.

2 seconds is the same as now.

The sun was 8 minutes ago. It's not that big of a deal, is it? Unless a solar flare is approaching, better stay out of the way.

A little advance warning is required.

However, it takes 40 minutes to get to Jupiter. That's a problem.

You've heard of Mars, but the problem is communicating with Mars because it takes light long enough to get there.

But if you look at the nearest set of stars, the nearest 40 or 50 stars, it's about 10 years.

So if you take a picture of what's going on, it's 10 years ago.

But when you look at the center of the galaxy, it was thousands of years ago.

Looking at the nearest large galaxy, Andromeda, it is 2 million years old.

Even if you took a picture of the Earth two million years ago, there would be absolutely no evidence of human existence. Because it is thought that humans do not exist yet.

So it just gives you a scale.

The Hubble Space Telescope can observe billions of years to billions of years.

But if we can come up with an idea of ​​how we can look farther, there are some things that go further, and that's what I've done in a lot of my work, developing technology. You will be able to look back to an even older time, before stars existed, before galaxies existed, when the universe was hot, dense and very different.

Because it is such a sequence, I get a more artistic impression.

There is a galaxy in the middle, which is the Milky Way, and around it is the Hubble Galaxy. You know, it's a kind of galaxy that's nearby. And then there are spheres showing different times.

And behind them are some more modern galaxies.

Can you see the big picture?

The beginning of time is an interesting one. It's something on the outside, right?

And there are parts of the universe that we cannot see. That's because it's so dense and so hot that light can't escape.

It's like you can't see the center of the sun. Other techniques must be used to find out what is happening in the Sun.

But you can see the edge of the sun and know that the universe is like that.

And you can see the model area like this outside. This is the radiation coming from the Big Bang, which is actually incredibly uniform.

Although the universe is almost a perfect sphere, there are very small variations that are exaggerated here.

And from them, in chronological order, we have to go from these small changes, to these irregular galaxies, to the first stars, to these more advanced galaxies, and finally to our solar system, and so on.

So this is a big design job, but let's see how things go.

As for how these measurements were made, we have a series of satellites, which you can see here.

Then there was the COBE satellite, launched in 1989, and we discovered these variations.

Then in 2000, the MAP satellite (WMAP) was launched with somewhat better images.

And later this year, this is a cool stealth version that actually has some beautiful design features, take a look. Planck satellites will be launched to create very high resolution maps.

It becomes a series of flows to understand the beginning of the universe.

And what we saw was watching these changes tell us the secrets about the structure of space-time, the content of the universe, and how the universe began to move as it should.

I got this photo. This is a very spectacular photo. Back at the beginning, the mystical process of initiating the universe begins.

Then we go through a period of accelerated expansion, repeating expansion and cooling until the universe becomes transparent, and then we reach the dark ages. Then the first stars light up, they evolve into galaxies, and then reach more inflated galaxies.

And sometime during this time, our solar system began to form.

And it continues to mature to this day.

And then there are some spectacular ones.

And this trash can part is what the fabric of space-time itself is doing during this period.

So this is a pretty weird model, right?

What evidence do you have for that?

So let's take a look at some of the natural patterns that result from this.

I have always thought that space-time is the cosmic entity, and that galaxies and stars are like sea foam.

This is a marker that shows where interesting waves are and what happened.

Here is the Sloan Digital Sky Survey, which shows the locations of a million galaxies.

So every galaxy has a dot here.

They go out and point their telescopes at the sky, take pictures, identify what the stars are and throw them away, observe galaxies, estimate their distances, and plot it.

And if you put them radially, they will go out in that direction.

And you see these structures, which we call the Great Wall of China, and they're gone because there's cavities and things like that and the telescopes aren't sensitive enough.

Now let's show this in 3D.

What happens is that if you take a picture as the Earth rotates, you will see a fan across the sky.

There are some places we can't see because of our galaxy or because we don't have a telescope to observe it.

The following photo shows a 3D version of this in rotation.

Can you see the fan scans across the sky?

Remember, every place here is a galaxy and it's like galaxies are in our neighborhood and we see the structure.

And if you look at this thing that we call the Great Wall of China, you see a complex structure and you see these cavities.

Some places have no galaxies, while others have thousands of galaxies.

There's an interesting pattern, but I don't have enough data to actually confirm the pattern.

There are only 1 million galaxies, right?

So we keep throwing a million balls into the air, what's going on?

Another survey very similar to this is the 2-degree Galactic Redshift Survey.

From now on, I will jump through it with Warp Million.

And every time there is a galaxy, there is a galaxy at that position. And if you know anything about galaxies, there are redshift measurements and everything else, so by entering the galaxy type and color, this is the actual representation.

And it's hard to see that pattern when you're in the middle of the galaxy. It's like being in the middle of life.

It's hard to see the pattern in the middle of the audience, it's hard to see this pattern.

So let's go out and swing around and look back at this.

And then you'll see the structure of the survey first, and then you'll start to see the structure of the galaxies that we see there.

Again, we see an extension of the Galactic Great Wall appearing here.

But you see cavities and you see complex structures. And how could this have happened?

Let's say you're the designer of the universe.

How would you arrange the galaxies in such a pattern?

Don't just throw them out at random.

There is a more complicated process going on here.

What are you going to do after all?

Now, let's get into the real game.

That means we have to take God seriously and make the universe right, not just change people's lives.

So if it's your responsibility, how are you going to do it?

what kind of technique?

what are you going to do

So I'm going to show you the results of a large-scale simulation of what we think the universe is like. Basically, it uses play principles and some of the design principles. These principles have been hard-earned by man, but apparently nature knew how to do it all along.

So you start with very simple ingredients and some simple rules, but you need enough ingredients to make it complicated.

Then add randomness, variability, and randomness to achieve a variety of expressions.

So what I'm trying to do is show the distribution of matter as a function of scale.

I'll try to zoom in, but this is the overview.

And I had to add one more thing to get the universe right.

It's called dark matter.

It's a substance that doesn't interact with light unlike the typical way normal substances do, which is how light illuminates me and the stage.

It's transparent to light, but we'll make it white to make it easier to see. OK?

The white stuff in this picture is dark matter.

It should be called invisible matter, but it is dark matter that we have made visible.

And the yellow stuff is ordinary matter that has become stars and galaxies.

Let me introduce you to the next movie.

So let's zoom in on this.

Notice this pattern and pay attention to this pattern.

I will keep zooming in.

And you can see that there are all these filaments, structures and voids.

And when numerous filaments come together into knots, they form a galaxy supercluster.

The galaxy we zoom in on is somewhere between 100,000 and 1 million galaxies in that small region.

That's why we live in a privileged environment.

We don't live in the center of the solar system, we don't live in the center of the galaxy, we don't live in the center of a cluster of galaxies.

We will zoom in there.

There are probably more than 100,000 galaxies in this region, about 1 million galaxies.

Keep zooming in. OK.

So I forgot to say scale.

One parsec is 3.26 light years.

So 1 gigaparsec is 3 billion light years, or the scale.

So it would easily take 3 billion years to travel that distance.

Now we are somewhere between here and here.

That's the distance between us and Andromeda, right?

The little specks you see here are galaxies.

Let's zoom out again here. This structure looks very regular from a great distance, but you can see that it consists of many irregular variations.

So these are simple constructs.

First we have a very simple fluid.

There's dark matter, ordinary matter, photons, and neutrinos, but they don't play much role in the later part of the universe.

And it's just a simple liquid that over time develops into this complex structure.

So when you first saw this photo, it didn't mean much to you.

Here, if you look across 1% of the visible universe's volume, you'll see billions of galaxies and nodes, but you'll find that they're not even the main structure.

There is a framework of dark matter, invisible matter, that really holds it all together.

So let's take a quick look at this. You can see how difficult it is to figure this out while you're doing something.

Here is the same end result.

You can see filaments, light is invisible matter, and yellow is stars and galaxies.

And we'll fly around, and fly around, and you'll see some filaments crossing every now and then, and you'll get a big cluster of galaxies.

Then fly to a place with very large clusters. And you can see what it looks like.

From the inside, it doesn't look that complicated, right?

It's only when you look at it on a very large scale and explore it that you realize it's a very complex and complex kind of design, right?

And I kind of grew up.

So the question is how hard is this to put together, right?

How big a team of contractors would it take to pull this universe together?

That's the problem, right?

And here we are.

You can see how the filaments are formed. You can see how several filaments come together to form this galaxy's supercluster.

And you have to understand what this looks like in practice. First, you can't move this fast and everything is distorted, but that's because you're using some kind of simple rendering and graphic arts.

Takes billions of years to circle around, and it might look like this to you, right?

And what if we could see invisible substances?

So the idea is how to put the universe together in a very simple way.

We begin by recognizing that the entire visible universe, everything visible in all directions by the Hubble Space Telescope and other instruments, was once in a region smaller than an atom.

It started as a small quantum-mechanical fluctuation, but expanded at an astonishing rate.

These fluctuations are then magnified to astronomical sizes, eventually becoming what we see in the cosmic microwave background.

And then there had to be some way to turn that movement into galaxies and clusters of galaxies and keep this kind of structure going.

Therefore, we present a smaller simulation.

This simulation was run on 1,000 processors for a month to do this simple visualization.

Here's what you can do on your desktop in two days.

This means that when the universe was at this point it started with small fluctuations, and now it is four times smaller, and so on.

And you start to see these networks, webs of fabric in this universe forming.

This is a simple one. Because it contains no ordinary matter, only dark matter.

And you can see how dark matter clumps together and ordinary matter just follows.

that's right.

Very even at first.

Variation is part of 100,000.

There are several peaks that are part of 10,000 years, and then gravitational pull over billions of years.

This is lighter than density, so it pulls in the material.

That pulls in more material, which in turn pulls in more material.

However, because the distance in space is so large and the timescale is so large, it will take a long time for this to form.

And it will continue to form until the universe is about half its current size in terms of its expansion.

And at that point, the universe will begin to mysteriously accelerate its expansion, cutting off the formation of larger-scale structures.

That is, we only see large-scale structures as far as the eye can see, after which only those that have already begun to form form, and then continue.

Now I can simulate it, but it takes two days on desktop.

A simulation like the one I showed you earlier would take 30 days on 1,000 processors.

So we had an idea of ​​how to play seriously, basically creating a universe filled with less material than eyedrops, and creating everything you see in every direction, yes, from almost nothing, so very small, very small. And it turns out to be almost perfect, except that some of the 100,000 levels have these small variations, which produce interesting patterns and designs that we see: galaxies, stars, etc.

So we have a model, we can compute it, and we can use it to design what the universe really looks like.

And the design goes far beyond our initial imagination.

This is what we started with Cosmic Background Explorer 15 years ago. I made the map on the right. Basically, we found that there was massive variation, and indeed variation on several scales. I can understand that somehow.

Since then WMAP has been introduced which provides higher angular resolution.

The same large structures are seen, but additional smaller structures are seen.

And the bottom right is what kind of map of the Earth we would get if the satellite were to map the Earth upside down.

You can extract all the major continents, but that's about it.

But what we expect when we get to Planck is that we'll have a resolution that's nearly as good as the Earth we see there, and we'll be able to actually see the complex patterns that exist on Earth.

You can also tell that there are some non-linear processes in the way the edges are sharp and things fit together.

Geology has effects such as moving plates.

You can tell just by looking at the map.

We hope to reach a point in the map of the early universe where we can see if there are any nonlinear effects that are starting to move and change. It also gives us a hint as to how space-time itself was actually created in the first moment.

That's where we are today, and that's what I wanted you to experience.

It gives you another perspective on what the design and everything else looks like.

thank you.

(applause)

What are your cells shaped like?

Fluffy cylinder? Jagged zigzags?

You probably haven't thought much about the body of these building blocks, but at a microscopic level, small changes can have big consequences.

And while some adaptations change these shapes for the better, others can set off a chain of debilitating complications.

This is the story of sickle cell disease.

Sickle cell disease affects red blood cells, which carry oxygen from the lungs to all tissues in the body.

To perform this important role, red blood cells are filled with hemoglobin protein, which carries oxygen molecules.

These proteins float independently within the flexible donut-like shape of the red blood cell, keeping the cell flexible enough to accommodate even the smallest blood vessels.

In sickle cell disease, however, a single genetic mutation alters the structure of hemoglobin.

After releasing oxygen to the tissue, these mutant proteins cluster into tight rows.

Hemoglobin rods transform the cells into long, pointed sickles.

These red blood cells are harder, more sticky, and do not flow smoothly through blood vessels.

Sickle cells can become lodged and pile up, completely blocking a blood vessel.

This prevents oxygen from reaching various cells, causing various symptoms experienced by sickle cell patients.

Beginning before the age of 1 year, patients experience recurrent stabbing pains in oxygen-deprived tissues.

The location of the blocked blood vessel determines the specific symptoms that occur.

When the spleen, part of the immune system, becomes blocked, the patient is exposed to dangerous infections.

Accumulation in the lungs may cause fever and difficulty breathing.

Clogging near the eye can lead to blurred vision and retinal detachment.

And if a blocked blood vessel feeds the brain, the patient can even have a stroke.

To make matters worse, sickle cells don't live as long, just 10 or 20 days, compared to 4 months for healthy cells.

This short lifespan means that patients live with a constantly depleted supply of red blood cells. A condition called sickle cell anemia.

Perhaps the most surprising thing about this malignant mutation is that it originally evolved as a beneficial adaptation.

Researchers have successfully traced the origin of the sickle cell mutation to an area historically ravaged by a tropical disease called malaria.

Malaria, which is spread by a local mosquito parasite, uses red blood cells as an incubator and spreads rapidly and fatally through the bloodstream.

But the same structural changes that turn red blood cells into obstacles also make them more resistant to malaria.

And when children inherit a copy of the mutation from only one parent, there is enough abnormal hemoglobin to make the malaria parasite difficult to survive, while most red blood cells retain normal shape and function.

In regions where this parasite is endemic, sickle cell mutations have provided a significant evolutionary advantage.

However, as adaptations flourished, it became clear that inheriting the mutation from both parents resulted in sickle cell anemia.

Most people with sickle cell disease today can trace their ancestry to countries where malaria is endemic.

And in Africa, where more than 90% of malaria infections occur worldwide, this mutation still plays an important role.

Fortunately, as this “adaptation” progresses, sickle cell treatments continue to improve.

For many years, hydroxyurea was the only drug that could reduce the amount of sickle cells, dull symptoms, and increase life expectancy.

Bone marrow transplantation offers a cure, but these procedures are complex and often inaccessible.

But promising new drugs are intervening in new ways, such as by binding oxygen to hemoglobin to prevent sickle cells or by making sickle cells less sticky.

And the ability to edit DNA makes it more likely that stem cells can produce normal hemoglobin.

With the availability of these tools in areas most affected by malaria and sickle cell disease, this reverse adaptation can improve the quality of life of more patients.

What technologies have practical applications in reducing global poverty?

And what I found was quite amazing.

We started looking at mortality rates in the 20th century and how they improved, and it turned out to be very simple.

You might think that antibiotics have probably made more of a difference than clean water, but the opposite is true.

And something very simple, an off-the-shelf technology that could easily be found on the early web at the time, would clearly make a big difference on this issue.

But I also saw more powerful technologies, nanotechnology, genetic engineering, and other new kinds of digital technology, and became very concerned about potential abuse.

Come to think of it, long ago in history we tackled the problem of one individual abusing another.

We came up with something - Ten Commandments: Thou shalt not kill.

It's kind of a one-to-one thing.

We organized cities. There were many people.

And to keep the majority from overpowering the one, we came up with concepts like individual freedom.

And because we have to deal with large groups, say, at the nation-state level, we either maintain mutual nonaggression, or go through a series of conflicts, eventually reaching a rough international deal to mostly keep peace.

But now we are in a new situation, exactly what people call an asymmetric situation, where technology is so powerful and transnational.

Individuals, not nation-states, have access to mass destruction.

This is a result of the fact that these new technologies tend to be digitized.

We saw the genome sequence.

Gene sequences of pathogens can be downloaded from the Internet if desired. Apparently someone recently saw in a scientific journal that the 1918 flu was too dangerous for FedEx.

If you want to use it in your lab to work on your research, rebuild it yourself. Because FedEx can break it.

So it cannot be denied that this is possible.

Therefore, individuals within small groups who are so empowered by access to this kind of self-replicating technology, whether biological or otherwise, are clearly dangerous in our world.

And the danger is that they could cause something like a pandemic.

And we have no experience with pandemics at all, and we are not very good at acting as a society against something we don't have a direct, intuitive level of experience with.

Therefore, it is not our nature to act in advance.

In this case, stacking technology won't solve the problem. Because it just gives people even more power.

So I thought in the early twentieth century that the solution must be the heart, not just the head, as people like Russell and Einstein imagined in conversations that existed in more powerful forms.

Advances in public policy and morality.

The deal that gives us civilization is the deal of not using power.

We are accorded individual rights by a society that protects us from not doing everything that others can do, but mostly only doing what is lawful.

Limiting the dangers of these new ones, therefore, essentially requires ultimately limiting the ability of individuals to access the power of the pandemic.

You must also have sensible defenses. Because there are no restrictions that prevent the actions of a crazy person.

And, you know, the nasty thing is that it's much easier to do something bad than defend against all possible bad things, so offensive use actually has an asymmetric advantage.

These are the kinds of thoughts I had in 1999 and 2000, and my friends said I was really depressed and they were really worried about me.

I signed a book deal to write darker thoughts about this and moved to a hotel room in New York. One of those rooms was full of books about the plague, and I was in that circle when a nuclear bomb exploded in New York.

And on September 11th, I was there, and I stood in the street with everyone.

And being there was such a precious experience.

When I woke up the next morning and drove out of town, all the sanitation trucks were parked on Houston Street, ready to begin clearing debris.

And when I walked down the middle to the train station, everything below 14th Street was closed.

It was a very compelling experience, but for someone who had a room full of books, I don't think it was all that surprising.

It was always a surprise that it happened on the spot, but it was no surprise that it happened.

And everyone started writing about this.

Thousands of people started writing about this.

And I eventually stopped reading the book, but then Chris called me to speak at a conference. I won't talk about this anymore. Because there are a lot of frustrating and depressing things going on.

But I came here and agreed to say a few things about this.

And I would say that the rule of law cannot be abandoned to combat asymmetrical threats. That's what we seem to be doing because of those in power now. Because it is abandoning what constitutes civilization.

And we can't fight threats in the stupid ways that we do. A million dollar act causes a billion dollars in damage and a trillion dollar response, which has little effect and is probably almost certainly exacerbating the problem.

So you can't compete on a 1 million to 1 cost to 1 million to 1 cost benefit ratio.

So, after giving up on this book, I had the great honor of being able to join Kleiner Perkins about a year ago, working through venture capital on the innovative side, and trying to find some innovations that could address some of these big problems and what I was seeing.

As you know, a 10-fold difference can make a 1,000-fold difference in results.

I have been blown away by the incredible quality and excitement of the innovations that have appeared on my desk over the last year.

It's overwhelming at times. I am so grateful to Google and Wikipedia that I can understand at least a little bit of what people are talking about as they walk in the door.

But I wanted to share with you three areas that I'm particularly excited about, and three related to the issues I was talking about in the Wired article.

The first is this entire field of education, and it's actually related to what Nicolas was talking about the $100 computer.

So, there's still a lot left in Moore's Law.

Today's state-of-the-art transistors are at 65 nanometers, but we've seen companies that give us great confidence that they can extend Moore's Law to the scale of about 10 nanometers, and we're honored to invest in them.

For example, a 6x reduction in dimensionality should improve chip performance by another 100x. So in practical terms, say, if the best personal computer you can buy today costs about $1,000, I think you can buy it for $10 in 2020. have understood?

Now imagine what that $100 computer will be in 2020 as an educational tool.

The challenge for us is we are confident it will happen. The challenge is whether it is possible to develop educational tools and things that use the Internet that can make use of these devices.

What I want to argue today is that we have incredibly powerful computers, but we don't have good software for them.

It's only when you look back after better software comes along and runs it on a 10-year-old machine. "God, was the machine that fast?"

I remember when they took the Apple Mac interface and brought it back to the Apple II.

The Apple II was perfectly capable of running that kind of interface, but at the time we didn't know how to do it.

That is, given what we know and ought to believe, Moore's Law has always been a constant, which means it has been a very predictable progress over the last 40 years or more.

Find out what computers will look like in 2020.

It's great that we are working to create education and educate people around the world. Because it will be a great force for peace.

And within the next 15 years, anyone in the world will be able to provide a $100 or $10 computer.

My second area of ​​focus is environmental issues. Because this obviously puts a lot of pressure on this world.

We'll hear more from Al Gore on that in the near future.

It is new materials that we see as a sort of Moore's Law trend that will drive our ability to deal with environmental problems.

We have a challenge as the urban population has grown from 2 billion to 6 billion people in a very short time this century. People are moving to cities.

They all need clean water, energy and transportation. And we want them to develop in an environmentally friendly way.

We are pretty efficient in the industrial sector.

We have improved energy and resource efficiency, but the US consumer sector in particular is very inefficient.

However, because these new materials offer incredible innovation, there are strong grounds for the expectation that these materials will be profitable enough to enter the market.

I would like to introduce a specific example of a new substance discovered 15 years ago.

Carbon nanotubes, for example, were discovered by Iijima in 1991. Carbon nanotubes have amazing properties.

And these are the kinds of things that we will discover as we start engineering at the nanoscale.

Strength: The strongest material known and has the highest tensile strength.

It's very, very hard. It has very little stretch.

In two dimensions, for example, fabric made from them is 30 times stronger than Kevlar.

And when you create a three-dimensional structure like a buckyball, you get all sorts of amazing properties.

Shoot particles to make holes and they will automatically heal. They go to zip and repair holes in femtoseconds, but they really aren't -- very fast.

(Laughs) Electricity is generated when light is applied.

In fact, it fires when you flash it with your camera.

It emits light when electricity is passed through it.

When you pass an electric current through these, you can carry 1,000 times more current than through a piece of metal.

Both p-type and n-type semiconductors can be made. That is, you can make transistors out of them.

They conduct heat along their length but not laterally. They have no width, but do not conduct in opposite directions when stacked. That's also a characteristic of carbon fiber.

If you put a particle in it, it will shoot from the tip. It's like a small linear accelerator or an electron gun.

The interior of a nanotube is very small, the smallest being 0.7 nanometers, so it's basically the quantum world.

A strange place inside a nanotube.

So we started looking at business plans that had things like Lisa Randall talking about, and we've already seen it.

I had a business plan to learn more about Witten's cosmic dimensional string to understand what was going on with this proposed nanomaterial.

In other words, inside the nanotube, we are really reaching the limit.

Therefore, using these and other new materials, we can achieve lighter, stronger and different properties, and we can see that these new materials can be applied to environmental problems.

New materials that can make water, new materials that improve the function of fuel cells, new materials that catalyze chemical reactions, new materials that reduce pollution, etc.

Ethanol -- A new way to make ethanol.

A new way to realize electric transport.

It's a green dream. Because it can be profitable.

And we've been committed to it. We raised a new fund and dedicated $100 million to this type of investment.

We believe we have yet to find Genentech, Compaq, Lotus, Sun, Netscape, Amazon or Google in these areas. Because this material revolution will propel them forward.

The third area we're working on, we just announced last week, and we were all in New York.

We raised $200 million in specialized funds to tackle pandemics in biodefense.

And the last time Kleiner raised was $400 million, so that's a huge amount of money for us.

What we've done in the last few months, uh, a few months ago, Ray Kurzweil and I wrote an op-ed in the New York Times about how it would be extremely dangerous to release the 1918 genome.

And with John Doerr, Brooke, and others [opaque] concerned, we started looking around at what the world was doing about pandemic preparedness. And we saw a lot of gaps.

So we asked ourselves if we could find something innovative to fill these gaps. Mr. Brooks told me during his break here that he found so much that he couldn't sleep. Because there are so many great technologies out there and we are essentially buried. And we need them.

There is one antiviral drug that people are talking about stockpiling, and it still works, broadly speaking. That's Tamiflu.

But Tamiflu -- this virus is resistant. Resistant to Tamiflu.

In AIDS, we found that cocktails were necessary to increase viral resistance. I need some antivirals.

Need better oversight.

We need a network that can know what's going on.

Rapid diagnostics are needed to determine if someone is infected with the only recently identified strain of influenza.

You need to be able to perform rapid diagnostics quickly.

We need new antiviral drugs and cocktails. We need a new kind of vaccine.

Broad-spectrum vaccine.

A vaccine that can be produced quickly.

Cocktails, even multivalent vaccines.

You usually receive a trivalent vaccine against three possible strains.

We need -- I don't know where this is going.

We believe that if we can close these 10 gaps, we have an opportunity to truly reduce the risk of a pandemic.

And the difference between a regular flu season and a pandemic is about 1,000 times more deadly, and certainly has a huge economic impact.

So we're very excited because we think there will be projects in the market within the next 2-3 years that will either fund 10 projects or speed up 10 projects to address this issue.

So if we can work, we can use technology, we can help education, we can help the environment, we can help tackle the pandemic, will that solve the bigger problem I was talking about in my Wired article? Unfortunately, the answer is really no. The problem of managing technology cannot be solved with more technology.

If we liberate power without limit, very few people will be able to abuse it.

You can't fight at a million-to-one disadvantage.

So what we have to do is we need better policies.

And, for example, policy solutions that we can do, which are not in a very political mood right now, are probably going to use the market when the administration changes.

Markets are very powerful.

For example, it probably won't work to try to regulate the problem, but if the cost of doing business, the cost of catastrophe, can be factored in, then those doing things where the cost of catastrophe is higher will have to insure against that risk.

So if you want to market the drug, you can market it.

However, regulatory approval is not required. You'll have to convince your actuary that it's safe.

And the broader application of insurance concepts allows us to harness a stronger force – market forces – to provide feedback.

How were you able to keep the law?

I think it's really good to obey the law.

Well, people have to be held accountable.

The law requires accountability.

Today scientists, technicians, businessmen and engineers do not take personal responsibility for the consequences of their actions.

Therefore, if you bind it, you must bind it with the law.

And finally, I think we have to do things that really aren't, things that are almost unacceptable to say like this. That means we have to start designing the future.

We cannot choose the future, but we can direct it.

Our investments in preventing pandemic flu are affecting the distribution of possible outcomes.

You may not be able to stop it, but the more you focus on the problem, the less likely it will pass.

So you can design the future by choosing what you want and don't want to happen and directing you to less risky places.

Vice President Gore discusses how the trajectory of climate change can be steered in a direction that makes catastrophic risks less likely.

But above all, what we have to do is help the good people, the people who are on the defensive side, to gain an advantage over those who try to abuse things.

All we have to do is restrict access to certain information.

For those of us who have grown up and who value free speech so highly, this is unacceptable, and it is unacceptable for all of us.

It is especially difficult for scientists to accept those who still remember that Galileo was in virtual captivity and continue to fight the Church.

But that is the price of having civilization.

The price of maintaining the rule of law is limited access to a vast and kind of unlimited power.

thank you.

(applause)

I went to Spain a few months ago and had the best foie gras of my life.

Best culinary experience of my life.

Because I am convinced that what I have seen is the future of cooking.

Ridiculous, right?

The future of foie gras and cooking.

No food today is more malicious than foie gras, right?

In other words, they are crucified.

It was banned in Chicago for a while.

It's pending here in California, and more recently in New York.

It's like you're the chef and you risk being attacked if you put it on the menu.

In fact, it happened to a famous chef here in San Francisco.

That's not to say there are no reasons against foie gras.

Causes usually boil down to gavage, or force feeding.

It basically catches a goose or duck and forces a large amount of grain down its throat.

In a few weeks you will have more grain than you will in your lifetime.

The liver expands eight times.

Suffice it to say that it is not the prettiest form of sustainable agriculture.

The problem for us chefs is that it tastes insanely good.

(Laughter) I mean, I love that stuff.

It's greasy, sweet, silky, smooth.

It makes everything else you put with it taste incredibly delicious.

Can you make a delicious menu without foie gras?

Yes indeed.

You can try the Tour de France without steroids, right?

(Laughter) Not too many people do that.

And for good reason.

(Laughter) So a few months ago a friend of mine sent this link to a guy named Eduardo Souza.

Eduardo makes what he calls natural foie gras.

natural foie gras.

What is natural about foie gras?

Taking advantage of the fall temperatures, geese and ducks devour food to prepare for the harsh realities of winter.

And for the rest of the year they are free to roam Eduardo's land and eat whatever they want.

So no force feeding, force feeding, factory like environment, no abuse.

And surprisingly, it's not a new idea.

His great-grandfather started Sousa's Homeland in 2011.

And they have quietly continued to do so ever since.

That was until last year, when Eduardo won the coveted French gastronomic award, the Coup de Coeur.

It's like the food Olympics.

He came first in foie gras.

big, big problem.

As he told me, it really pissed off the French.

(Laughs) He said so with a certain joy.

It was published in newspapers.

I read about it. It was on Le Monde.

"A Spanish chef has been accused..." - and the French accused him.

"Spanish chef accused of cheating."

They accused him of paying the judge.

Amazingly, they involved the Spanish government.

Huh, that's great.

Weeks of big scandals.

No piece of evidence was found.

Now look at that guy.

He doesn't look like he's paying a French judge for foie gras.

So that calmed down and a new controversy soon followed.

It's not foie gras, so you can't win.

It's not gastrointestinal, so it's not foie gras.

No force feeding.

So by definition he is lying and should be disqualified.

It may sound silly, but now that I've clarified it and read about it, in fact, had I discussed it before this controversy, I would have said, "That's kind of true."

As you know, foie gras is by definition force-fed, force-fed, what foie gras gets when you want to eat it.

That was until I got to Eduardo's farm in Extremadura, 80 miles north of Seville and very close to the Portuguese border.

I have seen a system that is incredibly complex and at the same time utterly simple, like all the beautiful things in nature.

And he told me that from the very first moment my life's work was to give the geese what they wanted.

He repeated it about 50 times in the two days he was with me.

I'm only here to give the geese what they want.

In fact, when I showed up, he was lying with the geese, taking pictures of them with his cell phone like a kid in the grass.

wonderful.

He's really just in love and one with him. He is a goose whisperer.

(Laughter) And when I was talking to him, I thought I was talking to you right now, in the middle of a question, in the middle of an excited question. Because the more I got to know him and his system, the more exciting this whole idea became.

He kept telling me

And I thought, Excited Jew from New York, right?

I was talking a little too aggressively, so I slowed down.

And finally, by the end of the day, I was Ed Waldo, do you know this?

But he still remained.

i figured it out.

I spoke too loudly.

So I muffled my voice.

I asked these questions and chatted with him in a half whisper through an interpreter.

And he stopped doing this.

And to my surprise, the geese on the other side of the paddock when I was there said, "Keep away from this kid!" --I lowered my voice and everyone came up to us.

Right up to us, like up here.

along the fence.

And the fence line itself was great.

Fences, like this conception of fences that we have, are completely against him.

This fiberglass fence is powered only on the outside.

he rewired it. He invented it.

I have never seen it. do you have?

The animals are fenced off. You charge inside.

he is not.

He charges only the outside.

why?

Because he told me he felt like a goose. And it wasn't just an ostentation, he actually proved it. Geese felt manipulated when they were confined to a small ranch.

Even if they were locked up in this Garden of Eden with the figs and everything else.

He felt they were being manipulated.

So he removed the electricity, removed the current inside, and kept it outside so he could protect himself from coyotes and other predators.

Well what happened?

They ate and charted how they ate about 20 percent more to nourish their livers.

The scenery is incredible.

So his farm is great.

It is truly the Garden of Eden.

They have figs and everything else for takeaway.

And the irony within the irony is because it's Extremadura, the region - what does Extremadura mean?

Very hard ground, right?

extra difficult. extra hard.

But for four generations, he and his family have literally turned this very hard land into a tasting menu.

Upgrade the lives of these geese.

And they are allowed to take whatever they want.

Another irony, double irony, is that Eduardo makes more money selling figs and olives than he does foie gras.

he doesn't care

He lets them take what they want, "usually it's about 50 percent. They're very fair," he says.

He takes the remaining 50 percent and sells it to make money.

part of his farm income.

It makes up the bulk of his farm income.

But he never controls it.

They get what they want, leave the rest to me, and I sell it.

In fact, his biggest obstacle these days has been the market for bright yellow foie gras.

That's how I was trained.

If you want to see what foie gras looks like, it should be bright yellow.

It is the proof that it is the best foie gras.

That's right, he hasn't been force-fed and he hasn't been force-fed a lot of corn, so his liver was pretty gray.

Or so it was.

But he found this wild plant called the lupine bush.

Lupine bushes are everywhere on Extremadura.

He left it to the seed, took the seed and planted it on the 30 acre property.

And geese love lupine bushes.

Not for the bush, but for the seed.

And when you eat the seeds, foie gras turns yellow.

Radioactive yellow.

bright yellow.

Best quality foie gras yellow I have ever seen.

(Laughter) So I'm hearing all this and I'm like, is this guy real? Is he making this up?

He seemed to have an answer for everything, and it was always natural.

It was never him.

And I always seemed to feel a little strange about people turning everything away from me.

Because they really want you to see yourself, right?

But he diverted everything from his ingenuity to working on his landscape.

I mean, I'm here, and I'm wary of this guy, but more and more I feel like I'm swallowing his every word.

We were sitting there and I heard [applause] in the distance and I looked over there.

Then he grabbed my arm and the interpreter's arm, made us hide under a bush and said, "Look at this."

"Shush," he said to me again for the 500th time.

"Shhh, look at this."

And here comes this flock of geese.

[Applause] And they're getting louder and louder and really loud, right above us.

And like airport traffic control, they are called back as they pass in front of us, and are called back again and again.

And they go full circle.

And his geese are now calling wild geese.

[Applause] And the geese are crowing.

[Applause] And then the sound gets louder and louder and they whirl and whirl and land.

And I'm just saying, "No."

(laughs) No way.

And I looked at Eduardo, who was about to cry at this, and said, "Are you saying that your goose is calling the wild geese to visit?"

And he says, "No, no, no.

they came to stay ”

Have they come to stay?

(Laughter) Geese have the same DNA as they fly south in the winter, right?

I said. I said, "Isn't that what they were put on this earth for?"

How to fly south in winter and north when it gets warmer? ”

He said, "No, no, no.

Their DNA is to find the conditions that make it easier to sustain life.

Happily.

they find it here.

They don't need anything anymore. ”

they stop. They mate with his domesticated geese and his flock follows.

Think about it for a second.

It is wonderful.

Imagine -- I don't know, but let's say a feral pig on a North Carolina pig farm comes across a factory farm and decides to stay there.

(laughs) So how was the taste?

I was finally able to taste it before leaving.

He took me to a neighborhood restaurant and served me his foie gras - foie gras confit.

It was unbelievable.

Of course, the problem with saying it this way is, you know, it's easy to overstate at this point.

I would like to make a metaphor, but in reality there is no metaphor.

I drank too much Kool-Aid from this guy and if he offered me a goose feather I would have thought, this guy is a genius, you know?

I am really in love with him at this point.

But it really was the best foie gras I've had in my life.

It made me think that I had never really eaten foie gras before.

I ate foie gras.

But this made a difference. Really transformative.

Let me tell you, I may not stick to this, but I don't think I'll ever put foie gras on the menu again because of that taste experience at Eduardo's.

It was sweet and sticky.

It had all the hallmarks of foie gras, but with so much honesty and sincerity in the fat.

And I could taste the herbs and spices.

And I continued - I said, I swear to God I've tasted star anise.

I was sure of it.

And I'm nothing like a supertaster, you know?

But I can taste things.

It contains 100% star anise.

And he says "no".

And I eventually cut back on the spice and eventually I was like, 'OK, salt and pepper,' and I thought I was shaking the liver with salt and pepper.

But it's not.

When he harvests the foie gras, he takes the liver and puts it in this jar for confit.

No salt, pepper, oil or spices.

what?

We returned for our final tour of the farm and he showed us wild pepper plants as well as plants he confirmed were present on the farm for salinity control.

He doesn't need salt and pepper.

And with potpourri of herbs and flavors his geese love to eat, no spices are needed.

At the end of the meal I turned to him, which was a question I had asked several times and he hadn't answered me directly, but I said, "Well, you are in Spain, and among the world's greatest chefs today is Ferran Adrià, the world's outstanding chef. Not far from you."

Why don't you give him this?

How come no one has heard of you? ”

And maybe it was because of the wine, maybe it was because of my excitement, but he answered me directly and said, "Because the chef is not qualified to eat my foie gras."

(Laughter) And he was right.

he was right

The chef makes the foie gras himself.

They create such a dish that all vectors go towards us.

For Eduardo, the theme is the expression of nature.

And as he said, I think it's fitting that it's a gift from God and that God said you did a good job.

Simple.

I went home, got on the plane with a little black book, and took pages and pages of notes about it.

I was really impressed.

And in one of them, one of my notes, in the corner of this note, it says, what would you say if someone asked you what you thought of conventional foie gras?

What do you think about foie gras eaten by 99.99999% of the world?

"I think it's an insult to history," he said.

And I wrote that I insulted history.

I'm on a plane and I'm just tearing my hair out.

why didn't i follow it up?

What the heck does that mean?

An insult to history.

So when I got home and did some research, I found the following:

Foie gras history.

Foie gras was invented by Jews.

true story.

true story.

It is a coincident.

They were looking for an alternative to schmaltz.

I'm tired of chicken fat.

They were looking for alternatives.

And in the fall I noticed that there is a natural, beautiful, sweet and delicious goose fat.

And they slaughtered them and used their fat for cooking during the winter.

Pharaoh heard this -- it's true and straight from the internet.

Pharaoh got—(laughter) I swear to God.

(laughter) Pharaoh heard this and wanted to taste it.

He tasted it and fell in love with it.

he began to demand it.

And he didn't just want it in the fall, he wanted it all year round.

and demanded that the Jews supply enough for all.

And, at the risk of their lives, the Jews, of course, had to come up with original ideas or at least try to satisfy the Pharaoh's wishes.

And they invented, what? Forced oral intake.

They invented the gavage method at a critical moment when their lives were in danger, and provided the Pharaoh with the gavage liver and the good liver they kept for themselves.

Probably anyway. I believe it.

That is the history of foie gras.

If you think about it, it's the history of industrial agriculture.

It's the history of what we eat today.

Most of what we eat today.

Huge farms, feed lots, chemical correction, long distance travel, food processing.

Everything is our food system.

It is also an insult to history.

It is an affront to the basic laws of nature and biology.

Are you talking about beef cattle, or chickens, or broccoli or Brussels sprouts, or, in this morning's New York Times, catfish wholesalers going out of business?

Either way, it's a mindset reminiscent of General Motors.

It is rooted in extraction.

Take more, sell more, waste more.

And in the future it will not serve us.

Jonas Salk has some great quotes.

“If all insects disappeared, life on Earth as we know it would disappear within 50 years,” he said.

If there were no humans, life on Earth as we know it would thrive. ”

and he is right.

We now need to adopt a new concept of agriculture.

Really new.

It means we stop treating the planet like some kind of business in liquidation.

And stop degrading resources under the guise of cheap food.

Start by looking at farmers like Eduardo.

A farmer who depends on nature for solutions and answers, rather than forcing them to do so.

Hear one of my favorite authors and thinkers on the subject, Janine Benyus, say, "Listen to nature's operating instructions."

That's the way Eduardo does it, and he does it brilliantly.

And what he has shown me, and what he can show us all, is a great thing for chefs, a huge blessing for chefs and for people who care about food and cooking, that the most environmentally friendly food choices are also the most ethical food choices.

Whether it's about brussels sprouts or foie gras.

And it's almost always, and I haven't found any other examples of it, but most of the time it's the tastiest choice.

I am a tired father.

It is now owned and ruled by two petty dictators. They rule my life with an iron fist while still wearing Huggies diapers.

(Laughter) Well, maybe because I'm obsessed with little people these days, I've got my eye on one headline.

In developed countries, the number of people having babies around the world seems to be decreasing.

From North America to Europe to China to Japan, fertility rates have indeed been consistently declining.

In fact, the world birth rate has halved in the last 50 years.

What on earth is going on?

My childless friends now cite climate change as a reason not to have children.

And many of you are sitting there right now saying, "We have overpopulation, we still have high fertility rates in many African and Middle Eastern countries, we still have orphaned children who need parents, we don't have enough resources to reach everyone, and by the way, we have a huge carbon footprint that is destroying this planet.

I hear you, I hear you.

Yet despite all this confusion, I still think I should have kids.

We believe we can and should fight shoulder to shoulder for the planet and humanity.

Now, if I may get a little personal, I understand that some people are skeptical about having a baby.

This is a photo my wife and I took before our child was born.

Young, happy, fresh.

(Laughter) Here's a picture of me after I had my baby.

The shell of a broken and defeated man.

(laughs) This is a picture of the car I wanted to drive when I grew up.

Porsche.

This is what I'm actually driving.

Honda Odyssey minivan.

(Laughter) (Applause) For minivans.

Where there was once hope, there is now convenient space and good mileage.

At this point, I would like to emphasize that I am fully aware of the terrifying threat of global warming and climate change.

I just want to admit that the choice to have a baby is a very personal choice.

And a lot of people who want to do it can't.

But just for today, let's look at the other side of the coin.

Not enough new talent will be a big problem going forward.

According to the World Health Organization, each woman now needs to have an average of about 2.1 children to replace the previous generation.

Many thought that overpopulation would be a problem in 100 years, but yes, it could be underpopulation.

So here's the question. What if this number drops below 2.1?

A domino effect will occur.

As we all age and live longer, the youth population will shrink, leading to a growing labor shortage in the world's largest economy.

I'm talking USA, China, Japan and Germany.

Fewer young workers means less tax revenue.

Less tax revenue means less money and resources going into the safety net programs we all depend on.

It's about pensions and health care.

All generations seem to be really connected.

But how did we get here in the first place?

Well, in some cases, it was on purpose.

Let's take the DeLorean to a simpler time.

Stay away from China.

Somewhere between the death of disco and The Empire Strikes Back -- 1980.

In 1980, to combat overpopulation, China decided to implement a one-child policy that drastically restricted most parents from having only one child.

Look at the good old Chinese propaganda. wonderful.

Well, let's fast forward to 2019.

Even after ending the one-child policy in 2015, China's birth rate has fallen significantly.

In fact, China's declining population is robbing it of one of its biggest drivers of growth: its talent.

If this trend continues, China's population will indeed peak in 2029 and then enter a "non-stop decline."

The Chinese government is now so dismayed that they are actually making new propaganda and begging couples to have children for the country.

Hop in the DeLorean and fly to Japan, the home of my beloved Honda Odyssey minivan.

(laughter) Japan currently produces more adult diapers than infant diapers.

The number of children in Japan has decreased for 37 consecutive years.

And unlike other countries, migrant workers have not been able to replace their population.

There will be a labor shortage and not enough money to fund safety net programs.

Currently, Japan has introduced two solutions.

First, financial incentives.

Some local governments in Japan provide funds for couples to have babies, with more money for each child born.

This actually worked for a year in 2014 in this town of Ama.

In fact, the fertility rate per woman rose from about 1.66 to 1.8.

However, it did not spread throughout Japan.

In 2018, Japan's ruling party leaders tried something new.

He told the young people, "It is selfish not to have children."

Shockingly, shaming was not a stimulant.

Surprise, I understand, surprise.

Who would have thought

(Laughter) Let's get in the DeLorean and go to Europe, the continent of delicious cheeses I love to eat but can't pronounce.

Fertility rates in the UK and much of Western Europe are around 1.7 per woman, better than Hungary, which hovered at least around 1.45.

Now Hungarian Prime Minister Viktor Orban has proposed a new solution to encourage people to have children.

He said families where a woman has four or more children will no longer pay income tax.

Pretty good, yes, pretty good.

At least, it's better than Russia's 2007 proposal, which once offered women in certain regions the chance to win a refrigerator if they had more children.

(Laughter) Yes, it didn't work, it didn't work.

But wait a minute, hit the brakes.

The main reason President Orban is proposing this is because he wants to limit the population of Muslims and people of color.

He believes that Hungarian traditions, culture and colors do not need to be "mixed with other countries' traditions, cultures and colors".

subtle.

Unfortunately for Orban and most of the EU, the fertility rate is currently not high enough to be replenished without immigration.

Population decline is progressing in EU countries.

That is, in Europe, karma seems to be brown and Muslim.

(Laughter) (Applause) I'm just saying.

The question remains, why don't people have enough children?

Why are birth rates declining in these countries?

In some cases, it is because women are more literate and more educated.

They have more financial opportunities – commend.

Only good things, only good things, yes.

(Applause.) In India, this is great, the fertility rate has actually declined, but it's above that magic number of 2.1.

Women also have more access to contraception and more control over their reproductive lives, all good news.

But especially in the United States, many young people are refusing to have children for the same reasons, mainly economic concerns.

Jump in a DeLorean and travel to my homeland, the United States, where birth rates hit a historic low in 2017.

The United States is the world's most expensive country to give birth to.

If you don't have insurance, even if everything goes well, giving birth will cost you $32,000.

It's like buying a brand new Honda Odyssey minivan, right?

congratulations. A baby has just been born, but the economic productivity of the baby is zero. what do you think will happen?

The United States is the only developed country in the world that does not require employers to provide paid parental leave.

"Mom, congratulations on the birth of your baby, it's very nice.

Get back to work or get fired, young mama! ”

My wife and I both work, and in Virginia we pay about $3,500 a month for childcare.

If you do the math, it's $40,000 a year.

It's like buying the latest revamped Honda Odyssey minivan.

I have one, but I don't need ten.

Here is my bold proposal.

Make it easier for people to have babies.

It seems that investing in our future requires actually investing in the present and helping those who want to be parents.

Provide them with affordable health care, provide them with affordable childcare, and give them paid parental leave.

In 2017, it was reported that France had the highest fertility rate among EU countries.

why?

A major reason for this is prenatal policies that actually keep women in the workforce.

I'm talking about childcare subsidies and paid maternity leave.

Thankfully, China and Japan are finally brainstorming and proposing such policies.

This is fantastic.

That being said, I am sure some of you who have listened to me still think that the best investment we can make in our future is not having children.

I respect that.

I know where it came from.

And while I know many in this audience want to have babies, they worry about the future.

And as a parent, I feel your feelings.

I am afraid of the future.

I wrote the last line a month ago.

But that happened to me three days ago when I was at TED.

Three days ago my wife called me crying.

Pick up in your hotel room.

Then she said, "I'm calling from the hospital."

My baby daughter Nusaiba, named after a warrior princess, had to be taken to the hospital because she found a boil on her stomach.

When the test results came back, they found a bump around her liver.

I found out this morning that she has stage IV liver cancer.

(audience gasps) It's been a tough week.

And, if possible, I'd like to take a moment to acknowledge the TED staff, everyone, top to bottom, everyone in the back, everyone in the dressing room, some of the speakers, that this rumor has spread.

On behalf of my family, wife and parents, thank you for being polite and kind this week as my Pakistani parents said they had to tell me this.

thank you.

(Applause) These are my loved ones, my Ibrahim and Nusaiba, my baby.

I talked it over with my wife and came to the conclusion that despite the terrible news and the battles to come, neither of us regret anything.

The decision to have a child was the best decision we ever made.

Our baby brought us so much joy and brought so much joy to the world. Having children is risky, but so is life.

And yes, I hope you pay attention, if you want to save the economy and your pensions, you need to invest in babies in the developed world.

But that's not why you have children.

That's not the main reason.

Babies have always represented humanity's best, boldest, most beautiful, limitless potential.

And what's the point if all of us in the developed world opt out and not invest in current and future generations?

What's the point in spending this absurd journey together?

And for those who can have children, who choose to have children, who can have children, and who choose to have children, with kindness, generosity, courtesy and love, may you pass on this beautiful thing called life.

thank you.

(applause)

Computers have evolved incredibly.

We walk around with supercomputers in our pockets.

How wonderful is that?

So it's a shame that the way we use and interact with computers has changed very little over the last 50 years.

We still use mice and keyboards. We are clicking screens and buttons.

Cell phones are no different.

I'm just using my finger instead of the mouse.

is that so?

Is that what the future will look like?

Are we going to be trapped in screens with faces that don't see the world around us?

It's not the future I imagine or the future I'm drawn to.

I'm always interested in the physical things that we use every day, like the ones on this table that our family doesn't care about.

Things tell our story. They tell us who we are.

They tell us a lot about us.

Let's take an example.

These are pictures of things people have touched in the last 24 hours.

what can you say about him

he loves his bike right?

The largest of his photographs.

What can you say about this girl?

She spends all her time at the beach.

I have a surfboard.

She lives by the sea.

What can you say about this man?

he is a chef

During the day, looking at all the ingredients he touched while preparing his meals, computers are just a small part of his life and this sad stuff is in the corner.

So if we use things all the time and they are a big part of our lives, can things be a way for us to interact with our digital lives?

Can the world be your interface?

that was my idea.

I've been working on it for 20 years.

My view is that you don't need a screen, keyboard, or mouse to interact with your digital life.

You can interact with your digital life simply by using the things you use every day.

And to make this idea a reality, we need to solve three big challenges.

Let's talk about them.

The first, of course, is "is it possible?"

How can you turn everyday objects that you use every day into computer interfaces?

Well, I was inspired by the book "Hackers".

I read it when I was a teenager, and one of the core ideas of the book is that you can change the purpose of things by inventing new technologies and hacking things to change them.

So I've been thinking about what kind of technology you can invent to hack and make things you use every day interactive.

So when I was working on this, I invented sensors that inject structured electric fields into objects, turning them into gestural interfaces.

So this doorknob could be a gesture sensor out of the box.

I can tell how you are touching. You can feel how it touches you.

You can draw a circle, or you can grab it.

And this doorknob has not been modified.

No issues with doorknobs.

Anything can be interactive.

What about plants?

Plants are interesting. Because plants can know where you are touching.

You can see the lines moving up and down on the image.

And it can turn into a musical interface.

(musical tone) Well, there's also the practical use of a calendar plant for those who value practicality.

(Laughter) We can give things a personality.

(Bass pitch changes) So in this particular example, Ran can communicate to you through images and sounds.

It doesn't like being touched, so it creates an electric image that hisses at you.

For example, this plant is a tougher, snake plant and likes to play with you. It fascinates you.

So everything can be different and everything can represent what it feels.

That means anything, including your body, can be hacked.

In this example, we hacked your body to measure how your hands are folded so you can use hand gestures to control other things. So if you don't want to listen to music a thousand times, you can plug your ears and turn it off.

So, anything can be hacked, research is important, but the second challenge we have is how can we move from R&D and prototypes to real products.

How can you make a real thing that is also an interface?

And you may ask yourself, who would do such a thing?

Silicon Valley?

Via Shenzhen?

Now, the challenge here is that the world is vast.

The apparel industry produces 150 billion garments each year.

By comparison, the technology industry manufactures only 1.4 billion mobile phones.

The world of things is much bigger than the world of technology.

The world of technology cannot change the world of things.

Instead, we need to turn the makers of things—the people who make chairs, clothes, and everything else—into makers of smart things, and create the technology that makes that possible.

So, to test this challenge, we came up with a very simple idea and challenge. Can a tailor make a wearable?

Well, we're not going to turn a tailor into an electrician.

We still want to have some tailors.

But what we want to do is create technology that looks, feels and behaves like the raw materials that tailors use to make clothes.

For example, a touch panel for tailors looks like this, and since it is made of fabric, you can cut it with scissors and sew it on.

Performance must be maintained at the same time.

This method of fabric touch panel manufacturing also requires a very different approach from manufacturing consumer electronics.

In our case, we have to go to a small factory deep in the mountains of Tokyo that has been making kimonos for generations.

We worked with a non-engineer colleague.

It was a craftsman who knew how to make things, an artist who knew how to make things beautiful.

Working with them, we have created one of the world's finest yarns in which a thin metal alloy is wrapped with polyester and cotton fibres.

These threads were made on the same machines that have been making threads for kimonos for generations.

These yarns were then passed to a factory that produced textiles, which were then woven into smart textiles in different colors and materials using regular machinery, and then passed those textiles to tailors on Savile Row in London.

So the tailors of Savile Row in particular are traditionalists.

they don't use computers.

They don't use machines.

They use their hands and cut.

They fit their products on human bodies, not 3D avatars.

They are modern, although technology is not part of their vocabulary.

They know how to use technology.

So if technology were shaped like buttons and fabrics, like things they could use, we could definitely make clothes wearable, i.e. clothes that could make phone calls.

(phone rings) Now it's proof that wearables can actually be made by tailors, not electronics companies.

We worked with Levi's, our partners and neighboring countries to create real products. That product is this jacket that I'm wearing now.

You can buy it. It's on sale.

It's made in the same factory that makes all the products, and you'll notice I control the presentation with the sleeve of my jacket.

Go on like this, go forward I'm going backwards like this.

And of course you can do more.

Do more than just control your presentation.

Now I can control the navigation, I can control the music, but most importantly it remains a jacket, a thing, and it makes me look great.

(Laughter) (Applause) And that's the most important thing.

(Laughter) Well, we've proven that things can be turned into interfaces.

We have proven that these things can be made by manufacturers of things, not technology companies.

It's amazing. Are you done yet?

(laughs) Not yet.

Third challenge: How can we scale?

How can I move from one product to multiple products?

And that's what we're working on now.

Let me explain how we do this.

First of all, let me be clear, I'm not talking about the Internet of Things.

I'm not talking about creating another gadget that you get tired of and toss in the back of your drawer and forget about.

I am talking about basic and important principles that guide my work. "Technology must make what already exists better."

We make them better by connecting them to your digital life, adding new conveniences and new features while staying the same without changing their original purpose.

This jacket I'm wearing lets me control my phone and my presentation, but it's still a jacket.

So when you start making everything interactive and connected, everything will have its own set of actuators, displays and sensors dedicated to it.

Running shoes don't have to have touch sensors.

why is that?

If you have a sensor, it should measure your running performance and impact on your knees while being a great shoe.

Manufacturers of things will need to start thinking about what digital capabilities they offer consumers.

They have to be service providers or they may become irrelevant.

Just like we've done with mobile phones, we have apps and services and everything else, and sometimes we have to provide and create a service ecosystem that keeps calling.

Fragmentation must be avoided to enable this ecosystem.

Different people should avoid having different interfaces.

We need to create a uniform user experience, and for that we need to create a single computing platform that powers all of this.

What will the platform be?

I think the answer is clear. It's the cloud, cloud computing.

Today, of course, you can't directly connect to the cloud.

Therefore, we need to develop small devices that can connect to everything and connect to the cloud to unlock its potential and add new capabilities.

So let's show you for the first time the actual device we built.

I will show you for the first time.

It's like that, small devices that connect to whatever we want to be smartly connected and interactive.

What will happen?

There are several electrodes on the back.

So when you plug it into different things like here, the device will know where it's plugged in and reconfigure itself to enable that particular feature.

We would like to offer this device to people who make things, people who make clothes and furniture, and use it in the same way as buttons and zippers.

And what they make with them is up to them.

We are not trying to prescribe use cases.

We want the people who make them, artists and designers, brands and artisans, to imagine and create this new world where things are connected and with new and exciting digital capabilities.

You don't need a keyboard, screen or mouse to interact with your computer.

I've been working on this idea for 20 years, and now it's taking shape, it's taking shape, and what we're noticing is that I always thought I was working on computer interfaces, I always thought of myself as an interaction designer, but I'm starting to realize that I'm not building interfaces.

What I realized is that me and my team are building a new kind of computer: the ambient computer.

thank you.

(applause)

great creativity. Great creativity is needed when it's needed.

discussion. Great creativity is surprisingly, absurdly, rationally and irrationally powerful.

Great creativity can spread tolerance, defend freedom, and make education look like a great idea.

(Laughter) Good creativity can shine a spotlight on deprivation or show that deprivation is not always what it is.

Great creativity can elect politicians and de-electorate political parties.

It can make war seem like a tragedy or a farce.

Creativity is a meme maker who sticks slogans on T-shirts and puts phrases on his mouth.

It is the Pathfinder that shows us a simple path through the impenetrable maze of morality.

Science is clever, but great creativity is lesser-known and more magical. And now we need that magic.

Now is the time of need.

Our climate is changing rapidly.

And for it to work well, it takes great creativity. It's about pushing us to think differently with dramatic creative statements.

Fun and creative scraps that entice us to act differently.

This is one of the scraps I'm working on to use my creativity to encourage people to go green.

(Video) Man: Well, today I'm going to walk instead of drive.

Narrator: So he walked, and as he walked he saw something.

Weird and wonderful things you haven't seen anywhere else.

Deer with itchy feet. flying bike.

A father and daughter separated from their bicycles by a mysterious wall.

and he stopped. It was she who was walking in front of him.

A woman who, as a child, skipped fields with him and broke his heart.

Sure, she's aged a little.

In fact, she was quite old.

But he felt an old-fashioned passion for her return.

"Ford," he called quietly. Because that was her name.

"Don't say anything more, Gusty," she said, for that was his name.

"I know there's a tent next to a caravan just 300 yards from here.

Let's go there and make love. I'm in a tent. ”

Ford took off his clothes. She spread one leg, then the other.

Gusti was an avid amateur pornographer who boldly entered her and made love rhythmically while she was filming.

The earth moved for two people.

And they lived happily ever after.

All because that day he decided to walk.

(Applause) Andy Hobsbawm: We have science, we've had discussions.

A moral obligation is on the table.

It takes great creativity to take it all in and keep it simple and sharp.

to connect it. It makes people want to act.

So this is a call and a plea to the incredibly talented TED community.

Let's face climate change creatively.

And let's do it right away. thank you.

(applause)

Xu Xian had just received an invitation to the inauguration ceremony of the new Jinshan Temple.

His wife, Bai Su Zheng, had warned him not to attend.

Their marriage had already survived an attack by the interfering priests, as she was actually a benevolent white snake spirit in human form.

However, being a devout Buddhist, Xu Xian felt obligated to show up.

What they didn't know was that these invitations were from none other than Fa Hai. Fa Hai was a misguided monk who tried to separate the young lovers and killed Xu Xian in the process.

The monk told Xu Xian that he should stay in the monastery to purify his soul because he had fellowship with the devil.

Xu Xian protested, but Fakai did not let Xu Xian escape.

At home, Bai Sojin was worried.

Her husband died too soon and she was unable to tell him she was pregnant with the child.

And since it had been so long since he was gone, she felt something must be wrong.

She made her way to the temple, where fire and smoke rose as the monks threw prayer mats upon encountering Fahai.

Bai Sujin, who was weakened by pregnancy, desperately mustered a fleet of shrimp soldiers and general crabs to subdue the monks, and waved to put out the fire.

However, the water also flooded the surrounding area, drowning many innocent villagers.

Bai Suzhen fell out of favor with the gods because it was the first time he had harmed a human being.

With their blessings withdrawn, Fahai tried to trap her in a magical alms bowl.

But just when all hope seemed lost, a bright glow rose from within her belly and saved her from the magic of a mad monk.

The couple thanked the magical powers for saving them and fled home, and Bai Su Zheng gave birth to a son, Shu Shiling, shortly thereafter.

But despite this joyous occasion, Xu Xian felt uneasy.

He was shaken by his wife's accidental vandalism and feared the misfortune it might bring to the household.

Less than a month later, Fahai appeared on their doorstep.

He offered Xu Xian a begging bowl to wish his newborn son good luck.

Xu Xian was still wary of the monks, but remembered Bai Su Zhen's destructive deeds and accepted the gift.

However, as soon as the bowl entered the house, it flew onto Ms. Bai Su Zhen's head and trapped her inside.

Against his family's wishes, Fahai buried the bowl under Leifeng Pagoda.

When Xu Xian pleaded for his wife to be released, the monk sternly replied, "When the iron tree blooms, you will be released." Guilt-ridden, Shu Xian fled to the monastery, leaving Shi Ling in the care of his aunt.

But there was something they didn't know.

This boy was the reincarnation of Wen Qiu Xing, the god of wisdom, who was sent to his family to reward Xu Xian's devotion.

It is this power that has protected Bai Suzhen in the temple, and as he has grown so has his wisdom.

At the age of 19, Shirin went to the capital to take the national imperial examination, and received the highest score in the entire empire.

The emperor himself presented Shilin with an ornate hat adorned with jeweled flowers as a prize.

But although he returned home in glory, the fate of his parents still weighed heavily on his mind.

Shi Ling appeased his exiled father to take him to visit Leifeng Pagoda to pay homage to his mother.

Kneeling before it, he placed the jeweled prize on the iron tree as an offering.

Suddenly the ground opened and Bai Su Zhen came out.

Pardoned by the divine tribute and the flowers of the Iron Tree, Shirin freed her mother and reunited her mortal and divine families.

It's late at night, pitch black, and a self-driving car winds its way down a narrow country road.

Suddenly, three dangers appear simultaneously.

what happens next?

Before surviving this onslaught, the car must detect obstacles and gather enough information about their size, shape and location so that the control algorithms can plan the safest course.

Cars without a human behind the wheel need smart eyes and sensors that resolve these details in an instant, regardless of environment, weather or darkness.

It's a tall order, but there's a solution that brings together a special kind of laser-based probe called LIDAR and a miniature version of the communication technology that keeps the internet buzzing, called integrated photonics.

To understand lidar, it helps to start with a related technology, radar.

In the aviation industry, aircraft positions are learned by emitting radio or microwave pulses at the aircraft from radar antennas and measuring the time it takes for the beam to reflect.

However, this is a limited view as the large beam size makes it impossible to visualize fine details.

In contrast, LIDAR systems (short for Light Detection and Ranging) in self-driving cars use narrow invisible infrared lasers.

Features as small as a button on the shirt of a pedestrian across the street can be imaged.

But how do we determine the shape and depth of these features?

LIDAR fires trains of ultrashort laser pulses to provide depth resolution.

Ride an elk on country roads.

When a car passes by, one lidar pulse can scatter from the root of a corner, and the next lidar pulse can reach the tip of one corner before being bounced off.

Measuring how long it takes for the second pulse to return provides data on the shape of the corners.

With many short pulses, the lidar system quickly renders a detailed profile.

The most obvious way to create pulses of light is to turn a laser on and off.

However, this destabilizes the laser, affecting the precise timing of the pulses and limiting depth resolution.

It is recommended to use another to keep the light on and periodically shut off the light reliably and quickly.

This is where integrated photonics comes in.

Digital data on the Internet is transmitted by precisely timed pulses of light, some of which are on the order of 100 picoseconds.

One way to create these pulses is with a Mach-Zehnder modulator.

This device takes advantage of a specific wave property called interference.

Imagine dropping a pebble into a pond. As the ripples spread out and overlap, a pattern is formed.

In some places, wave peaks can be very large when stacked. Elsewhere they cancel out completely.

A Mach-Zehnder modulator does something similar.

It splits the light waves along two parallel arms and finally recombines them.

As the light slows down and delays in one arm, the waves get out of sync and recombine, canceling each other out, blocking the light.

By switching this delay in one arm, the modulator acts like an on/off switch, emitting pulses of light.

A light pulse lasting 100 picoseconds leads to a depth resolution of a few centimeters, but tomorrow's cars will need even better visibility.

By combining the modulator with an ultra-sensitive and fast-acting photodetector, resolution can be increased down to millimeters.

This is over 100 times better than what you can see with 20/20 vision across the street.

First generation automotive lidar relied on complex rotating assemblies that scanned from the roof or hood.

Integrated photonics have shrunk modulators and detectors to less than a tenth of a millimeter, packing them into tiny chips that one day fit inside the lights of a car.

These chips also contain clever variations of modulators to eliminate moving parts and allow for faster scanning.

By slowing the light in the modulator arm just a tiny bit, this additional device acts more like a dimmer than an on/off switch.

Stacking an array of many such arms in parallel, each with a slightly controlled delay, allows us to design something new: steerable laser beams.

This clever eye can probe and see more thoroughly than nature ever imagined, from a new perspective, helping you overcome any obstacle.

No one sweated, except perhaps one disorienting moose.

What drives people to cold-blooded murder?

What could be in the mind of a murderer?

And what kind of society produces such people?

Over 150 years ago, Fyodor Mikhailovich Dostoevsky addressed these questions in what would become one of the most famous works of Russian literature, Crime and Punishment.

First serialized in a literary magazine in 1866, this novel tells the story of Rodion Romanovich Raskolnikov, a young law student in St. Petersburg.

Raskolnikov lives in extreme poverty and lacks the funds to continue his studies at the beginning of the story.

A letter from his country home only added to his pain, knowing how much his mother and sister had sacrificed for his success.

Growing desperate after selling his last valuables to an elderly pawnbroker, he hatches a plan to murder and rob her.

However, the repercussions of performing this unthinkable act turned out to be more than he was prepared for.

The novel is sometimes cited as one of the first psychological thrillers, but its scope extends far beyond Raskolnikov's inner turmoil.

From dimly lit taverns to run-down apartments to claustrophobic police stations, the underworld of 19th-century St. Petersburg comes alive in Dostoevsky's poignant prose.

Characters include Marmeladov, a tragic former official who has ruined his family, and Svidrigailov, a free-spirited and lustful aristocrat.

When Raskolnikov's own family arrives in town, their moral innocence stands in stark contrast to the depravity of those around them, even as their fortunes become increasingly intertwined.

This dark depiction of Russian society reflects the author's own complex life experiences and evolving ideas.

As a young writer with a promising military career, Fyodor was drawn to the ideas of socialism and reform, joining intellectual circles to discuss radical writings banned by the imperial government.

After the exposure, members of this group, including Dostoevsky, were arrested.

Many were sentenced to death, but received only mock executions and a final pardon from the tsar.

Dostoevsky spent four years in a Siberian labor camp before being released in 1854.

This experience left him with a much more pessimistic view of social reform, and his focus shifted to spiritual issues.

In his 1864 novella Notes from the Underground, he elaborated on his belief that utopian Western philosophy could never satisfy the contradictory desires of the human soul.

Crime and Punishment was conceived with many of the same themes and completed the following year.

In many ways, the novel follows a common narrative flow of a promising young man who is seduced and degraded by the dangers of city life.

But that social critique cuts even deeper.

Raskolnikov justifies his career as a net benefit to society, even at the cost of the exploitative pawnbroker's death.

In doing so, he repeats the doctrines of selfishness and utilitarianism accepted by many of Dostoevsky's contemporary intellectuals.

And Raskolnikov cuts himself off from humanity, believing that his intellect can transcend moral taboos.

However, despite the book's deep commitment to morality, Crime and Punishment is never taken as merely moralistic, and each character is given his or her own unique and compelling voice.

One of the most remarkable things about Crime and Punishment is its ability to thrill, even as the first act reveals the details of the central murder case.

Raskolnikov's crime is clear.

But only through Dostoevsky's gripping account of the social and psychological turmoil that ensued can we learn the true nature of Dostoevsky's punishment, and the possibility of salvation.

Hello.

Well, I'm here to tell you about my animal muse, the sloth.

(Laughter) I spent the past decade documenting the strange life of the world's slowest mammal.

I still remember the first time I saw it.

I was fascinated by their strange ecology.

I mean, what's wrong with an animal that was born with a smile on its face?

(laughter) And the need to hug.

Audience: Oh, great.

But sloths are greatly misunderstood.

They are given names that speak of sin and are stigmatized for their lazy lifestyles, and people seem to think that the fittest have no place in the fast-paced struggle for survival.

Well, I'm here to tell you what we're doing wrong about this animal and how understanding the truth about sloths can help save us and this planet we call home.

I have traced the sloth-based slander to a Spanish conquistador named Valdes. He was the first to write about sloths in the Encyclopedia of the New World.

He said sloths were "the stupidest animals ever seen in the world."

I have never seen an animal so ugly or more useless. ”

(laughs) Tell me the truth, Valdes.

(laughs) I would like to ask you a few words about Valdez's painting skills.

(Laughter) So what is it?

(Laughter) I've never seen a more useless illustration of a sloth.

(Laughter) But on the plus side, he's giving the sloth a very human face, and the sloth certainly has a very human face.

Taken in Costa Rica, this sloth looks a lot like Ringo Starr.

(Laughter.) But sloths are strikingly similar to the Beatles.

(Laughter) Actually, I'm particularly happy with Paul.

But like The Beatles, Sloth is also very successful.

They descend from an ancient lineage of mammals, with dozens of species once present, including giant ground sloths. The giant sloth was about the size of a small elephant and was one of the only animals large enough to eat and disperse whole avocado seeds.

So... (laughter) Some people have already solved it.

(Laughter) So, if it weren't for sloths, there wouldn't be avocados on toast today, and hipsters around the world wouldn't be happy with their breakfasts at all.

(Laughter) (Applause) There are currently six surviving species, and they fall into two groups.

Bradypus, the three-toed sloth with the Beatles haircut and the Mona Lisa smile.

Then there's the two-toed sloth.

They look like a Wookie crossed with a pig.

It inhabits the jungles of Central and South America and has a very strong fertility.

A study in the tropical forests of Panama in the 1970s found sloths to be the most abundant of all large animals.

They accounted for a quarter of mammalian biomass.

Well, this is just so many sloths, suggesting they're actually doing something very right.

So instead of ridiculing sloths for being different, what if we tried to learn from them?

We humans are obsessed with speed.

Busyness is a badge of honor, and convenience trumps quality when it comes to speed.

Our addiction to express life is suffocating us and the planet.

We adore animals like cheetahs, the "Ferrari of the Animal Kingdom" who can do 60 seconds in 3 seconds without doing anything.

Well, so what?

(Laughter) (Applause) So what?

Sloths, on the other hand, slowly pick up speed at 17 feet per minute with the wind at their back.

(Laughter) But going fast comes at a cost.

Cheetahs are fast, but at the expense of strength.

They lose 1 in 9 times being killed by more powerful predators like hyenas because they cannot risk getting involved in a fight.

No wonder they are laughing.

(Laughter) Sloth, on the other hand, took a more stealthy approach to dinner.

They survive by catching and consuming stationary leaves.

(Laughter) But leaves, like antelopes, do not like to be eaten. As such, the leaves are full of toxins and very difficult to digest.

Therefore, in order to consume them, sloths also had to become athletes—digesting athletes.

(laughter) Sloth's secret weapon is a four-chambered stomach and plenty of time.

Digestion rate is the slowest among mammals.

And it can take up to a month to process a single leaf, giving your liver plenty of time to process toxins.

So sloths are not lazy.

No, they are busy.

Digesting.

(laughs) Well, I'm really busy.

(Laughter) Work hard, that sloth, work very hard.

And of course, leaves have very little heat, so sloths have evolved to expend as little energy as possible.

They do about 10 percent of the work of similarly sized mammals and, thanks to some ingenious adaptations, survive on just 100 calories a day.

Bradypus, a three-toed sloth, has more neck bones than any other mammal, including giraffes.

This means you can turn your head 270 degrees and scan your surroundings without moving your body.

(Laughter) It's also that they're amazing swimmers.

When floating on water, sloths can move three times faster in water than they can on land.

(Laughter) So -- (Laughter) Sloths are the only mammals we know that don't bloat.

When the gas needs to be expelled, the gas is actually reabsorbed into the bloodstream and expelled through the mouth as a kind of mouth fart.

(Laughter) Turning their lives upside down saves even more energy.

They have about half as much skeletal muscle as land mammals.

They don't really have that many extensors, which are weight-bearing muscles. Instead, they rely on contractile muscles to pull themselves.

With long hooked claws and high fatigue resistance, you can literally spend hours hanging like a happy furry hammock.

And sloths can do almost anything in this upside-down position.

They sleep, eat and even give birth.

Their throats and blood vessels are uniquely adapted to pump blood and swallow food against gravity.

Their ribs have sticky patches that keep their huge stomachs from crushing their lungs.

Also, their fur stretches in the opposite direction, so they can get soaking wet after a tropical rain.

The only problem is that when the sloth is turned upside down, gravity loses its dignity.

Audience: Oh, great.

They can't keep themselves straight.

And they drag themselves along as if climbing a flat surface.

And I think this is why early explorers like Valdez thought sloths so bad. Because they were looking at the sloth from the wrong angle, ignoring the context.

I have spent many happy hours fascinated by the movement of sloths.

Their lack of muscle does not hinder their strength or agility.

The Zen master of nature does gentle movements like “Swan Lake” in slow motion with the core control of a Tai Chi master (laughs).

This person fell asleep on the move, which is not uncommon.

(Laughter.) But you're probably wondering: How can a hanging bag of digesting leaves avoid being eaten?

good question.

Well, this is one of the sloth's main predators.

Harpy eagle.

It can fly at speeds of 80 miles per hour, has grizzly bear-sized claws and razor-sharp eyesight, and its wing rings focus sound so it can hear the slightest rustling of leaves.

Sloths, on the other hand, have poor hearing and poor eyesight, and apparently have no option to flee from danger.

No, they live in invisibility cloaks worthy of Harry Potter.

Their fur has grooves that attract moisture and act as small hydroponic gardens of algae, and they also attract numerous invertebrates.

So they are their own slow-moving miniature ecosystems.

They become one with the trees.

And we believe they move so slowly that they fly around the canopy, sniffing out their actions and slipping past the giant harpy's radar.

Sloths are ninjas and rarely leave the safe canopy. Except when defecation, it is done at the base of the tree about once a week.

Now, this dangerous and energetic behavior has long been a mystery, and there are many theories as to why they behave the way they do.

But I think they secretly leave a fragrant message for potential spouses.

Because sloths are usually silent and solitary creatures, except when the female is in heat.

She climbs to the top of a tree and screams for sex.

With a D sharp.

(Laughter) Can you believe it?

(sloth screams) Sharp.

Only this note attracts the attention of men.

It mimics the call of the Kiscadie flycatcher.

So females stay hidden even when they're yodeling at the top of their lungs for sex.

Her secret booty call travels for miles across the canopy, and the male taps her slow trail towards her.

(Laughter) I think the scent message in her poop helps get Romeo to climb the right tree and not waste precious energy climbing the wrong tree.

By the way, the only thing sloths do quickly is sex.

I've seen them do it in action, and it's done in a matter of seconds.

But why should you spend your precious energy on it, especially after that journey?

(Laughter) Unlike other mammals, sloths waste no time trying to keep their body temperature constant.

Since energy from the sun is free, they bask like lizards and wear unusually thick coats for the tropics to retain their heat.

Sloths have an unusually low metabolism.

And we think this may be one reason why most animals are sometimes able to recover from fatal injuries.

This sloth recovered from amputation of both legs, and I know of one that even managed to survive being electrocuted in a power line.

And we now believe that slow metabolism may be the key to surviving extinction.

Researchers at the University of Kansas who were studying mollusks found that high metabolism could predict which species of mollusks went extinct.

Sloths have existed on Earth in one form or another for over 40 million years.

The secret of their success lies in their lazy nature.

Energy saving icon.

And I founded the Sloth Appreciation Society to promote and protect the slow, steady and sustainable life of sloths.

I'm a very fast character.

I'm sure you're guessing.

And the sloth taught me a lot about slowing down.

And I think it would be a benefit to the planet if we all slowly understood their books.

Why not let us all embrace our inner lazy by slowing down, being more careful, using less convenience, conserving energy, recycling creatively, and reconnecting with nature.

If we don't, I fear that we humans will end up being "the dumbest animals in the world."

thank you very much.

May the sloth be with you!

(applause)

Nanahuatl, the weakest of the Aztec gods, sickly and covered in pimples, was chosen to form the new world.

There were already four worlds, each set in motion by its own 'primary sun', each destroyed in turn. The first world was destroyed by the jaguar, the second by the wind, the second by the rain of fire, and the fourth by the flood.

To establish the Fifth Sun, Lord Quetzalcoatl, the "feathered serpent", went to the underworld and returned with the bones of the early peoples, nourishing them with his own blood and creating new life.

But in order for them to have a world to live in, another god had to jump into the great bonfire and become the fifth sun.

The Lord of Food and the Lord of Fire chose Nanahuatl for this mission, but the Lord of Rain and the Lord of the Four Directions chose their offering, the proud and wealthy Teccistecatl.

First, the chosen one had to complete a four-day fast and a bloodletting ritual.

Nanahuatl had nothing but cactus thorns to bleed and fir branches to paint the red offering, but was determined to do his best.

Tekzistcatl, on the other hand, used majestic jade thorns and branches adorned with iridescent quetzal feathers to display his wealth as a sacrifice of his own blood.

When four days had passed, the fire flared up high.

Four times Teccestecatl approached the flames with pride, but four times he backed off in terror.

Humble Nanahuatl stepped forward.

Other gods painted him chalky and glued feathers to him.

Without hesitation he threw himself into the flames.

A fire-blackened eagle swooped over the fire, grabbed Nanahuatl and carried it into the sky.

So the Lord and Lady bathed him, seated him on a winged throne, and tied a red belt around his head.

Inspired by Nanahuatl, Teccestecatl threw himself into the remains of the fire, the chilled ash.

The jaguar jumped over the bonfire, but was unable to carry Teccistecatl into the air.

When Teccistecatl reached the horizon, a band of goddesses clothed him in rags.

Yet he shone as brightly as Nanahuatl.

But he had much less courage and much more pride, so one of the gods picked up the hare and threw it in his face, dimming his light.

However, the Fifth World had not yet been truly established.

Nanahuatl, the primal sun, shone for four straight days without moving through the sky as all previous suns have.

Returning to their hometown of Teotihuacan, the gods began to worry.

They sent Obsidian Hawk to ask what the problem was.

Nanahuatl replied that just as he had sacrificed himself to become the sun god, he needed the blood of other gods to feed him in order to travel through the skies.

Infuriated by this suggestion, Lord Dorn stood up and shot an arrow at Sun.

Lord Sun fired back, and a quetzal feather arrow struck Lord Dawn in the face, turning him into frost.

Before anyone could act rashly, the other gods turned to each other and discussed what to do.

Of course, no one wanted to sacrifice themselves, but neither did they want to act like Lord Dawn.

Besides, Nanahuatl kept his deal to nourish the Earth to the end, so how could he refuse to nourish him in return?

They remembered that even the wimpy Tecuztecatl eventually succeeded in emulating Nanahuatl's bravery.

Finally, five other gods agreed to sacrifice themselves.

One by one, Death stabbed their hearts with obsidian knives and offered their bodies to the new Sun God.

After the last god's sacrifice, Lord Quetzalcoatl blew away the embers of the conflagration to bring it back to life, and at last the sun began to move across the sky, heralding the dawn of the Fifth Age.

Thanks to the pimple wimp whose fortitude inspired all the other gods, the sun moves along its daily orbit, followed by the rabbit-faced moon.

Over the next 40 years, we will face a global neurological epidemic if nothing is done to prevent it.

cheerful thoughts.

All countries shaded blue on this map have 20 percent or more of their population over the age of 65.

This is the world we live in.

And this is the world your children will live in.

For 12,000 years, the human age distribution has looked like a pyramid with the oldest at the top.

It's already flattened out.

By 2050, it will become a cylinder and start reversing.

This is why it's happening.

Life expectancy has more than doubled since 1840 and is now increasing at a rate of about five hours per day.

This is why it's not always a good thing. After the age of 65, the risk of developing Alzheimer's and Parkinson's disease increases exponentially.

By 2050, there will be about 32 million people over the age of 80 in the United States, and if we do nothing, half of them will have Alzheimer's and another 3 million will have Parkinson's.

These and other neurological diseases currently have no cure or prevention and cost about one-third of a trillion dollars annually.

It will be well over $1 trillion by 2050.

Alzheimer's disease begins when proteins that are supposed to fold correctly become misfolded, creating a kind of crazy origami.

So one approach we're taking is to try to design agents that act like molecular scotch tape to hold proteins in their proper shape.

That would prevent tangles from forming that would destroy large parts of the brain.

Interestingly, misfolded protein tangles are also found in other neurological diseases that affect very different parts of the brain. This suggests that this approach may be general and could be used to treat many neurological disorders, not just Alzheimer's disease.

There are also interesting associations with cancer here, as people with neurological disorders have very low incidence of most cancers.

And while this is a connection most people don't pursue right now, we are fascinated by it.

Most of the significant creative work in this field is funded by private philanthropy.

And with governments abandoning much of this issue, there is a lot of room for more private support here.

In the meantime, we are waiting for all these things to happen, but here's what you can do yourself.

If you want to lower your risk of Parkinson's disease, caffeine has some protective effects. No one knows why.

A head injury is bad for your body. They cause Parkinson's disease.

And bird flu is no good either.

In terms of protecting against Alzheimer's disease, fish oil has been shown to be effective in reducing the risk of Alzheimer's disease.

Lowering blood pressure is also necessary, as chronic hypertension is the single greatest risk factor for Alzheimer's disease.

It is also the greatest risk factor for glaucoma, Alzheimer's disease of the eye.

And of course, when it comes to cognitive impact, "use it or lose it" applies, so you need to stay mentally stimulated.

But hey, you're listening to me.

This fixed the problem.

And one last thing. I hope people like me get lucky, okay?

Because the clock is ticking for all of us.

thank you.

California's north coast is home to tropical rainforests, or temperate rainforests, which can receive over 100 inches of rain annually.

This is the region of the Coast Sequoia Trees.

The species name is Sequoia sempervirens.

Sequoia sempervirens is the tallest animal on earth.

The range of this species reaches heights of 380 feet.

It is 38 stories high.

These are the trees that would stand out in Midtown Manhattan.

No one knows how old the oldest surviving coastal sequoias are. Because no one has ever drilled a hole in any of them to count the rings. And in any case the core of the oldest individual appears to be hollow.

However, although the oldest surviving sequoia is thought to be perhaps 2,500 years old, about the same age as the Parthenon, it is also suspected that individual trees older than that may exist.

A range of coastal sequoias are visible. Here it is, it's red.

Dreadnoughts, the largest individuals of this species, live on the north coast of California, where the rains are very heavy.

In recent history, a series of intensive logging and clearcutting operations, especially from the 1970s to the early 1990s, have cleared approximately 96 percent of the Coast Sequoia forest.

Yet about 4 percent of the pristine redwood rainforest remains pristine and wild, now fully protected in a pearly chain of small parks along California's north coast, including Redwood National Park.

Curiously, however, the fragments we leave behind, the Sequoia rainforest, remain largely unexplored to this day.

The Sequoia rainforest is incredibly difficult to navigate, and even today, never-before-seen individual trees are still being discovered, including Hyperion, which became the tallest tree in the world in the summer of 2006.

Let's do a little gedanken experiment.

Imagine what a living Sequoia would actually look like.

So Chris, can you come over here? i have a tape measure

Courtesy of TED.

So, Chris, can you hold the end of that tape measure?

I'll show you what the breast height diameter of a large sequoia is.

Unfortunately, this tape isn't long enough, it's only 25 feet of tape.

Chris, can you put your arm in there? Let's go. OK.

And maybe about 30 feet around here is the diameter of a large redwood.

Now let your imagination run wild.

Think about this tree, which is 325 feet tall, 32 stories tall, and towers upwards into the sequoia space. Over time, each individual life form expresses its shape upwards into space.

The Sequoia species seem to exist in a different kind of time, which should be called Sequoia time rather than human time.

Sequoia time moves at a more majestic pace than human time.

To us, when we look at a sequoia tree, it appears motionless and still, but the tree is in constant motion, moving upward into space, articulating itself, filling sequoia space over sequoia time, thousands of years.

Plant this little seed, wait 2,000 years, and you get this. "Lost Monarch"

Found in 1998, it lives in the Titan Forest on the North Coast.

Yet when you look at the base of a sequoia tree, you can't see the creature.

You are like a mouse staring at an elephant's leg, most of the creatures are overhead and out of sight.

I was so intrigued that I wrote about some things.

Steve Sillett and Marie Antoine are the main explorers of the sequoia canopy. They are world-class athletes as well as world-class forest ecological scientists.

When Steve Sillett was a 19-year-old student at Reed College, he heard that the canopy of the sequoia forest was thought to be the so-called sequoia desert.

At that time, it was believed that there was nothing there but a branch of a redwood tree.

Then he and his friends decided to free climb through the sequoia forest without ropes, tools or anything to see what was there.

He climbed a small tree next to this giant sequoia, then jumped through the air and grabbed a branch with his hands, hanging like he was grabbing the bar of a trapeze.

And from there it climbed directly through the bark to reach the top of the tree.

A friend of his, a man named Marwood Harris, was after him.

Neither of them noticed that the branch Steve jumped into had a yellow hornet nest the size of a bowling ball hanging from it.

And when Marwood jumped down, his face and eyes were covered in stinging hornets. He almost gave up.

He would have fallen to his death from 75 feet above the ground.

But when they reached the top, what they found was not a desert of Sequoias, but a lost world, a sort of three-dimensional maze in the air filled with unknown life.

Currently, I was working on a different subject. It is the emergence of infectious diseases that arise from the earth's natural ecosystems and transcend species to invade humans.

After reading three books on this, in a way it's gotten a little bulky.

My wife and I both love our children.

And then I started climbing trees with my kids using the so-called arborist climbing technique with ropes. Use the rope to climb into the tree crown.

Children are very good at climbing trees.

That's my son, Oliver.

They don't seem to suffer from a fear of heights like humans do.

(Laughter) If ontogeny replicates phylogeny, then the offspring will be somewhat closer to our roots as tree-forest primates.

Humans seem to be the only primates I know to be afraid of heights.

All other primates run up trees when frightened and feel safe there.

We camped overnight on a tree boat in the trees.

This is my then 15 year old daughter Laura looking out from a tree boat.

By the way, it is tied with a rope so that it does not fall.

When you look outside from the tree boat in the morning, you can hear birds chirping in three dimensions.

Flying squirrels visited us at night, but since they had never seen humans in the canopy before, they didn't seem to recognize humans for what they were.

And we practiced advanced techniques like skywalking, which allows us to move from tree to tree in space like Spider-Man.

It became a writing project.

As Steve Sillett climbs a large redwood, he shoots an arrow that pulls a fishing line, over tree branches, and up a rope pulled into the tree by the fishing line.

Go up to the 30th floor.

Two people climb a Gaya tree, thought to be one of the oldest sequoias. there you are

They are only one-seventh of the way to the tree.

There is a sense of exposure.

There is a small person on the ground right there.

It feels like climbing a wooden wall.

But then, when you enter the sequoia canopy, it feels like you've stepped through a layer of clouds.

And suddenly you can't see the ground, you can't see the sky, and you enter a three-dimensional labyrinth in the air, inhabited by hanging gardens of earthy ferns and tiny creatures of all kinds.

There are epiphytes, which are plants that grow on trees.

These are huckleberry bushes.

Many kinds of moss, and all kinds of lichens cover the trees.

As you get closer to the top of the tree, it feels like you won't fall, and it actually becomes harder to move.

You're gnawing among the branches densely populated with creatures that don't spawn near the ground.

It's like scuba diving into a coral reef, except you go up instead of down.

And trees tend to spread over the upper platform-like areas.

Maria is sitting in one of them.

These limbs may be 500 to 600 years old.

Sequoia bark grows very slowly.

It also features huckleberry bushes growing from the tops of the redwood trees, known professionally as huckleberry afros, where you can sit and eat berries during breaks.

Sequoias have a huge surface area that extends upwards into space due to a property called iteration.

Redwood is a fractal. And when they put out their limbs, the limbs splattered onto a small tree that was a copy of a sequoia.

Here we see a repeat in Kronos, one of the old redwoods.

This iteration is a giant flying buttress that emerges from the tree itself.

This buttress is less than half the length of the tree.

Then enter the sequoia forest.

This special trunk is one meter in diameter at its base and extends upwards for 150 feet.

It's as big as the largest tree east of the Mississippi, but it's still a minor feature in Kronos.

This 3D map of the canopy structure of a sequoia named Iluvatar, created by Steve Sillett, Marie Antoine, and colleagues, gives you an idea.

What you see here is a hierarchically expanded schematic of the trunk of this tree. The trunk of this tree grows over time into a 6-layer fractal: trunks grow trunks and trunks grow trunks.

I asked Steve to include a human in this to give it a sense of scale.

That person is right there. The person is waving at us.

I wanted to ask Craig Venter if it is possible to insert synthetic chromosomes into humans. Then you can repeat the same thing if you want.

And, to repeat, the fingers of our hands are people like us, and they have people on their hands, and so on.

And if we had biology like Sequoia, we'd have six layers of people, so to speak.

And it would be great if you could wave at someone and wave at the same time.

(Laughter) Again, let's get closer to Iluvatar.

We are looking at that yellow box.

And this hallucinatory painting shows you - all you see in this painting is Ilvator.

These are millennial structures, some of the trees that are believed to be over 1,000 years old.

There are four humans in this shot (1, 2, 3, 4).

And there is something I want to show you.

This is a flying buttress.

Sequoias revert to their original form as they spread out into space, and these flying buttresses are limbs that protrude from smaller trunks and merge back into the main trunk.

Just like cathedrals, flying buttresses strengthen the tree crown and help the tree survive for a long time.

Scientists are conducting all kinds of experiments with these trees.

They wired them like patients in the ICU.

They are discovering that sequoias can move moisture from the air into their trunks and possibly even into their root systems.

It also has the ability to root anywhere on the tree itself.

When part of the sequoia rots, the sequoia feeds its roots into its own shape, drawing nutrients from itself as it breaks apart.

If we have a sequoia-like biology, even if we get gangrene on our arm, we can still extract nutrients and extract nutrients and water until it falls off.

Canopy soils can occur hundreds of feet above the ground, up to a meter deep, and are home to as yet unnamed organisms.

This is an unnamed species of the copepod family. Copepods are crustaceans.

These copepods are a major component of the ocean and form a major part of the diet of grazing baleen whales.

It is completely unknown what they do in the canopy soil of the sequoia forest, hundreds of feet from the sea, or how they got there.

I have some interesting theories that I would like to discuss if I have time.

However, when you look closer to the tree, you can see the increased complexity.

What we are looking at is the Gaya summit, believed to be the oldest redwood.

The Gaya tree may be 3,000 to 5,000 years old, and no one really knows, but its top has broken off and is now rotting.

This tiny Japanese garden-like creation probably took 700 years to form the complexity we see today.

When looking at a tree, you need a magnifying glass to see a giant tree.

At the end of this talk, I have to show you something, unfortunately, very sad.

The Eastern Hemlock Tree is often referred to as the Sequoia of the East.

And we are now going full circle.

In the 1950s, a tiny creature called a hemlock woolly adelgid appeared in Richmond, Virginia.

It jumped out of species from other Asian organisms that lived in Asian hemlock trees.

When transferred to a new host, an Eastern Hemlock tree, the tree escaped predators and the new tree was not resistant.

The Eastern Hemlock Forest is, in some ways, considered the last fragment of primary rainforest east of the Mississippi River.

I didn't even know there was rainforest in the East, but the Great Smoky Mountains National Park can get up to 100 inches of rain per year.

And in the last few summers, these invasives, the arboreal Ebola fever, swept through the virgin hemlock forests of the East, wiping them out completely. I climbed there this summer.

This is the Great Smoky Mountains National Park, but hemlock is dead as far as the eye can see.

And what we are witnessing is not only the potential death of the Eastern Hemlock species, its extinction from nature by this invasive parasite, but also the death of the incredibly complex ecosystem in which these trees are but the base of the empty labyrinth that exists in their canopy.

It's really heartbreaking to watch.

But I can hardly imagine the idea that the national news media isn't picking up on this at all. This means that one of the most important ecosystems in North America is being destroyed.

What can the sequoias tell us about ourselves?

Well, I think they can tell us something about human time.

The fragility of human time, the ephemeral nature of man, and the brevity of human life, it is the need to love.

But we are different from trees. Trees also teach us something from our own differences.

I think we are human and have the capacity to love, the capacity to wonder, and a kind of endless curiosity and restless inquisitiveness that is very well suited to us as primates.

And, at least for me personally, trees have taught me a whole new way to love my children.

Exploring the forest canopy with them is one of the greatest things I have ever done on earth.

And I think one of the happiest things is the feeling that I've been able, with my children, to introduce them to a very small circle of humans who are lucky, or perhaps stupid enough, to be able to climb trees.

thank you very much.

(Applause.) Chris Anderson: At an earlier TED, I think it was Nathan Myrvold, who told me that these trees are over 2,000 years old, so many of them are thought to have ecosystems with species found nowhere else on Earth but in that one tree. is that correct?

Richard Preston: Yes, that's right. I mentioned Hyperion, the tallest tree in the world.

And I was part of the climbing team that made the first ascent in 2006.

And while we were climbing Hyperion, Marie Antoine spotted a golden brown ant of an unknown species about halfway up the trunk.

Interestingly, ants are not known to occur on sequoia trees. We wondered if this ant, this type of ant, was unique to just that one tree, or just that grove.

Subsequent climbs failed to find the ant again, and no specimens were collected.

we don't know what it is. I just know it's there.

CA: So we have to wonder when species other than ours were recording important stories on Earth. Our story is about Iraq, war, politics, and celebrity gossip.

You told us another story of this tragic arms race going on, and perhaps whole ecosystems disappearing forever.

It's the amazing sense of amazement you gave me, the sense of how fragile this whole thing is.

RP: It's fragile, and you know, I'm thinking about new human diseases, parasites invading humanity.

But that's just one small part of the larger problem of species invasion through ecosystems around the world, and, you know, the planet itself -- CA: Part of it we've caused inadvertently.

RP: It's caused by humans. Caused by movement of people.

You can think of the Earth's biosphere as a palace, the continents as a room in a palace, and the islands as small rooms.

But recently, the palace doors have been flung open and the walls are crumbling.

CA: Thank you very much, Richard Preston.

RP: Thank you.

I would like to introduce an interesting person named Ötzi.

Since he is a mummy, he lives in the South Tyrolean Archaeological Museum in Italy.

This is an artist's recreation of what he looked like when he was alive 5,300 years ago.

Want to see how he is today?

(Laughter) Now brace yourself, there's a terrible mummy photo coming your way.

So while he's not as handsome as he used to be, he's actually in great condition for a mummy, as he was found frozen in ice.

Ötzi is the earliest known mummy with preserved skin.

At 5,300 years old, which is very old, older than the pyramids of Egypt, Ötzi's skin is covered with 61 black tattoos, with lines and crosses on all parts of his body where he may have experienced pain.

Scientists therefore suspect it was used to mark sites for some type of treatment, such as acupuncture.

So if the oldest skin we've ever seen is all covered in tattoos, then it's clear that tattooing is a very old practice.

But fast forward to today and tattoos are everywhere.

Nearly one in four Americans has a tattoo, and tattooing is a multi-billion dollar industry. Whether you love tattoos or hate them, this talk will change the way you think about tattoos.

So why are tattoos so popular?

Unlike Ötzi, most of us today use tattoos for some sort of self-expression.

Personally, I love tattoos because I love art, but there is something very wonderful, almost romantic to me about tattooing as an art form that cannot be commercialized.

right? Your tattoo lives and dies with you.

It can't be bought, sold or traded, so its only value is truly personal and I love that.

Now, I am obsessed with color, so I tend to gravitate towards really colorful tattoos.

I teach an entire course on it in college.

But my first tattoo was an all-black tattoo like Ötzi.

Yes, I did the mundane thing young people sometimes do and got a tattoo in a language I couldn't read.

(Laughs) Well, I am 19 years old, and I have just returned from my first trip abroad, and I was meditating in a Buddhist monastery in the mountains of Japan.

Now here's something that surprised me.

My 14-year-old tattoo and Ötzi's 5,300-year-old tattoo are made of the exact same material. Soot, the black powdery carbon powder that remains in the fireplace when you burn things.

And if you zoom all the way into my tattoos and Otzi's tattoos, you'll see that they all look like this.

A tattoo is nothing more than a collection of tiny pigment particles (soot in this case) trapped in the dermis, the tissue layer just below the skin's surface.

Therefore, for over 5,000 years, we have done little to update tattoo technology, other than access to more colors and slightly more efficient methods of application.

I am an artist and a scientist, leading a nanotechnology lab. Nanotechnology is the science of building things from extremely small components, thousands of times smaller than the width of a human hair.

And I started asking myself how nanotechnology could help with tattoos.

If a tattoo is just a bunch of particles on your skin, why not replace those particles with particles that do more interesting things?

Here's my big idea. I believe tattoos give you super powers.

(laughter) I don't mean that tattoos will make us fly, but I think that tattoos will give us new abilities that we don't currently have, so we can have superpowers.

By upgrading the particles, the tattoo can be designed to change not only the appearance of the skin, but also the function of the skin.

let me show off

This is a diagram of a microcapsule.

These are tiny hollow particles with a protective outer shell, about the size of tattoo pigment, that can be filled with virtually anything you want.

So what if we put an interesting substance inside these microcapsules and use it to make tattoo ink?

What can you do with a tattoo?

What kind of problems can you solve?

What human limitations can we overcome?

Well, here's an idea. One of our weaknesses as humans is our inability to see ultraviolet light, or UV light.

This is the high-energy portion of sunlight that causes sunburn and increases the risk of skin cancer.

Many animals and insects can actually see ultraviolet light, but we cannot.

If possible, I would like the sunscreen to be visible when applied to the skin.

Unfortunately, most of us don't wear sunscreen, and even those who do don't really know when it's gone because it's invisible.

This is the main reason we treat more than 5 million preventable skin cancers each year in the US alone, costing the US economy over $5 billion annually.

So how can we overcome this human weakness with tattoos?

Well, if the problem is that you can't see UV light, you might get a tattoo to detect UV light.

So I thought, why not take a microcapsule, fill it with a UV-sensitive color-changing dye, and make a tattoo ink out of it?

Now, one of the woes of being a tattoo technician is finding a willing subject.

(Laughter) And when it came time to test this tattoo ink, I figured I'd better not torture the poor grad student.

So I decided to get a few tattoos on my arm instead.

And it actually worked. check it out!

I call these tattoos solar freckles.

And for now they are invisible, but as soon as you expose them to UV rays that act like the sun, blue spots will appear.

I'm not wearing sunscreen in this video, but if I had, those blue spots wouldn't have reappeared, and later when the sunscreen wore off, the UV rays would reappear the freckles, and you'd know it was time to reapply the sunscreen.

These tattoos therefore serve as a real-time, naked-eye indicator of skin UV exposure.

And of course there are a lot of really cool and artistic things you can do with a color changing tattoo like this, but I hope it also helps solve a bigger problem in skin protection.

(Applause) Let me give you another example.

A normal human body temperature is between 97 and 99 degrees Fahrenheit, and if you're outside that range, you should see a doctor immediately.

Now, the problem is that humans cannot detect their own body temperature without a thermometer.

Sure, you can try the old-fashioned hand-to-the-forehead trick, but there's absolutely no scientific evidence to back it up.

(Laughter) So what if you could create a tattooable thermometer that you could always access?

Now, remember how Sun Freckle used UV-sensitive dyes found in microcapsules in tattoo inks?

Well, if you put heat-sensitive dyes in microcapsules, you can make different tattoo inks that change color at different temperatures.

Suppose the degrees Fahrenheit were 96, 98, and 100 degrees.

Placing these inks side by side gives a temperature scale that is tailored to the human body.

In this video, you can watch the different patches of the tattoo fade away in sequence as the tested pigskin is heated.

So if you put a tattoo like this in a stable place against external temperature changes, maybe inside your mouth or the back of your lip?--then you could always read your body temperature with just one glance at your tattoo in the mirror.

That's amazing?

(Applause.) Thank you.

(Applause.) Another limitation of us humans is that our skin doesn't conduct electricity. This might be a good thing, but not necessarily -- (Laughter) if you have electronic biomedical implants like pacemakers, for example.

If you currently have a pacemaker, you will need surgery every 5 or 10 years to replace the battery when it dies.

Wouldn't it be great if, instead, you could easily recharge your battery through a conductive skin patch?

Well, when trying to address that problem with tattoos, the first step would be to create a tattoo that conducts electricity.

Therefore, my laboratory is working on the development of conductive tattoo ink.

And now, conductive tattoo inks can be used to make skin more than 300 times more conductive.

We currently have a long way to go to reach copper-like conductivity, but progress is being made and I am really excited about this because I think it could open up a whole new world of possibilities for tattoos.

I envision a future where tattoos make us possible. Tattooable wires and tattooable electronics allow technology to fuse with the body, making it feel like an extension of ourselves rather than an external device.

These are examples of the new abilities you get by using nanotechnology to upgrade your tattoos, but this is really just the beginning.

I believe there are limits to what you can do with high tech tattoos.

In the future, tattoos will become not only beautiful, but also functional.

thank you.

(applause)

I have been at MIT for 44 years.

I went to TEDI.

Every other TED, and I went to every TED under Ricky, I talked about what the Media Lab does. The Media Lab currently employs about 500 people.

And when I was reading the news reports, it said that I actually quit the Media Lab last week.

I didn't quit Media Lab, I resigned as chairman. It was a somewhat silly title, but someone else took over. One thing you can do as a professor is to stay as a professor.

And I plan to run one laptop per child for the rest of my life. Anyway, this has been going on for about a year and a half.

So let's talk about this. Spend 18 minutes explaining why we do it, how we do it, and what we do.

And at some point I'll also tell you what a $100 laptop looks like.

Chris asked me to talk about some big issues, so I thought I'd start with at least the three issues that drove me this way.

And the first one is very obvious.

It's amazing to meet a head of state and say, "What is your most precious natural resource?"

At first they won't say "children," but if you say "children," they will readily agree.

It's not that hard.

(Laughter.) We all agree that whatever the solution to the big problem involves education, it can be just education, and it would never be possible without an element of education.

That's certainly part of it.

And the third is a little bit more confusing.

It is not that all of us in this room were taught how to speak and how to speak, but that we learned how to walk and speak by interacting with the world, asking for something, standing up and reaching for it with certain results.

On the other hand, at about the age of six, we were told to stop such learning, and that all learning from then on was through teaching, whether it was people standing up like I do now, or books, or anything else.

But it was actually through teaching.

And one of the general things that computers have brought to learning is that it now involves a kind of learning that is a bit like walking and talking, in the sense that much of it is driven by the learner himself.

That's the rule -- you may know Seymour Papert.

This was in 1982 when we were working in Senegal.

Because some people think that $100 laptops came out just a year or two ago, or that we were just struck by lightning. This actually goes way back in time, actually all the way back to the 60's.

It's the 80's here.

Steve Jobs gave us some laptops. We were in Senegal.

It didn't scale, but at least it brought computers to developing countries, and children quickly learned that they could swim like fish, even though English wasn't their language and the Latin alphabet was hardly their language.

They could play these like pianos.

Somewhat recently, I personally participated.

These are two anecdotes. One is in a Cambodian village, which has no electricity, no running water, no television, no telephone, but now has broadband internet.

And for these kids, their first English word is "Google" and they only know Skype.

They just use Skype.

And they go home at night. Broadband connections are available in huts without electricity.

Parents love this. Because when you open your laptop, it becomes the brightest light source in the house.

And talk about where metaphor and reality mix. This is the actual school.

In parallel, Seymour Papert lobbied the Governor of Maine in 2002 to enact one laptop per child into law.

I think it's fair to say that 80 percent of teachers at the time were, I mean, anxious.

In fact they were against it.

And they really wanted that money to be spent on higher salaries, more schools, whatever.

And how is it now, three and a half years later?

They report five things: truancy reduced to near zero, attendance at parent-teacher meetings (none did, but now nearly everyone attends), fewer discipline problems, and increased student participation.

My teachers tell me that they enjoy teaching now.

My kids have laptops and they are addicted. -- And the fifth thing, which interests me the most, is that teachers have to turn off the server at certain times of the night because they get a lot of emails from kids asking for help.

So when you see something like that, this is not something you should test.

Gone are the days of pilot projects where people said, “I want to do 3,000 or 4,000 in our country and see how it works.”

screw you. If you go to the end of the line, other people will do it, and if you find it works, you can join too.

And this is what we do.

(Laughter) (Applause) So "One Laptop Per Child" was founded about a year and a half ago.

We are a non-profit organization.

We've raised about $20 million to build it and then do the engineering to get it into production.

Scale really matters.

You can buy the components at a low price, so it doesn't matter, right?

Because you can contact the manufacturer. I'll skip the name, but we want a small display and it doesn't have to have perfect color uniformity.

One or two pixels may be missing.

And this particular manufacturer said, "We're not into that. We're into the living room."

We focus on perfect color uniformity.

You are not part of our strategic plan. ”

So I said, "That's a shame. We need 100 million units a year."

(Laughter.) And they said, "Oh, well, maybe we can be part of your strategic plan."

That's why scale matters.

That's why we won't launch this unless we have 5-10 million units in the first run.

And the scale itself is the idea of ​​launching big enough to bring the price down and that's why I said 7 million to 10 million there.

And we do it without a sales & marketing team.

So you're looking at the Sales & Marketing team.

We do that by visiting seven big countries and getting them to agree to launch it. Then other countries can follow suit.

we have a partner

All others are pending.

And this was widely reported.

This is the so-called green machine that I introduced with Kofi Annan at the World Summit held in Tunisia in November.

Now, when people start looking at this, they're going to say, "Oh, this is a laptop project."

No, this is not a laptop project. It's an educational project.

And the fun part is, I'm pretty focused on that. I tell people I used to be a light bulb, but now I'm a laser. I just make it And it turns out it's not that difficult.

Because the economics of laptops are: We say 50 percent here, but 60, 60 percent of the cost of a laptop is sales, marketing, distribution, and profit.

None of that now.

First of all, we sell it at cost and the government distributes it, so none of those are included in our cost.

They are distributed to schools like textbooks.

Then that part disappears.

Now, laptop displays cost roughly $10 per diagonal inch.

It could go down to eight. You can go down to 7, but you won't go down to 2 or 1.5 unless you do something really smart.

The rest (the little brown box) is very attractive because the rest of the laptop is devoted to itself.

It's a bit like an obese person having to expend most of their energy to move their obesity.

(Laughter) And today we have an incredible situation.

I've been using laptops since the early days.

And my laptop is running slower, less reliable, and less comfortable than it used to.

And this year it's even worse.

(Applause.) People applaud, and sometimes I get a standing ovation, but I say, 'What's going on? Why are you all sitting there?'

And recently, someone - who remains anonymous - called our laptops "gadgets."

And I said, 'God, our laptops are going to break like bats in hell.

When you open it, it becomes "Bing Bing". ”

It will be just like when you bought an Apple Macintosh 512 in 1985.

It worked really well.

And we're steadily going downhill.

Well, people always ask what it is.

That's it.

Two parts that are probably worth noting: It's going to be a mesh network, so when the kids open their laptops, everything is networked, and only one or two points of backhaul are needed.

Two megabits can serve thousands of children.

So when you bring something to a village, it allows the villages to connect, and it does it very well.

Dual Mode Displays -- The idea is to have displays that both work outdoors. Wouldn't it be fun to use your phone outdoors in the sun?

Well, you can't see it.

And one of the reasons you can't see it is because most phones are backlit most of the time.

What we're doing now is doing both front lighting and back lighting.

And you know whether to switch it manually or with software.

When frontlit, it becomes black and white at 3x resolution.

Therefore, many Taiwanese now live in Taiwan to a greater or lesser extent.

And after about 30 days, you can clearly see if this is working.

Perhaps most importantly, the kids can actually do the maintenance.

This is also hard for people to believe, but I believe this to be absolutely true.

That's the machine we showed in Tunis.

This is the direction we are heading.

And it was something we thought was impossible.

Now let's turn this around.

Isn't this design?

So this is a kind of mechanical engineering personification that you can play with.

I work at MIT.

At least we can decide to go left or go left -- Chris Anderson: Before we do that, for the simulcast folks -- Nicholas Negroponte: Sorry. I forgot. CA: Show off a little.

So no matter where the camera is -- OK, good point. Thank you Chris.

The idea was that it could be transformed into an e-book rather than just a laptop.

It's like an e-book.

When you go outside, it becomes black and white.

There is no game button, but it can also be used as a game machine or book machine.

If you set it up like this, it becomes a TV.

And so on -- Is that enough for a simulcast? Sorry.

I'll let Jim decide which way to send it later.

OK. seven countries.

(Laughter) I say "probably" about Massachusetts because you have to actually do the bidding.

You must bid by law, etc.

Otherwise, there is no need to bid.

They can decide – it is the federal government in each case.

This is a bit of an annoyance as many people say "let's do it at the state level" because states are more agile than federations due to their size.

Still we count.

We are actually negotiating with the federal government.

We are actually dealing with the Ministry of Education.

And when you look at governments around the world, the Ministry of Education tends to be the most conservative, and it's also the one that pays the biggest salaries.

Everyone thinks they know about education, and education incorporates many cultures as well.

It's really hard. And it's certainly a difficult road.

Looking at the countries, they are fairly distributed geographically.

did they all agree? No, not quite.

Thailand, Brazil and Nigeria are probably the three most positive and most agreeable.

We intentionally don't sign anyone or anything until we have something that actually works.

I visit those countries at least every three months, so I am circumnavigating the world every three weeks.

I wrote at the end that this is kind of a schedule, and I might give some of it away for free within two years at this conference.

Everyone says it's a $100 laptop, but it can't be.

Arrive at probably 135, start then drift down.

This is very important because so many things come to market with a price and then go up in price.

It's kind of a loss leader, and as soon as it looks interesting you can't afford it or scale it out.

Therefore, we are targeting $50 in 2010.

The gray market is a big problem.

And one way -- just one -- but one way that works for the gray market is to make something totally unique -- which is a bit like the fact that cars -- thousands of cars are stolen every day in the United States.

Not a single post office truck is stolen.

Because there is no market for post office trucks.

It looks like a post office truck.

Can be spray painted. You can do whatever you want.

I recently learned that white Volvos are not stolen in South Africa.

period. none. zero.

So we want it to look very much like a white Volvo.

Each government has a task force.

This may not sound like much, but we're trying to get governments to help us, but it's not easy.

The economics of this start with the federal government and then with other governments, child-to-child funding, where children in this country buy it for children in the developing world, perhaps of the same sex, perhaps of the same age.

My uncle gives it to his niece or nephew as a birthday present.

So all sorts of things are going to happen and it's going to be very exciting.

And everyone says, I say, this is an educational project.

Do you provide software?

The answer is, "The system certainly contains software, but no, it does not provide educational content."

It's actually happening in every country.

But we are certainly constructionists.

We believe in learning by doing. Everything from the logo that started in 1968 to more modern ones like Scratch if you've heard of it are part of it.

are we dreaming? Is this true?

The only criticism is that people don't really want to criticize this. Because this is a humanitarian effort, a non-profit effort, and to criticize it is actually a bit stupid.

(Laughter) But what people can criticize is, "Great idea, but these people can't do it."

And that could mean that either these people, professors, etc. can't do it, or it's impossible.

Well, on December 12th, a company called Quanta agreed to manufacture it. That question is gone now that the company makes about a third of all the laptops on the planet today.

So it doesn't matter if it happens or not.

What if it comes out for $138?

What happens if the release date is delayed by six months?

It's a pretty soft landing.

thank you.

You know, we're going to do things a little differently.

I'm not going to show you the presentation. I will tell you.

And at the same time, we'll only be looking at images from a photostream that's pretty close to live, snapshots of Second Life. I hope you find this fascinating.

You can -- vie for your attention with strange pictures on the screen that flow from there.

After talking a little bit about some of the big ideas on this, I thought I'd bring John back here so he can be a little more interactive and think and ask questions.

I think the first question is why build a virtual world in the first place.

And I think the answer will always be driven, at least to some extent, by those who are crazy enough to start the project in the first place.

So, a little bit of my own initial background and what inspired me to actually try to build this kind of thing, going all the way back to my teenage and adult years.

I am a very creative child, I read a lot and from an early age I was first interested in electronics and later in computer programming.

I was always trying to make something.

I was into taking things apart, putting them together, whatever I could do with my hands, wood, electronics, and metal.

For example, and this is the great thing about Second Life, I had a bedroom.

And when they are teenagers, they all have their own bedrooms, which they make their own hideouts. But I wanted a door, so I thought it would be cool if I could go up without opening the door like in Star Trek.

I thought it would be nice to do so. So, I got up to the ceiling and to my parents' delight, cut into the ceiling joist, pulled it up off the ceiling and installed the door.

I installed this door pull up garage door opener in my attic.

You can imagine how long it took me to do this at home and how uncomfortable my parents were.

What has always struck me is that, as humans, we have so many great ideas of things we want to do, but so often in the real world we don't get to actually execute them, the actual execution phase where we actually combine materials and build what we have imagined in terms of design.

So for me, when the internet came along and I was doing computer programming and I was just running my own little company and thinking about what to do with the internet and computers, it hit me right away that the ultimate thing I really wanted to do with the internet and computers was to simulate the world with the internet and connected computers and sort of the laws of physics and the rules of how things work together, kind of recreate the idea of ​​an atom and how things are made, and then run it inside the computer. So that we can all go in there and make something.

And that's what was so appealing to me.

I just wanted this place where I could make things.

I think you can see that in the origins of what happened in Second Life, and I think it's important.

Also, more generally, I think the general trend is to use the internet and technology as a kind of space between us for creativity and design.

It is a kind of great progress of mankind.

Technology is generally used to allow us to create in the most shared and social way possible.

And I think Second Life and the virtual world represent the best we can do right now to achieve that.

Another way to think about space, in terms of content, is to connect some sort of virtual world to it.

I thought it might be fun to talk about it for a minute.

Considering going to space, it's a fascinating thing.

So many movies, so many kids, we all dream of exploring space. Now why?

Stop for a minute and why think that conceit?

Why would we humans want to do that?

I think there are several. That's what we see in the movies - you know, this is this dream that we all share.

One is that if you go to space, you can start all over again.

In a way, you will become a different person on that journey. Because it doesn't, and you're leaving behind society and life as you know it.

So, when you begin this quest, you will inevitably change - perhaps irreversibly - yourself.

And two, there's a tangible sense that if you travel far enough, you know it's there. Oh yeah, you never know what you'll find once you get to space.

It's going to be different here.

And indeed, it will be so different from what we see here on Earth that everything will be possible.

It's kind of an idea. We humans crave the idea of ​​establishing new identities and going where anything is possible.

And if you actually sit down and think about it, I think virtual worlds, and where we're increasingly adopting computing technology, essentially represent a highly probable, actually tactically possible version of space exploration.

We are fascinated by the idea of ​​virtual worlds because, just like the universe, they allow us to reinvent ourselves, they contain everything, and perhaps anything can happen there.

To give you an idea of ​​the scale, compare the universe to Second Life, which most people don't realize is similar to the Internet in the early 90's.

In fact, Second Life's virtual world is a lot like today's Internet in the early '90s. Everyone is so excited, there is so much hype and excitement every moment about one idea or the next, but then there is despair and everyone thinks everything is going to go wrong.

Everything that happens in Second Life, and in the wider virtual world, happened in the early 90's.

We always play a game in the office where we can find the same article in any article, just by replacing the words "Second Life" with "Web" and "Virtual Reality" with "Internet".

You can find the exact same article written about anything people are observing.

In terms of scale, Second Life currently has about 20,000 CPUs.

Currently, there are approximately 20,000 computers connected at three facilities in the United States, simulating this virtual space. The virtual space itself is like a small city in terms of its active population, with around 250,000 people roaming there a day.

The space itself is about ten times the size of San Francisco and just as dense.

So you get an idea of ​​the scale. It's growing very quickly right now and is currently around 5% per month in terms of adding new servers.

And of course, unlike the real world, the whole thing is growing very quickly and historically exponentially, just like the Internet.

So what that kind of space exploration is all about is the amount of content that's in it, and I think the amount is important.

For the virtual world, it was important that it was a space with truly limitless possibilities.

As humans, we are very sensitive to that.

I know, you can see it. You know when you can do something in that space and when you can't.

Second Life today has 20,000 machines and about 100 million user-created objects. The object is probably something like this, possibly interactive.

Tens of millions of them are always thinking. Code is attached.

So the world is already very vast in terms of the amount of very important things out there.

If someone plays World of Warcraft, for example, 4 World of Warcraft DVDs will be released.

By comparison, Second Life has about 100 terabytes of user-generated data, about 25,000 times its size.

Again, much like the Internet compared to AOL, and AOL's chat rooms and content at the time, what's going on here is very different. Because when people are allowed to do whatever they want, the scale of what they can do is pretty amazing.

The last important thought is that it's almost certainly true that whatever this evolves will be larger than the web itself in terms of total usage.

And let's justify it with two statements.

In general, we use the web to organize, exchange, create, and consume information.

It's like Irene talking about Google being data-driven.

I think of the world as information.

Everything we interact with, every experience we have, is like we are flowing through a sea of ​​information and interacting with it in different ways.

Information is presented on the web in the form of text and images.

Web topology and geography are mostly links between texts.

It's one way to organize information, but there are two important ways to access information in the virtual world that are very different and far superior to what has been possible on the web so far.

First, as I said earlier, the first difference in virtual worlds is that they present information using the most powerful symbolic symbols available to humans.

For example, C-H-A-I-R is the English word for it, but this picture is a universal symbol.

We all know what that means. No need to translate.

Also, if you show them a picture or write the C-H-A-I-R on a piece of paper, it will be even more memorable.

I can do a test and show that after a few days I remember much better what I was talking about the chair.

Therefore, when we organize information using the symbols of our memory, the most common symbols that we have been obsessed with throughout our lives, we are able to excite, stimulate, remember, transfer and manipulate data to the maximum extent possible.

Virtual worlds are therefore the best way for us to organize and experience information in nature.

And I think that's what people have been talking about for 20 years. As you know, 3D, lifelike environments are very important to us in a magical way.

But the second thing, and I don't think this is so obvious, is that the experience of creating, consuming, and exploring information takes place in a virtual world that is implicitly and inherently social.

you are always with other people.

And we humans are social creatures, and we must consume information in the presence of others, or be helped by it, or enjoy it more.

It is essential for us. There is no getting away from it.

When you're on Amazon.com looking for a digital camera or something, you're there right now and there are like 5,000 people on the site and you can't talk to them.

You can't go to someone browsing the same page for digital cameras as you and say, "Hey, have you seen this? Because I'm thinking about buying it."

As a simple example, the experience of shopping together is an example of how we, as social creatures, want to experience information in that way.

So the second point, that we inherently experience information together, or want to experience it together, is fundamentally important to this trend of using technology to connect us.

So I think it's likely that in the next decade or so, these virtual worlds will likely become the most common way humans use Internet electronics, so to speak, to consume information.

Cartography in India is a very good example.

Perhaps the solution is to talk to others in real time.

Ask for advice, not just how to organize maps statically.

I think that is another big point.

Wherever this goes, whether it's Second Life, its descendants, or something broader that happens in various points around the world, this is the use of the Internet, and I think that total traffic and total unique users will be reversed, and that the Web and its bibliographic set of textual and graphical information will become tools or part of its consumption patterns, but the patterns themselves will mostly occur in this type of environment.

Great idea, but I think it's very defensible.

So maybe we can stop here and bring John back and have a longer conversation.

thank you. John. That is wonderful.

(Applause) John Hockenberry: Why isn't the urge to create, to create Second Life, a utopian urge?

For example, in the 19th century, literary works that imagined other worlds were decidedly utopian.

Philip Rosedale: I think that's great. That's a very deep question. yes.

Can virtual worlds become utopias, that would be one way I would say.

The answer is no. I think the reason is that the web itself, as a good example, is thoroughly bottom-up.

The idea that infinite possibilities, all sorts of magic can happen, only happens in an environment where we really know that there is fundamental freedom at the level of the individual actor, at the level of the Lego bricks that make up the virtual world, so to speak.

I need that level of freedom, so I get asked a lot, is there some kind of utopian thing, or is there a utopian trend in things like Second Life, are you going to create a world with grand plans?

Such top-down planning alienates nearly everyone, even those with good intentions when building it.

And furthermore, when human societies are governed, when they set up grand schemes of rules, new ways of interacting with people, new ways of laying out cities, etc., those things have historically never been larger than this, I always laugh and say, the Mall of America, it's like the largest piece of centrally designed architecture ever built.

JH: The Kremlin was pretty big.

PR: Kremlin, yes. that's true. The entire complex.

JH: Tell us about the tools you created in the early days of Second Life. I was sure people would want to use it to create avatars and communicate, but people said, 'No, I'm not interested in that at all.' And name the ones you didn't think of, but people started asking for right away.

PR: I'm sure you can come up with multiple examples of both.

One of my favourites. I had this feature built into Second Life. I was really passionate about this feature.

It was the ability to get close to someone and have a more private conversation, but it wasn't instant messaging because you had to befriend someone.

It was just this idea that you can have a private chat.

I remember it being one of the examples of data-driven design.

From my point of view, I thought this was a very good idea, but it was never used and in the end, I think they turned it off by now.

We finally gave up and removed it from the code.

But more generally, there's another example I can think of for this. This is great when compared to utopian ideas.

Second Life originally had 16 simulators. Currently there are 20,000.

So when there were only 16 people, it was about the size of this university's campus.

And then we zoned it. You know, we've put in nightclubs, we've put in discos where we can dance, and we've made places where we can fight with guns if we feel like it, and we've made other places like Coney Island, like boardwalks.

And we set up zoning, but of course people could build around it however they wanted.

And what was surprising from the beginning was that the idea that we put out with the zoning concept was basically immediately and completely ignored, and about two months after the whole thing started, which is a really short time even in Second Life, users, people who were using Second Life at the time, residents came to me and said they wanted to buy a disco. Since I built it, he said he wanted to buy the land, demolish it, and build a house on it. And I sold it to them - that is, we transferred ownership and they threw a big party and blew up the whole building.

And I remember it just telling you that you don't know exactly what's going to happen.

When you think about the popular stuff people have made -- JH: CBGB has to shut down eventually. That's the rule.

PR: That's right. And it ended on day one, but basically internet time.

For example, pregnancy.

You can have babies in Second Life.

This is all done using tools like Second Life's built-in tools. So the innate notion of getting pregnant and having a baby is, of course -- Second Life is platform-level, corporate-level, and -- at Linden Labs -- Second Life has no gamification at all.

We don't try to structure the experience or make it utopian in the sense we put it into.

So, of course, we never introduced a mechanic to have babies or take two avatars and combine them.

But people built the ability to have and care for babies as a purchasable experience you get in Second Life. So this is a very interesting example of what's going on across the economy.

And, of course, the existence of the economy is another consideration.

I didn't talk about it, but this is an important feature.

When people are given the opportunity to create in the world, there are really two things they want.

One is rightful ownership of what they create.

And second, if they feel like it, they don't do it all the time, but often they do. They want to be able to actually sell their work as a means of making a living for themselves.

It's true on the web, but it's true in Second Life as well.

Therefore, the existence of the economy is extremely important.

JH: Questions for Philip Rosedale?

(Audience: Well, the first observation is that you look like the character.) JH: The observation accuses Philip of looking like a Second Life character, Avatar.

If you reply, I'll take care of the rest of your questions.

PR: But I don't look like my avatar.

(Laughter) How many people here know what my avatar looks like?

Probably not so many.

JH: Is it plagiarizing someone else's avatar, sort of -- PR: No, no. I did not do it. One of the other men at work had a great avatar (female avatar). I used to do that too sometimes.

But my avatar is a man in chaps.

Spiky Hair -- More spiky hair than this. orange hair.

Handlebar mustache. Characters like village people.

Very cool.

JH: So the question?

(Audience: [unintelligible].) JH: The problem is that Second Life seems to lack some cultural tweaks.

It doesn't seem to have its own culture, and the differences that exist in the real world aren't reflected in Second Life's maps.

PR: Well, first of all, we're in a very early stage, so it's only been a few years since this started.

So part of what we are seeing is the same evolution of human behavior that we see in emerging societies.

So a valid criticism of Second Life today is that it resembles the Old West more than it resembles Rome from a cultural standpoint.

That said, the evolution of culture and the nuanced interactions that create culture are happening ten times faster than in the real world, and it's like walking into a bar in Second Life where 65 percent of the people aren't Americans, and in fact speak a variety of different languages.

In fact, one of the ways Second Life makes money is by creating really cool translation tools. When you drag it onto your body, it basically pops up on your screen and allows you to translate (sorry) typed text spoken to you on the fly using Google, Babel Fish, or any other online text translation tool.

So I think the multicultural nature and kind of cultural melting pot that's happening within Second Life is quite remarkable compared to what we've been able to achieve so far in the real world.

So I think the culture will be tweaked and emerge, but of course we still have to wait a few years for that to happen.

JH: Any more questions?

(Audience: What's your demographic?) JH: What's your demographic?

PR: So the question is, what is the demographic going on?

So while the average age of people in Second Life is 32, Second Life usage increases dramatically as their physical age increases. So as we move from 30 to 60, there are a lot of people in their 60s using Second Life as well. This is also not a sharp curve. Very distributed. In real life, from 30 to 60 years old, your weekly usage increases by 40 percent. That is, it does not actually increase. Many people mistake Second Life for some kind of online game. In fact, it's generally unappealing -- I'm just speaking broadly critical -- not very appealing to people who play online video games. Because the graphics are still not on par -- I mean, these are very nice pictures, but the graphics in general aren't quite on par with the tweaked graphics you see in Grand Theft Auto 4.

The average age is 32 years old. 65% of users said they were outside the US.

The distribution between countries is very wide.

Second Life has users in virtually every country in the world.

The main ones are: Together, the UK and Europe account for about 55 percent of Second Life's usage base.

From a psychological point of view, men and women. About 45 percent of the users online in Second Life today are women, because Second Life matches men and women almost equally.

However, women spend about 30-40 percent more hours in Second Life than men. This means that more men register than women, and women stay and use more than men.

This is also a demographic fact.

Psychologically speaking, people in Second Life are markedly different than you think when you actually go in and talk to them and meet them. I would suggest that you do this and find out.

But it's not a bunch of programmers.

It's not easy to explain as a demographic.

If you had to paint the big picture, remember those eBay enthusiasts in the first few years of eBay?

Maybe a little like that. In other words, early adopters.

They tend to be creative. They tend to have an entrepreneurial spirit.

Many of them (about 55,000 so far) are cash flow positive. They make money from what they do in Second Life, which is real world money. So this is a very constructive, still creative, building stuff, building your own business type of aspiration. So that's it.

JH: Philippe, you describe yourself as being really creative when you were young and you loved making things.

I mean, it's not often you hear someone describe themselves as really creative.

Perhaps this is a euphemism for a C-student who spent most of his time in his room? Could you?

(laughs) PR: There was a time when I was a C student. It is interesting.

When I entered college, I studied physics in college and found something really strange. Because I was definitely an antisocial kid. I read all the time.

I was shy. It doesn't seem like it now, but at the time it was very embarrassing.

I have moved many times. I had that experience too.

So I kind of lived in my own world. And obviously it helps to develop a real interest in something.

JH: So you're going through your fifth life at this point?

PR: If you count, yes, cities. So, but I did and I didn't. I guess I didn't do as well as I could in school. i think you are right

I was never an obsessed person. Please understand a man like A.

I was going to say that when I went to college, I had a great social experience that I hadn't had before, a more fraternal experience, where I met 6 or 7 other people I studied physics with, and I was very competitive with them, so I started getting A grades. But you're right. I was not a student of A.

JH: Last question. here.

(Audience: The pamphlet says -- ) JH: You want to rephrase that?

PR: Yes, say it again.

So the pamphlet says that we may come to prefer our digital selves to our physical selves, that we may prefer adaptable and manageable digital identities to our physical identities, and in fact much of human life and human experience may shift to the digital realm.

Of course, it's kind of a scary thought.

It is a terrible change, a terrible destruction.

what do i think about that? I think you are asking. What should I do -- JH: What do you say to people who say it's terrible?

(Audience: I'm curious, how would you respond if someone told you that?) PR: Well, I have a few things to say.

One is that it causes anxiety, just like the internet and electricity did.

So it's a big change, but it's not inevitable.

Therefore, no amount of setbacks, intentional or political actions will prevent these technological changes from bringing us together. Because people's basic motivations to be creative and entrepreneurial inject energy into these virtual worlds, just as they do with the web.

So I believe this change is a big disruptive change.

Clearly, I am an optimist and a strong believer in what is happening here, but even the most sober and detached thinker on this issue must, from the sidelines, conclude, based on the data, that these kinds of economic forces at work will undoubtedly bring about major changes that will be very disruptive to our lives, to our very existence, and to our notions of identity.

I don't think we can escape that change.

In general, I think we were talking about this. In general, I think that to exist in a virtual world, to be challenged by it, to survive in it, to live a good life in it, is a challenge, so to speak, because of its multiculturalism, its language, its richness of entrepreneurship, its kind of flea market nature of today's virtual world.

It poses challenges for us to overcome. We must be better than ourselves in many ways.

we have to learn things. And you know, we need to be more tolerant, smarter, learn faster, and be more creative. Probably more than we do in real life.

And if that's the case with the virtual world, I think these changes, though scary but inevitable, are ultimately for the better, and so we should get over them.

But I want to say yes. And many other authors and speakers on the subject, you know, say, fasten your seatbelts because change is coming. Big changes will happen.

JH: Thank you, Philip Rosedale.

(applause)

The sight of nurses measuring our height, weight, blood pressure and attaching glowing plastic clips to our fingers is becoming more and more common in hospitals around the world.

Suddenly, a digital screen reads out the oxygen levels in your bloodstream.

How did this happen?

Without a blood sample, how could a plastic clip know anything about our blood?

Here are some tips. Our bodies are translucent. This means that it does not completely block or reflect light.

Rather, it allows some light to actually pass through skin, muscles, and blood vessels.

can't believe it?

Place the flashlight on your thumb.

It turns out that light helps us look inside our bodies.

Consider a medical finger clip called a pulse oximeter.

When you breathe in, your lungs transfer oxygen to hemoglobin molecules, and a pulse oximeter measures the ratio of oxygenated hemoglobin to oxygen-free hemoglobin.

This is done by using a small red LED light on one side of the finger clip and a small photodetector on the other.

When an LED illuminates a finger, oxygen-free hemoglobin in blood vessels absorbs red light more strongly than oxygenated hemoglobin.

Therefore, the amount of light that reaches the opposite side is determined by the concentration ratio of the two types of hemoglobin.

However, the two patients' fingers have different sized blood vessels.

For one patient, a saturation reading of 95% represents a healthy oxygen level, but for another patient with smaller arteries, the same reading can dangerously misrepresent the actual oxygen level.

This can be accommodated by using a second infrared wavelength LED.

Light has a vast spectrum of wavelengths, with infrared just outside the range of visible colors.

All molecules, including hemoglobin, absorb light with different efficiencies across this spectrum.

Thus, contrasting red and infrared absorbance provides a chemical fingerprint to rule out the effect of vessel size.

The emerging medical sensor industry is now exploring a whole new level of precision chemical fingerprinting using optically manipulated devices as small as tenths of a millimeter or less.

Called integrated photonics, this microscopic technology is made from silicon wires that guide light like water in a pipe, and can be redirected, reshaped and even temporarily trapped.

The ring resonator device is a silicon circular wire, a light trap that enhances chemical fingerprinting.

When placed near a silicon wire, the ring will only suck up and temporarily store a specific wave of light, that is, a periodic wavelength that matches an integer number of times along the circumference of the ring.

This is the same effect as when you pluck a string on a guitar.

Only certain vibration patterns dominate strings of certain lengths, giving the fundamental tone and its overtones.

Ring resonators were originally designed to efficiently route different wavelengths of light, each a channel of digital data, within fiber optic communication networks.

But one day this kind of data traffic routing might apply to tiny chemical fingerprint labs on penny-sized chips.

These future lab-on-a-chips may enable easy, rapid and non-invasive detection of various diseases by analyzing human saliva and sweat in the clinic or at home.

Human saliva, in particular, reflects the protein and hormone composition of our body and can provide early warning signals for certain cancers, infectious diseases and autoimmune diseases.

To pinpoint disease, lab-on-a-chip may rely on several methods, including chemical fingerprinting, to sift through large mixtures of trace substances in saliva samples.

Different biomolecules in saliva absorb the same wavelengths of light, but each has a different chemical fingerprint.

In the lab-on-a-chip, after the light passes through the saliva sample, numerous fine-tuned rings each suck up slightly different wavelengths of light and transmit it to a partner photodetector.

Combine this detector bank to resolve the cumulative chemical fingerprint of the sample.

From this information, a small on-chip computer containing a library of chemical fingerprints of different molecules could determine their relative concentrations and potentially aid in the diagnosis of certain diseases.

From globe-trotting communications to lab-on-a-chip, humans have repurposed light for both transmission and extraction of information.

Its ability to glow continues to surprise us with new discoveries.

People love their cars.

They are a form of entertainment, a form of art, and a pride of ownership.

The song is written about cars.

Prince wrote a great song called "Little Red Corvette".

He didn't write "Little Red Laptop Computer" or "Little Red Dirt Devil".

He wrote about cars.

One of my favorites has always been "Fall in love with your man in a Chevrolet van." Because that was my car when I was in college.

In fact, doing market research around the world, I find that people have an almost universal desire to own a car. Today, 750 million people worldwide own a car.

And you say, it's a lot.

But do you know?

We really have to ask: can the world sustain that number of cars?

And if we look at projections over the next 10, 15, 20 years, the global parking lot could grow to around 1.1 billion vehicles.

If you put them side by side and wrap them around the earth, you would go around the earth 125 times.

In the last 100 years, automobile technology has advanced significantly.

Cars are dramatically cleaner, safer, more efficient and significantly cheaper than they were 100 years ago.

But the fact remains that the basic DNA of the car has changed very little.

Given what we know about product-related issues and technology that exists today, what would we do if we were to reinvent the car today instead of 100 years ago?

I wanted something really affordable.

The fuel cell looked great. It has one-tenth the number of moving parts as an internal combustion engine, and the fuel cell propulsion system emits only water.

And we wanted to make use of Moore's Law in our electronic controls and software, so we wanted our cars to be absolutely connected.

So we set out to reinvent it around electrochemical engines, fuel cells and hydrogen as an energy carrier.

The first was autonomy.

Autonomy has really set the vision for the direction we want to go.

We have embodied all the major components of the fuel cell propulsion system.

We then enabled Autonomy to run on Hy-Wire, and we showed off Hy-Wire at this conference last year.

Hy-Wire was the world's first drivable fuel cell and is now following it up with Sequel.

And the Sequel is just a real car.

So if you can run the video -- (futuristic music) [reinventing the car] (video) I'm really happy to introduce Sequel.

[accelerate] [cruise] [steer] [brake] But the real big question is probably on your mind. Where does hydrogen come from?

And secondly, when will this kind of car go on sale?

So let's talk about hydrogen first.

The advantage of hydrogen is that it comes from so many different sources. It can be obtained from fossil fuels or from any method of generating electricity, including renewable energy.

And it can come from biofuels.

It's very exciting.

The vision here is for each local community to harness its natural power in producing hydrogen.

Currently, large amounts of hydrogen are being produced around the world.

It's made to remove sulfur from gasoline, which I find a bit ironic.

It is produced in the fertilizer industry. Manufactured in the chemical manufacturing industry.

Hydrogen is produced because there are good business reasons for its use.

But it shows that we know how to make it, how to make it cost-effectively, and how to handle it safely.

We did an analysis where each of the 100 largest cities in the US had a station, and placed the stations so that they were within 2 miles of each station at any given time.

We installed one for every 25 miles of highway, and found that it was equivalent to about 12,000 stations.

At $1 million each, that's about $12 billion.

That's a lot of money.

But if we were to build the Alaskan pipeline now, it would be half what the Alaskan pipeline would cost.

But the really exciting vision we're seeing in action is refueling at home, just like charging your laptop or charging your cell phone.

Therefore, we are very excited about the future of hydrogen.

We think it's a question of when, not if it will happen.

What we have been aiming for, and where we are making great strides towards this goal, is to have a hydrogen and fuel cell based propulsion system that is designed and validated to compete with internal combustion engines.

We are talking about doing away with the internal combustion engine and doing so in terms of affordability in large quantities, its performance and durability.

That's what we're aiming for in 2010.

In our development work, we have not yet found anything that makes it impossible.

We actually think the future will be event-driven.

We can't predict the future, so we want to spend a lot of time creating it.

I am very intrigued by the fact that our cars and trucks sit idle 90 percent of the time and are parked around us.

They are usually parked within 100 feet of their owners.

Now, if you compare your car's power generation capacity to the US grid, you'll find that 4 percent of your car's power equals the US grid's power.

It is a huge power generation capacity, a mobile power generation capacity.

And hydrogen and fuel cells give us the opportunity to actually use parked cars and trucks to generate power for the grid.

Earlier, we talked about swarm networks.

Let's talk about the ultimate flock. When all processors and all cars are idle, they become part of the global grid for computing capabilities.

We find the premise very interesting.

Thus, the automobile becomes less of a commodity and more of an appliance, a mobile power, a mobile platform, and a means of transportation for information, computing, and communication.

And the key to all of this is making it affordable, making it exciting, and introducing it into a path where there are ways to make money.

And again, this is a pretty massive march.

Many people say this. "How can you sleep at night when you're wrestling with a problem that big?"

I tell them I sleep like a baby and wake up crying every two hours.

(Laughter) In fact, I think the theme of this conference captures one of the big keys to getting that done. It's about relationships and cooperation.

thank you very much.

(Applause) Chris Anderson: Larry, Larry -- wait, wait, wait. Larry, wait a minute.

I have a lot of questions.

I just want to ask you one thing.

I could be wrong about this, but my feeling is that the public perception today is that GM doesn't take these environmental considerations as seriously as its Japanese competitors or Ford.

When consumers want it, when regulators force it on us, are we serious about it, not just going there?

Do you really want to show leadership on this matter?

Larry Burns: That's right. we are totally serious.

We've already put in over $1 billion, so I hope people think we're serious when we're spending this much.

And second, this is a basic business proposition.

I'll be honest. We are looking for and interested in business growth opportunities.

If we don't fix the problem, the auto industry's growth will be plateaued by sustainability issues.

And there are simple principles of strategy. It's "Do yourself before others do anything to you."

If we can see this possible future, so can others.

And we want to create it first, Chris.

thank you very much.

Well, I would like to start with the testicles.

(Laughter) Men who get five hours of sleep each night have significantly smaller testicles than those who sleep more than seven hours.

(Laughter) Plus, men who routinely sleep four to five hours a night have the same testosterone levels as men 10 years older.

In other words, lack of sleep can make you look 10 years older in important aspects of your health.

And it turns out that sleep deprivation has similar consequences for women's reproductive health.

This is the best news for you today.

(Laughter) From this point on, things can get even worse.

Not only can sleep do amazing things for you, but you'll also learn how not getting enough sleep can do amazingly bad things for both your brain and your body.

Let's start with the functions of the brain and learning and memory. What we've discovered over the last decade or so is that sleep is necessary after you've basically learned to hit the save button so that you don't forget new memories.

But recently, we've discovered that sleep is necessary even before we learn to really prime our brains. It's almost like a dry sponge ready to absorb new information for the first time.

And without sleep, the brain's memory circuits are kind of flooded and unable to absorb new memories.

Let me show you the data.

In this study, we decided to test the hypothesis that an all-nighter is a good idea.

So we took a group of individuals and assigned them to one of two experimental groups, the sleep group and the sleep deprivation group.

Now, the sleep group will get a full eight hours of sleep, while the deprivation group will keep them awake under full supervision in the lab.

By the way, no naps or caffeine, which is disastrous for everyone involved.

And the next day, we'll put the participants inside an MRI scanner and have them study a whole list of new facts while taking snapshots of their brain activity.

And I'm going to test how effective that learning is.

That's what you see here on the vertical axis.

And a direct comparison of these two groups shows that the brain's ability to create new memories is 40% less in the absence of sleep.

Considering what is happening to the sleeping population among our educated population right now, I think this is alarming.

In fact, to put this into context, the difference between a child passing an exam or failing miserably is 40%.

And we've figured out what's going wrong in the brain that causes this kind of learning disability.

On the left and right sides of the brain is a structure called the hippocampus.

And the hippocampus can be thought of as the brain's information inbox.

It is very good at receiving and holding new memory files.

And looking at this structure of people who slept through the night, we saw a lot of healthy learning-related activity.

However, in sleep-deprived people, no significant signals were actually found.

So it's as if sleep deprivation shuts down your inbox in memory and bounces all your newly received files.

I was unable to effectively anchor new experiences in my memory.

Here's the bad things that can happen if I deprive you of sleep, but let's go back to that control group for a moment.

Remember those people who got a good eight hours of sleep?

Well, we can ask a completely different question. What is the physiological quality of sleep that restores and enhances daily memory and learning ability?

And by placing electrodes across the head, what we have discovered is that there are large, intense brain waves that occur in the deepest stages of sleep, overlaid by these amazing bursts of electrical activity called sleep spindles.

And these brainwave properties of deep sleep combine to act like a file transfer mechanism during the night, moving memories from short-term, vulnerable reservoirs to more permanent long-term storage in the brain, thereby protecting and securing them.

And with real-world medical and social implications, it's important to understand how these memory benefits actually work during sleep.

And I would like to talk about one of the areas where we have clinically expanded this research. It is the context of aging and dementia.

Because, of course, it's a well-known fact that as we age, our learning and memory abilities begin to wane and decline.

However, what we have found is that a physiological sign of aging is a deterioration in the quality of sleep, especially the deep sleep I mentioned earlier.

And last year, we finally published evidence that these two things aren't just happening at the same time, they're deeply interrelated.

And it suggests that deep sleep disruption is an underestimated factor contributing to age-related cognitive decline and memory decline, and was recently found to be the same in Alzheimer's disease.

Okay, I know this is very depressing news.

I have it in the mail. it's coming towards you

But there is a potential silver lining here.

Unlike many other factors known to be associated with aging, such as changes in the physical structure of the brain, aging is horribly difficult to treat.

But that sleep is the missing piece in the puzzle that explains aging, and it's interesting because maybe something can be done about Alzheimer's disease.

By the way, one way to approach this at my sleep center is not to use sleeping pills.

Unfortunately, they are not natural sleep-producing blunt instruments.

Instead, I'm actually developing a method based on this.

It is called direct current brain stimulation.

Applying a small amount of voltage to the brain has a measurable effect, though usually too small to be felt.

Now, when this stimulus is given during sleep in young, healthy adults, it not only amplifies the size of the deep sleep brainwaves, as if they were singing along to the deep sleep brainwaves, but in so doing it can almost double the amount of memory effect they derive from sleep.

The question now is whether this same potentially affordable and portable technology can be applied to the elderly and those with dementia.

Is it possible to restore healthy, high-quality, deep sleep? Could that help restore aspects of children's learning and memory functions?

That is my true hope now.

It's one of our monthly goals, so to speak.

This is an example of sleep for the brain, but sleep is essential for the body as well.

We already talked about sleep deprivation and the reproductive system.

Or you can tell them that one hour is enough for sleep deprivation and cardiovascular health.

Because there's a global experiment that takes place twice a year, involving 1.6 billion people in 70 countries, and it's called Daylight Savings Time.

Now, one hour less sleep in the spring is associated with a 24% increase in heart attacks the next day.

One hour of sleep in the fall reduces heart attacks by 21 percent.

Isn't that incredible?

And we see exactly the same profile for car crashes, car crashes, and even suicide rates.

But to dig deeper, I want to focus on sleep deprivation and the immune system.

Here is an image showing this beautiful blue element.

These are called natural killer cells, and natural killer cells can be thought of as the immune system's intelligence agents.

They are very good at identifying dangerous and unwanted elements and eliminating them.

In fact, what they're doing here is destroying a mass of cancerous tumors.

So what you want is always a fearless set of these immune assassins, but sadly, without enough sleep, that's what you don't have.

This experiment will look at what percentage of immune cell activity is reduced by simply restricting sleep to four hours throughout the night instead of being sleep deprived all night.

And it's not small, it's not 10 percent or 20 percent.

Natural killer cell activity decreased by 70 percent.

This is an alarming condition of immune deficiency, and perhaps explains why important links have been found between sleep deprivation and the risk of developing various types of cancer.

That list now includes bowel cancer, prostate cancer, and breast cancer.

In fact, the link between sleep deprivation and cancer is now so strong that the World Health Organization has classified any form of night shift as a possible carcinogen because it disrupts sleep-wake rhythms.

So you may have heard the old adage that when you die you sleep.

Well, I'm talking pretty seriously now, but this is deadly stupid advice.

We know this from epidemiological studies involving millions of individuals.

There is a simple truth; Shorter sleep means shorter lifespan.

Short sleep duration predicts death from all causes.

And if an increased risk of developing cancer or Alzheimer's isn't alarming enough, we found that sleep deprivation erodes the fabric of life itself, even the DNA genetic code.

This study therefore measured changes in gene activity profiles in a group of healthy adults who were restricted to six hours of sleep per night for a week, compared to the same individuals who slept a full eight hours per night.

And we made two important discoveries.

First, sleep deprivation distorted the activity of a significant amount of 711 genes.

The second result was that the activity of about half of those genes actually increased.

The other half decreased.

The genes that were switched off by sleep deprivation were those related to the immune system, so once again we can see immunodeficiency.

In contrast, the genes that were actually upregulated or increased by sleep deprivation were genes associated with tumor promotion, genes associated with long-term chronic inflammation in the body, stress and consequent cardiovascular disease.

There is no health condition that will allow you to retreat unscathed at the sign of sleep deprivation.

It's like a broken water pipe in your house.

Lack of sleep permeates every corner of our physiology, altering even the very DNA nuclear alphabet that describes our daily health.

And at this point, you might be thinking, "Oh my god, how can I get better sleep?"

What is the secret to a good night's sleep? ”

Well, in addition to avoiding the detrimental effects of alcohol and caffeine on your sleep, if you're trying to avoid napping during the day and struggling to sleep at night, I have two pieces of advice for you.

The first is regularity.

Go to bed at the same time and wake up at the same time on weekdays and weekends.

A regular life will stabilize sleep and improve the quantity and quality of sleep.

The second is to keep cool.

To initiate and then maintain sleep, your body's core temperature must drop 2-3 degrees Fahrenheit. This is why it is easier to fall asleep in a room that is too cold than in a room that is too hot.

So aim for a bedroom temperature of around 65 degrees, or around 18 degrees Celsius.

That will be the optimal state for most people's sleep.

And finally, taking a step back, what's the mission-critical statement here?

Well, I think it's probably this one. Unfortunately, sleep is not a lifestyle luxury.

Sleep is biologically essential.

It is a life support system, Mother Nature's best effort to achieve immortality.

And the decline in sleep across the developed world is having a devastating impact on our health and wellbeing, as well as the safety and education of our children.

It's the silent sleep deprivation epidemic that is fast becoming one of the greatest public health challenges we face in the 21st century.

We believe it's time to reclaim the right to sleep through the night without bearing the unfortunate stigma of shame and laziness.

In doing so, we can reunite with the most powerful elixir of life, the Swiss Army knife of health, so to speak.

And when that soapbox rant is over, I'm just going to say, "Good night, good luck, and most of all..."

I hope you can sleep well.

thank you very much.

(Applause.) Thank you.

(Applause.) Thank you very much.

David Viello: No, no, no. Please stay there for a moment.

But I'm glad I didn't run away. I am grateful.

That was scary.

Matt Walker: You're welcome. DB: Yes, thank you, thank you.

I can't keep up with sleep, what should I do?

What are we doing when we toss and turn in bed late at night or work shifts?

MW: You're right, sleep can't keep up.

Sleep is different from banking.

You cannot pile up debt and expect to pay it off later.

I would also like to mention why it is so devastating and why our health deteriorates so quickly. First, humans are the only species that deliberately deprives us of sleep for no apparent reason.

DB: Because we are smart.

MW: And I point that out because, throughout evolution, Mother Nature never had to face this problem called sleep deprivation.

I mean, she never developed a safety net and that's why things fall apart so quickly, both in your brain and your body, when you're sleep deprived.

So you just need to prioritize.

DB: Okay, but what about tossing and turning in bed?

MW: So if you stay up in bed for too long, you should get out of bed, go to another room and do something different.

The reason is that the brain quickly associates the bedroom with the place of waking, and that association needs to be broken.

Therefore, go back to bed only when you feel sleepy. Then you relearn old associations that your bed is a place to sleep.

So, as an analogy, you never sit at the dinner table and wait to get hungry, so why lay in bed and wait to get sleepy?

DB: Well, thank you for the wake-up call.

Great job, Matt.

MW: You're welcome. thank you very much.

In 1962, Buckminster Fuller published a particularly bold proposal for a geoscope.

It was a 200-foot-diameter geodesic sphere suspended over the East River in New York City in full view of the United Nations.

It was certainly a big idea, one that he felt could really inform and deeply influence decision-making in this sphere through the animation of global data, trends and other information about the planet.

And 45 years later, it's clear we need this kind of clarity and perspective, but what we have is improved technology.

Today, it doesn't take a million light bulbs to create a spherical display.

You can use LEDs.

LEDs are smaller, cheaper, longer lasting and more efficient.

Most important in this regard is speed.

And this speed, combined with today's high-performance microcontrollers, allows this piece to actually simulate over 17,000 LEDs using just 64.

And how this happens is due to the phenomenon of persistence of vision.

However, this ring rotates at about 1,700 rpm, which means it rotates 28 times per second.

Actual speed at the equator is about 90 miles per hour.

There are four onboard microcontrollers, and each time this ring rotates, it receives a position signal as it passes behind the display.

And from there, an onboard microcontroller can estimate the ring's position at every point around rotation and display arbitrary bitmap images and animations.

But this is really just the beginning.

In addition to a high-resolution version of this display, my father and I are working on a new patent-pending design for a full-volumetric display that exploits the same phenomenon.

This is achieved by rotating the LED around two axes.

As you can see here, this is an 11 inch diameter circuit board.

These blocks represent LEDs.

We can see that when this disc rotates around this axis, it creates a disc of light that we can control.

It's nothing new. It's a propeller clock. That's the rim you can buy for your car.

But what's new is that when you rotate this disc around this axis, this disc of light actually becomes a ball of light.

And you can control it with a microcontroller to create a full volume 3D display with just 256 LEDs.

This work is currently a work in progress -- scheduled for release in May -- but what we've done is put together a small demo just to demonstrate the geometric transformation of a point to a sphere.

I'll show you a little video, but please note that this has no electronic controls and only 4 LEDs.

This is actually only about 1.5 percent of the final exhibition scheduled for May.

So look.

Here you can see that it only rotates around the vertical axis, creating a circle.

And when the other axis starts to move, they actually blur into volume.

In this case, the effect is actually slightly reduced due to the camera shutter speed.

This work is scheduled to be released in May.

It will be on display at the Interactive Telecommunications Spring Show in Greenwich Village, New York City. It is open to the public, so please come and visit us. Great show.

There are hundreds of student innovators with great projects.

The piece will actually be on display at the Sierra Simulcast Lounge from now until the end of the show.

So I would like to talk to you. Please feel free to come by and take a closer look.

I am honored to be here. Thank you very much.

(applause)

In 1995, the British Journal of Medicine published a startling report on a 29-year-old builder.

He accidentally jumped on a 15cm nail, which went straight through his steel toe boot.

He was in excruciating pain that made even the slightest movement unbearable.

But when the doctors took off his boots, they were confronted with an astonishing sight. The nail hadn't touched his leg at all.

For hundreds of years, scientists thought pain was a direct response to injury.

By that logic, the more severe the injury, the more pain it should cause.

However, as I learned more about the science of pain, I realized that pain and tissue damage are not necessarily linked, even when the body's threat signaling mechanisms are fully operational.

We can experience intense pain that is disproportionate to the actual injury. Furthermore, pain can be experienced even in the absence of injury, like builders, or the well-documented cases of male partners of pregnant women experiencing pain during pregnancy or childbirth.

what's going on

There are actually two phenomena involved: the experience of pain and a biological process called nociception.

Nociception is part of the nervous system's protective response to harmful or potentially harmful stimuli.

Sensors in specialized nerve endings detect mechanical, thermal and chemical threats.

When enough sensors are activated, electrical signals travel down the nerves to the spine and then to the brain.

The brain weighs the importance of these signals and causes pain when it determines that the body needs protection.

Pain usually helps the body avoid further injury or damage.

However, there are a range of factors besides nociception that influence the pain experience and can make pain less useful.

First, there are biological factors that amplify nociceptive signals to the brain.

When nerve fibers are repeatedly activated, the brain may decide that they need to be made more sensitive in order to adequately protect the body from threats.

Adding more stress sensors to a nerve fiber makes it so sensitive that even the mere touch of light on the skin will give off a strong electrical signal.

In other cases, nerves adapt to transmit signals more efficiently, amplifying the message.

These amplified forms are most common in people experiencing chronic pain, defined as pain that lasts longer than 3 months.

When the nervous system is continuously put on high alert, pain can outlast physical injury.

This creates a vicious cycle: the longer the pain lasts, the more difficult it is to recover.

Psychological factors are apparently also involved in pain, either by influencing nociception or directly affecting the brain.

A person's emotional state, memories, beliefs about pain, and expectations for treatment can all affect the amount of pain they experience.

In one study, children who reported believing they had no control over their pain actually experienced more pain than those who believed they had some control.

Environmental characteristics are also important. In one experiment, volunteers who placed a cold stick on the back of their hand reported feeling more pain when exposed to a red light than a blue light, even though the stick was the same temperature each time.

Finally, social factors such as the presence or absence of family support may also influence pain perception.

All of this means that a multidisciplinary approach to pain treatment that includes pain specialists, physical therapists, clinical psychologists, nurses, and other health care professionals is often the most effective.

Although the mechanisms behind the experience of pain are only beginning to be understood, there are several promising research areas.

Until recently, glial cells surrounding neurons were thought to be merely supporting structures, but we now know that glial cells play a major role in influencing nociception.

Studies show that disabling certain brain circuits in the amygdala can make rat pain disappear.

And genetic testing of people with rare, pain-insensitive diseases could identify several other potential drug targets, ultimately enabling gene therapy.

Hello.

I am not a real person.

In fact, I am a copy of a real person.

But I feel like a real human being.

It's kind of hard to explain.

Hold on -- I think I've seen a real human... there's one.

Take him on stage.

Hello.

(Applause) What you see there is a digital human.

I wear an inertial motion capture suit and know what my body is doing.

There's a camera here that feeds machine learning software that monitors my face and takes my facial expressions like "hmm, hm, hm" and forwards them to the guy.

We call him "Dejidag".

He's actually a 3D character that I'm controlling live in real time.

So, I'm working on visual effects.

And one of the hardest things about visual effects is creating a believable digital human that the audience will accept as real.

People are really good at recognizing others.

Go figure!

That's okay, we like challenges.

Over the past 15 years, we have filmed people and creatures that people accept as real.

If they are happy, you should be happy too.

And if they are in pain, you need to empathize with them.

We are also making good progress.

But it's really, really hard.

Effects like this take thousands of hours and hundreds of truly talented artists.

But things have changed.

Over the past five years, computers and graphics cards have gotten significantly faster.

Then came machine learning, deep learning.

So we asked ourselves. Do you think you can create a photorealistic human that shows the real emotions and details of the person controlling the digital human in real time, like they do in the movies?

In fact, that's our goal. If you were having a one-on-one conversation with DigiDoug, would it be real enough to tell if I was lying to you?

that was our goal.

About a year and a half ago we set out to achieve this goal.

What I'm about to do is basically take you on a little journey to see exactly what we had to do to get here.

A huge amount of data had to be collected.

In fact, by the time this work was finished, we had probably one of the largest face data sets on the planet.

of my face.

(laughter) Why me?

Well, I would do anything for science.

I mean, look at me!

I mean, come on.

First I had to figure out what my face actually looked like.

It's not just a photo or a 3D scan, it's what any photo actually looks like, how light interacts with my skin, and more.

Luckily for us, about three blocks away from our studio in Los Angeles, there's a place called ICT.

Laboratory affiliated with the University of Southern California.

There is a device called a "light stage".

It has a myriad of individually controllable lights and a multitude of cameras.

This allows me to reconstruct my face under a myriad of lighting conditions.

It even captures changes in the face due to blood flow and facial expressions.

This allowed me to build a model of my face. Frankly, this is really great.

Unfortunately, it contains a disappointing level of detail.

(laughs) I can see all my pores and wrinkles.

But we had to have it.

Reality is all about details.

Without it you would miss it.

But it's still far from the end.

This allows me to build a model of a face that looks like me.

But like me it didn't move much.

That's where machine learning comes in.

And machine learning requires a lot of data.

So I sat in front of a high definition motion capture device.

We also performed traditional motion capture with markers.

We created a bunch of images of my face and a moving point cloud representing the shape of my face.

Oh, I made a lot of facial expressions and said different lines in different emotional states...

This required a lot of captures.

Once we had this massive amount of data, we built and trained a deep neural network.

Once that's done, within 16 milliseconds, the neural network will be able to see my image and know everything about my face.

It can calculate my facial expressions, wrinkles, blood flow, and even the movement of my eyelashes.

This will be rendered and displayed with all the details previously captured.

We are still far from the end.

This is a work in progress.

Actually, this is the first time to show off outside the company.

And you know, it doesn't look as convincing as we'd like it to. There's a wire coming out of my back and there's a 1/6th of a second delay between capturing video and displaying it.

Sixths of a Second -- Wow!

But that's why you still hear a little echo etc.

And you know, this machine learning is all new to us, and it can be hard to convince them to do the right thing.

Slightly sideways.

(Laughter.) But why did you do this?

Actually, there are two reasons.

First of all, it's just insanely cool.

(laughs) How cool is that?

Well, at the push of a button, we can bring you this story as a completely different character.

It's Elvar.

We put him together to test how this works with different looks.

And the great thing about this technology is that even if I change my character, the performance is still me.

I often speak from the right side of my mouth. So does Elver.

(Laughter) Well, the second reason we did this is, you guessed it, this would be great for a movie.

It's a brand new and exciting tool for artists, directors and storytellers.

It's obvious, right?

I mean, this is going to be really nice.

But also, now that we've built it, it's clear that this is much more than a movie.

wait a minute.

Didn't you just change your identity with the push of a button?

Isn't this like a "deepfake" or face swap you've all heard of?

Well, I guess so.

In fact, it uses some of the same technology that deepfakes use.

Deepfakes are 2D and image-based, while ours is full 3D and much more powerful.

But they are very related.

And now I hear you thinking, "Damn!"

I thought I could at least trust the video and believe it.

If it was live video, shouldn't it be true? ”

Well, you know that's actually not the case, right?

Even without this, there are simple tricks you can do with your video, such as how to frame a shot that can really misrepresent what is actually happening.

I've been in the visual effects business for a long time and have long known that with enough effort, you can fool anyone with anything.

What this stuff and deepfakes are doing is making manipulating video easier and more accessible in the same way Photoshop manipulated images not so long ago.

I like to think about how this technology can bring humanity to other technologies and bring us all closer together.

Now that you've seen this, let's think about the possibilities.

Suddenly, you will see it at live events and concerts like this.

Digital celebrities will come to life in real-time, just like movies, especially with new projection technology.

And new forms of communication will emerge.

You can already interact with DigiDoug in VR.

And it's a sight to behold.

It's like you and I are in the same room, even if we're miles apart.

You'll be able to choose which version of yourself you want others to see the next time you make a video call.

It looks like really, really good makeup.

I was diagnosed with it about a year and a half ago.

I'm old

DigiDoug is not.

With video calling, you don't have to get old.

And as you can imagine, this is used to give the virtual assistant a body and a face.

Human nature.

I really liked the fact that when I spoke to my virtual assistant, it responded in a soothing, human-like voice.

Now they have faces.

And you get all the non-verbal cues that make communication so much easier.

It's going to be really nice.

You can know when your virtual assistant is busy, confused, or worried about something.

Well, I can't leave the stage without seeing my real face, so please compare.

Let's take off the helmet here.

Yes, don't worry, it's much worse than it looks.

(Laughter.) This is where we are.

I'm putting this back here.

(laughs) Doink!

This is where we are.

We are about to be able to interact with amazingly realistic digital humans, whether controlled by humans or by machines.

And like all new technology these days, it comes with some serious and real concerns that we have to deal with.

But I'm really excited to see what I've only seen in science fiction all my life.

Communicating with a computer becomes like talking to a friend.

Talking to a faraway friend is like sitting in the same room together.

thank you very much.

(applause)

On a cold January day in 2005, I went on the most important drive of my life.

I was walking down this road in upstate New York trying to find this old factory.

The day before, I received a flyer in the mail that read, "Fully equipped yogurt factory for sale."

I threw it in the trash.

And 20 minutes later I picked up the phone and called the number.

The factory will be closed after its 85th anniversary.

So I decided to go see it.

At this point, I had no idea where this road or my life was headed.

I owned a small cheese shop and hated business.

But the hills and roads and smells are all nostalgic.

I grew up in a similar environment near the Kurdish Mountains in Turkey.

My family made cheese and yogurt. I grew up hearing stories about shepherds.

We didn't have many things, but we did have the moon and the stars and simple food from each other.

I have finally come to America.

I didn't even know New York had a farm.

I made it all the way upstate, but I never left.

Now I'm at a loss.

I passed a road sign that said "dead end".

And soon it was a factory.

The smell hit me first.

It was like a container of milk left in the sun.

The walls were very thick with peeling paint and cracks everywhere.

The factory is so old that the owner considered it unworthy.

I expected to leave zero, but I couldn't believe the price.

Once inside, nothing bothered me.

All I could see were people.

There were 55 of them.

just be quiet.

Their only job was to dismantle the factory and shut it down permanently.

I met a guy named Rich, the production manager.

He offered to take me and show me around.

He didn't say much, but he told me a few stories all the way through.

Rich worked there for 20 years.

His father made yogurt before him and his grandfather made cream cheese before him.

It turns out that Rich feels guilty that this factory will be closed under his supervision.

What shocked me most at that time was that this was not just an old factory.

This was a time machine.

This is where people built their lives, went off to war, and boasted home runs and report cards.

But now it was on the verge of closing.

And the company didn't just abandon yogurt, it abandoned yogurt.

As if they weren't enough.

And I was shocked at how these people were behaving.

There was no anger or tears.

Just be silent.

Gracefully they decided to close this factory.

I was so upset that the CEO closed the factory while looking at a spreadsheet somewhere in a distant tower.

Spreadsheets are lazy.

They don't tell you about people, they don't tell you about communities.

Unfortunately, too many business decisions are made this way today.

After seeing what I saw, I was never the same person.

On my way home, I called my lawyer, Mario.

I called Mario and said, "Mario, I want to buy this place."

"Hamdi, one of the world's largest food companies, will close here and exit the yogurt business," Mario said.

Who are you to make it work? ”

I said, "Exactly."

But the next day I called him again and said, "Mario, I really want to buy this place."

He said, 'Hamdi, you have no money.

(Laughs) Even after half a year, I haven't even paid my salary. ”

(Laughter) It was true.

(Laughter.) But I was in debt, I was in debt again.

By August 2005, I had the keys to this factory.

The first thing I did was hire 4 of the original 55 people.

There was Maria, the office manager.

There was Frank, the sewer man.

There was Mike who was in charge of maintenance.

And Rich, who is in charge of production, showed us the factory.

Then the first board meeting was held.

Mike says, "Hamdi, what are you going to do now?"

They look at me like I have a magical answer.

So I said, 'Mike, I'm going to the Ace Hardware store to buy some paint.

And I plan to paint the walls outside. ”

Mike wasn't impressed.

he look at me

He said, 'Hamdi, that's fine, I'll do it, but tell me you have more ideas.'

(Laughter) I said, 'Yes.

Let's paint the walls white. ”

(Laughter) To be honest with God, that was the only idea I had.

(Laughter.) But we painted those walls that summer.

Sometimes I wonder what they would say to me if I said to them, "Would you like to see this wall we're painting?"

In two years, we're going to launch a yogurt here that Americans have never seen or tasted.

It will be delicious, it will be natural.

And we'll call it 'Chobani' - it means 'shepherd' in Turkish. ”

And when I say, "I'm going to rehire all or most of our 55 employees,"

And then another 100, then another 100, then another 1,000. ”

But if I say to them, "Can you see the town over there?"

For every person we hire, we create 10 more local jobs.

The town will come to life and the roads will be filled with trucks.

And with the first money we make, we're going to build one of the best little league ballparks for kids.

And in five years we will be the number one Greek yogurt brand in the country. ”

did they believe me?

of course not.

But that's exactly what happened.

(Applause.) We got to know each other by painting the walls.

we believed in each other.

And we figured it out together.

I and all my colleagues have never left the plant in the last five years.

We worked day and night and all holidays to fix the plant.

The best thing about Chobani to me is that the very same people who abandoned it have rebuilt it 100x better than it was before.

And all of them have a financial stake in the company today.

(Applause.) All the while, I kept wondering -- you know, I'm not a businessman, I'm not from that tradition -- I just kept wondering, what is this all about?

American companies say profits matter.

Mainstream business says money matters.

The CEO's strategy paper says shareholders matter.

And it comes at a cost of many things: factories, communities, jobs.

But not by the CEO.

CEOs make their employees suffer for themselves.

But still CEO salaries are getting higher and higher.

And so many are being left behind.

What I'm trying to say here is, no more.

It's not right, it was never right.

It's time to admit that the strategies that have guided companies and CEOs for the past 40 years are broken.

(Applause.) This book will teach you everything about business except how to be a noble leader.

I need a new playbook.

We need new strategies to look at people again.

It looks beyond profit.

In the movies, names are given to people who take different paths to do things right.

They call them "antiheroes".

I think the same way of thinking is necessary in business.

We need an anti-CEO, and we need an anti-CEO strategy.

Now let's talk about what this anti-CEO strategy is all about.

The anti-CEO strategy is about gratitude.

Business books today say, "Business exists to maximize shareholder returns."

I think that's the stupidest idea I've heard in my life.

(Laughter) Actually, companies have to take care of their employees first.

(Applause.) You know, a few years ago when we announced that we were giving stock to all 2,000 employees, some said it was PR, others said it was a gift.

I said it's not a gift.

I have also seen it and participated in it.

They won it with talent and hard work. I have no other choice.

A New Way of Doing Business -- First and foremost is the employee.

not profit.

The new anti-CEO strategy is about community.

Today, fully-equipped businesses are asking their communities, "What tax breaks and incentives will I get?"

The reality is that companies should go to communities in trouble and ask, "How can I help you?"

(Applause.) Idaho wasn't on anyone's radar when we tried to build our second yogurt factory.

It was too rural and too far away for much incentive.

So I went there.

We also met locals and farmers.

We shook hands and broke bread.

I said, "I want to build here."

No need to look at financial research.

As a result, the community is thriving.

New schools open every year.

New food companies are born every year.

And they said to me, "There will be no trained workers here."

I said, "Okay, we'll teach you."

We partnered with a local community college to train hundreds of employees in advanced manufacturing techniques while building our factory.

And today our factory is one of the largest yogurt factories in the world.

(Applause.) The new way of doing business is community.

Find a community you can join.

get permission.

And stay with them, let's break through the walls, and let's succeed together.

The anti-CEO strategy is about responsibility.

Today's strategy states that companies should not get involved in politics.

In reality, companies must become allies of the people.

As we grew up in New York and were looking for more talent, we remembered finding refugees from Southeast Asia and Africa looking to work in Utica, an hour away.

"They don't speak English," someone told me.

I said, "Neither do I. Let's hire an interpreter."

(Laughter) "They don't have transportation."

I said, "Let's take the bus. It's not rocket science."

Today, in rural America, immigrants and refugees make up 30 percent of the Chobani workforce.

(Applause) (Cheers) And it changed us for the better.

The New Way of Doing Business -- It's business, not government, and it's perfectly positioned to change the world today: gun violence, climate change, income inequality, refugees, and race.

It's a business that has to take sides.

(Applause.) And finally, the anti-CEO strategy is about accountability.

According to today's handbook, the CEO reports to the board.

In my opinion, CEOs report to consumers.

During Chobani's first few years, the number 1-800 on the cup was my personal number.

(Laughter) When someone called me and wrote me a letter, I replied personally.

Because consumers are in power, they sometimes made changes based on what they heard.

That's why the business exists.

That is you. Today, each of you has the power to make a difference.

If you don't like a brand, a company, or what their business does, you can throw it in the trash.

And when you find someone doing it right, you can reward them.

After all, all this is our responsibility.

A New Way of Doing Business -- We report to consumers, not corporate boards.

If you have the right relationship with your employees, if you have the right relationship with your community, if you have the right relationship with your product, you will be more profitable, more innovative, more committed people and a community that will support you.

And that's what the anti-CEO strategy is all about.

The treasures I found in that factory, the dignity of work, the strength of character, the human spirit, are what we need to unleash into the world.

Brothers and sisters, there are people and places left behind and left behind all over the world.

But their spirit is still strong.

They just want another chance, and they just want someone to give them another chance and not just take it back, but build something better than before.

And this is the difference between return on investment and kindness return.

This is the difference between profit and true wealth.

And if it can happen in small towns in upstate New York and Idaho, it can happen in every city and town and village in the world.

Now is not the time to build walls, it's time to start painting them.

I will leave all the colors to you.

Thank you very much.

(applause)

Sunbathing on rocks and waddling awkwardly along beaches, these motionless mammals are easier to think of as sea cats than sea lions.

But don't be fooled by their behavior on the beachside.

Beneath the waves, sea lions are hunters with incredible endurance.

Running at speeds of 4 to 18 miles per hour and hunting for up to 30 hours at a time, these majestic mammals live up to their name.

And thanks to a series of finely tuned physical adaptations over millions of years, they are resourceful foragers.

Sea lions hunt at much greater depths than other semi-aquatic animals to find their favorite prey.

Some species can dive to depths of up to 400 meters, collapsing their flexible rib cages and compressing their elastic pair of lungs to deal with the increased pressure.

This forces air up through the narrow airways, and as oxygen leaves the lungs, the cartilage rings collapse and are retained in the larger upper airways.

As you ascend, this air is used to reinflate your lungs, but for now your heart slows down to conserve oxygen.

Blood flow is directed only to the most vital organs, such as the heart, lungs, and brain, which depend on oxygen reserves stored in the blood and muscles.

Once on the hunting grounds, sea lions rely on their superior vision to locate prey.

Most mammalian eyes have a structure called a lens. This is a transparent convex structure whose shape refracts light to enable vision.

In humans, this lens is curved to process light waves traveling through the air.

But sea lions have to do their best at depths of hundreds of meters.

To accommodate this, their eyes have much rounder lenses to refract light underwater, and teardrop-shaped pupils that can expand to 25 times their original size.

This lets in as much light as possible, allowing you to accurately locate prey even in the darkest of environments.

But once they get close, they rely on something akin to a sixth sense to actually catch the meal.

Their whiskers, or vibrissae, are composed of keratin and filled with nerve fibers that extend deep into the connective tissue of the face.

Sea lions have complete control over the direction of these whiskers, and can lie flat against their faces or protrude at 90-degree angles.

Properly adjusted, these whiskers can sense the fine trails left behind by moving underwater fish.

And it's accurate enough that even a blindfolded sea lion can distinguish between objects less than two centimeters in size.

With these tools, healthy sea lions can catch plenty of fish such as anchovies, mackerel and squid on every outing.

And their extraordinary memory allows them to recall multiple hunting grounds, including those they haven't visited in decades.

This memory extends to breeding and birth sites, and which neighbors are friends or foes.

There is even evidence that after 10 years, sea lions remember how to perform tasks without any practice, and can easily navigate old treads.

But despite these amazing adaptations, habitat changes are occurring too rapidly for sea lions to cope.

As the ocean warms due to climate change, certain toxic algae flourish.

This algae is harmless to the fish that eat it, but the domoic acid in the algae can cause seizures and brain damage to sea lions that consume them.

Changing ocean conditions have allowed this algae to bloom year-round, increasing the number of sea lions washing up on shore.

This tragic discovery is just one of many ways the health of aquatic animal communities can help us better understand our planet's oceans.

These danger signals help us take action to protect ourselves and other marine mammals.

And the more we learn about the changes in the oceans in which sea lions live, the better prepared we are to help these clever creatures thrive.

This is Aunt Zipp from Sodom, North Carolina.

She was 105 when I took this photo.

She would always say things like, "Time may be a great healer, but I'm no beauty expert," which made me stop and think.

(Laughter) She said, "Be nice to your friends.

Why would you be a complete stranger without them? ”

(laughs) This is one of her songs.

Let's go with the flow and try it together.

And I'm going to have Michael Manring play bass with me.

Give him a big old hand.

(clap hands) One, two, three, four.

(music) Well, my true love is black-eyed Daisy. If I don't see her, I go mad.

My true love lives upstream on the river. A few more jumps and I'm with her.

Hey, black-eyed Susie! Hey, black-eyed Susie!

Hey, hey, black-eyed Susie, hey.

Now think of 105-year-old Aunt Zipp from Sodom, North Carolina.

I used to go there and learn these old songs from her.

She could not sing much and could not play anymore.

And I pulled her out the door.

Directly below, her grandson was plowing a tobacco field with a mule.

There is a double outhouse next to here.

And we sang this old song She wasn't feeling very well, so she was singing "Hey, hey!" She simply replied, "Black-eyed Susie."

Oh, hey, hey, black-eyed Susie! Hey, black-eyed Susie!

Hey, black-eyed Susie, hey.

Well, my girlfriend and I went blackberry picking.

she got angry I had it licked.

There are ducks in the pond, geese in the sea, and devils when a pretty girl has an idea.

Hey, black-eyed Susie! Hey, black-eyed Susie!

Hey, hey, black-eyed Susie, hey.

Take a banjo.

Well, we plan to get married next Thanksgiving.

I will lie down she will make a living

She makes blackjack and I make gravy. I might eat chicken someday.

Hey, hey, hey, hey Hey, black-eyed Susie, hey!

again.

Oh, hey, hey, black-eyed Susie! Hey, black-eyed Susie!

Hey, black-eyed Susie, hey.

(Applause.) Thank you, Michael.

Ralph Stanley.

He came to campus when I was in the creative studies department at the University of California, Santa Barbara, majoring in biology and art.

I believe this was 1968.

And he played bluegrass-style music, but near the end of the concert, he played an old timing style called banjo-picking, which came from Africa, to accompany the banjo.

It's called the clawhammer style, which he learned from his mother and grandmother.

i fell in love with it.

I went to him and said, how can I learn it?

He said, "Well, I could go back to my hometown, Clinch Mountain, or I could go back to Asheville, North Carolina, or Mount Airy. There's a lot of music there."

Because there are still a lot of old people playing that old style.

So I went back that summer.

I fell in love with the culture and the people.

And you know, I went back to school, got my degree, and told my parents I wanted to be a banjo player.

You can imagine how excited they were.

So I wanted to show you some of the pictures I took of some of my mentors.

Just a few, but you'll probably get a little hint of these people.

And play some banjo. Let's do a little medley.

(music) (applause) The last few photos were of Ray Hicks, who just passed away last year.

He was one of the great American folklore writers.

The story of Old Jack he learned—he told you so little you could understand. But it was really great.

And he lived in that house that his great-grandfather built.

There is no running water or electricity. A wonderful, wonderful man.

And you can see more photos.

Actually, I have a website that has a lot of pictures of other people that I couldn't show you.

This instrument appeared in the picture. It is called mouth bow.

It was arguably the world's first stringed instrument and is still played in the southern mountains.

Now, people in the old days didn't use expensive guitar strings to make something like this.

They just took sticks and intestines and stringed them.

It was hard work for the cats, but it turned out to be a great little tool.

Something like this.

(music) Now, have you heard the many stories told with joy by men and women of all ages about the many daring deeds of the Johnson boys?

You take Kate, I take Sal. We both would have a Johnson Girl.

You take Kate, I take Sal. We both would have a Johnson Girl.

Now they were rebel scouts and were widely known.

When the Yankees saw them coming, they put down their guns and hid.

You take Kate, I take Sal. We both would have a Johnson Girl.

You take Kate, I take Sal. We both would have a Johnson Girl.

Isn't that the sound?

(Applause) Well, I think it was 1954.

We were driving in a suburb of Gatesville, Texas, where I grew up early in my life.

Outside of Gatesville, we were returning from the grocery store.

Mother was driving. My brother and I were in the back seat.

We were really mad at her. we looked out the window.

We were surrounded by thousands of acres of cotton fields.

You know, we just went to the grocery store, and my mother didn't buy me a jar of Ovaltine with a coupon for Captain Midnight's decoder ring.

And buddy, it pissed us off.

Well, my mother couldn't stand it too much either, and she was driving and said, "You guys! You think you can get whatever you want.

You have no idea how hard it is to make money. Your father works very hard.

You think money grows on trees. You have never worked a single day in your life.

you guys make me so angry You plan to get a job this summer. ”

she stopped the car. "Get out of the car," she said.

My brother and I got out of the car.

We stood on the edge of thousands of acres of cotton fields.

There were about 100 black people selected.

Mother grabbed us by the shoulders. She marched us out into the fields.

She went to the foreman. "These two little boys haven't worked a day since they were born," she said.

Of course we were still 8 and 10 years old.

(Laughter) She said, "Can you put them to work?"

Well, it must have seemed like an interesting idea to the foreman. Throw these two middle-class little white boys into the cotton fields of Texas in August. It's hot.

So he gave each of us a cotton sack about ten feet long and about that circumference, and we began picking.

Well, cotton is soft, but the outside of the plant is full of stickers.

And if you don't understand what you're doing, your hands will quickly bleed.

And my brother and I started picking it up, and our hands started bleeding, and--"Mother!"

And my mother was sitting by the car like this.

She had no intention of giving up.

Well, the foreman must have seen that he was going crazy.

He crept up behind us and sang in a low voice.

He just sang: "I know there are long white robes in Heaven.

don't wanna leave me

Well, I know Heaven has long white robes.

I don't want to leave you behind. ”

And as the people began to sing back, from around him he sang, "Good news, good news, chariots are coming.

Good news: Chariot is coming.

Good news: Chariot is coming.

And I don't want it to leave me. ”

Now, neither my brother nor I had heard of such a thing once in our lives. It was so beautiful.

We sat there all day picking cotton without complaining or crying while they sang "Oh Mary, don't cry, don't moan," "Walk in the water," "I've done it," "This little light of mine," etc.

In the end, by the end of the day, we each picked about a quarter of a bag of cotton.

However, the foreman was kind enough to give us a check for $1, but my mother wouldn't let us cash it.

I am 57 years old. I still have a check left.

Well, my mother wanted us to learn the importance of hard work from there.

But if you have kids, you know it often doesn't work out that way.

No, we learned something else.

The first thing I learned that day was that I never wanted to work that hard again.

(Laughter) And almost never.

However, it was also eye-opening to learn that there are people in the world who have to work so hard every day.

I also learned that a great song can make the hard work a little easier.

It can also bring groups together in ways that others can't.

Well, I was just an eight-year-old boy that day when my mom pulled me out of the car in the hot Texas cotton fields.

I didn't even know music.

But that day, when I was picking cotton in the cotton fields and people started singing, I found myself in the center of real music, and I've wanted to be there ever since.

Try this old song with me. I sing: Heaven has long white robes, I know.

You sing: don't wanna leave me

Well, I know Heaven has long white robes.

don't wanna leave me

Good news, good news. A chariot is coming.

Good news: Chariot is coming.

Good news: Chariot is coming.

And I don't want it to leave me -- it's been a while since you plucked the last bale of cotton.

Let's try again.

We know that heaven has a crown of stars.

don't wanna leave me

We know that heaven has a crown of stars.

don't wanna leave me

Good news: Chariot is coming.

Good news: Chariot is coming.

Good news: Chariot is coming.

And I don't want it to leave me.

A few years ago, I vaguely remembered this story and told it at a concert.

My mother was also in the audience.

Of course she was happy to tell a story about herself, but after the concert she came over and said, 'David, I have something to tell you.

I have it all set.

I put it together with the foreman. Built with the land owner.

I just wanted you to learn the importance of diligence.

But I didn't know it would make you fall in love with music. ”

let's try it. Good news: Chariot is coming.

Good news: Chariot is coming.

Good news: Chariot is coming.

And I don't want it to leave me.

(Applause) Now, here's the steel guitar. It's an American made instrument.

Originally made by the Dopiera brothers, they later created the dobro, a wooden body with a metal cone.

It is usually played flat on your lap.

It was created to play Hawaiian music in the 1920s, before the advent of the electric guitar, and tried to make a loud guitar.

And African Americans have discovered that they can drink straight from broken bottlenecks. A good Merlot works very well.

The wine we drank yesterday would have been perfect.

Fold it over your finger and slide it into the note.

This instrument saved my life.

Fifteen years ago, fourteen years ago, maybe this year, my wife and I lost our daughter, Sarah Jane, in a car accident. It was the worst thing that nearly took me from this world.

And I think just by going through such incredible sadness and just standing on the edge of that abyss and just wanting to dive in, I think I learned a lot about what happiness is.

I had to make a list of reasons to stay alive.

I was ready, so I had to sit down and make a list. I was ready to get out of this world.

And you know, at the top of the list were, of course, Jenny and her son Zeb, my parents. I didn't want to hurt them.

But when I thought about it more, it was very simple.

I didn't care -- I had a radio show, I had a radio show on public radio called "Riverwalk," I didn't care. I didn't care about prizes or money or anything like that.

none. none.

The list might include seeing daffodils blooming in spring, smelling freshly cut hay, body surfing on waves, the feel of a baby's hand, the sound of Dr. Watson playing guitar, listening to old records by Muddy Waters or Uncle Dave Macon.

And for me it's the sound of a steel guitar. Because my parents' neighbor just gave me these things.

So I sat with it and didn't know how to play it, but I was just playing the saddest thing I could.

And it was the only one of all the instruments I play that I could really make that connection with.

This song was born from there.

(music) Well, it's hard.

Lord, I don't want to hear that news.

If you want to talk about it, I will listen to you.

Words can no longer describe it. Tell me what I always do

Just break another bottleneck and play steel guitar blues.

People say, "Oh, stop now!"

Oh, that's easier said than done.

While I can hardly move, I am running around happily.

Sometimes I wish I was in a funky mood all the way until I got up to the steel guitar blues.

Well, you can try to keep it all to yourself with drinks, drugs, and cigarettes, but you know it won't get you there.

But here I got some medicine that might ease the situation.

Call me the morning after you've had a shot of Steel Guitar Blues.

Please open it now.

(Applause.) Oh, I think we have time to talk about this. My father was an inventor.

When Sputnik surfaced in 1957, we moved to California.

And he was doing gyroscope research. He has many such patents.

And we moved across from Michael and John Whitney.

They were about my age.

John went further and Michael became one of the inventors of computer animation.

Michael's father was researching something called computers.

This was 1957 and I was just ten years old. I didn't know what it was. But he took me to see what they were making. It was like a library, with vacuum tubes as far as the eye could see, floor to floor. One of the engineers said, "Someday you'll be able to put this in your pocket."

I thought, damn it, it's going to be a big pair of pants!

(Laughter) So, that Christmas -- maybe I had time to do this -- that Christmas I got a Mr. Wizard Juan O Rama chemistry set.

Yes, I wanted to be an inventor like my father. So did Michael.

His great-grandfather was Eli Whitney, inventor of the cotton gin.

So we looked it up - this was a commercial chemistry set.

What really surprised us was that it contained three chemicals: sulfur, potassium nitrate and charcoal.

Hey, we were only 10 years old, but we knew it made gunpowder.

We made a few pieces, put them in the driveway, threw matches, and whew, they burst into flames. Oh it was great.

Now, obviously the next thing to do was build a cannon.

So we went to Michael's garage -- his dad had all sorts of stuff, and we put the pipe in a vise there, screwed a cap on the end of the pipe, drilled a hole in the back of the pipe, took out some firecrackers, pulled out the fuse, tied them, put them back, and -- in the hole -- then stuffed some of the gunpowder into that pipe and put three ball bearings on top of the garage.

(Laughter) We weren't stupid. I put a sheet of plywood about 5 feet in front of it.

We backed out, lit it, and they flew away from there - they went through the plywood like paper.

through the garage.

Two of them crashed into the side door of his new Citroen.

(laughter) We demolished everything and buried it in his backyard.

It was the Pacific Palisades. It's probably still there.

Well, my brother heard that we made gunpowder.

He and his companions were older and rather mean.

They said they would beat us if we didn't make gunpowder.

We said, "What are you going to do with it?"

They said they were going to melt it down to make rocket fuel.

(laughs) Of course. I will make it in large quantities.

(Laughter.) So we made them in bulk and it was in my house, now we had just moved here. We had just moved to California.

My mother redid the kitchen. On that day, my mother passed away. I had a pie tin.

It fell to Chris Burquist to carry out the meltdown.

Michael and I stood on the far side of the kitchen.

He said, "Yeah, hey, it's melting. Yeah, sulfur is melting."

no problem. yeah i know ”

It flared up and he turned around and he looked like this.

No hair, no eyelashes, nothing.

There was a large worm in my mother's kitchen cabinets. The air was just filled with black smoke.

She went home and brought back that set of chemicals, and we never saw it again.

But we thought a lot about it. Because every time she cooks tuna, it turns out amazing tuna with a hint of gunpowder.

So I like to invent things too, so I thought I'd end the set with something I invented a long time ago.

When drum machines were still new, I began to wonder why the oldest form of music, hambone rhythms, could not be combined with the latest technology.

I call it Thunderware.

Drum triggers were new at the time.

So I put them all together and sewed 12 pieces into this suit.

Yesterday I introduced some hambone rhythms. I'll do some similar things.

Here's the trigger, here's the trigger, here, here. right there.

It hurts a lot if you don't remove it. have understood.

Well, the drum triggers come out of my tail and can go into the drum machine and make different drum-like sounds.

So let's put them all together. You can also change the sound by stepping on this pedal here. And let's wrap this up by doing a little hambon solo or something.

Thank you guys.

(applause)

First of all, I would like to ask a question to everyone in the audience. Think about this question for a moment.

I wanted to ask what do you think is the most beautiful?

It is not in the world of butterflies and flowers, but in humans.

What do you find most attractive about people?

eyes?

do you like beautiful eyes?

blue eyes?

Curly hair?

long nails?

big feet? Some people like big feet.

What is it about people that we find attractive?

I think the way we think about beauty comes from different things: social media, the internet, magazines. Especially if it comes from a model.

I feel like that defines beauty today.

And personally I feel that beauty is in everything.

Some may say big feet aren't cute, but there are always shoes that look better on my size 9 than on a size 6.

Therefore, I believe that there is beauty in everything.

For example, I love your horror!

they are great

Your gorgeous hair, Talia. oh my god!

I wish I could get mine this big.

Sensei, I think it's amazing that you have such a bright and bold head.

This gloss is perfect!

As you can see, I find beauty in everything.

And of course, "I find beauty in everything" is a very cliché.

Like all beauty.

I don't think everyone thinks there's beauty in everything, but the reason I think there's beauty in everything is that when I was younger, I was drawn to something that I think is great now.

My one thing connects millions of people around the world.

As you can probably guess, this is my skin condition called vitiligo.

And vitiligo is basically my immune system, the melanin that makes my skin color, thinks my melanin is like a disease, a cold, and fights it off, which makes my skin white.

I was chosen because of this skin condition.

I was bullied.

I was alienated.

Even from those who never intended to alienate me.

For example, we take family photos, like everyone else, but my mom brought a little makeup. It was her makeup.

My mother is not the same skin tone as me, much darker than me.

So can you imagine that my face is black and the rest is kind of brown and white?

I was obviously not comfortable, but my mother tried to make me comfortable.

I was alienated.

At school, I changed schools around the 3rd and 2nd grades, but it's hard to make friends, especially when you're young, but luckily I had two girls who would hang out with me.

They didn't really know who I was, but they wanted to play, so they wanted to check me out and see if I was one of the cool kids.

And then, after a few weeks of being in that school and having friends, all of a sudden, my friends were gone.

And I was a little confused as to why I had trouble making friends.

Where have they gone now that they finally made it?

They avoided me at recess, they avoided me at lunch, and one day I finally approached them and said, "Guys, what's going on? Why aren't you talking to me anymore?"

They said to me, "Sorry, I can't talk to you anymore."

Our parents said they might know your skin condition. ”

Can you imagine how that made me feel when I was in 2nd and 3rd grade?

It hurts.

To be honest, I felt alienated and embarrassed.

I had no idea what this skin condition was at grade 2 or grade 3.

I wasn't asked if I wanted this skin condition.

I didn't want it, but I wanted it and was alienated.

But the problem is, when I got a little older, I didn't want to be in that position anymore, and I didn't want to be bullied.

So instead of removing myself from that position, what did I do?

I became a bully.

And it's not that one side is better than the other.

I can say that because I've been on both sides.

I didn't want to be bullied anymore, so I took the initiative and said to the bullies.

So I think it's the only side that's on this side, this must be the good side. ”

So I decided to go over there.

I will bully my child.

You think, "Your hair is ugly!"

"Eh, who did that?"

"Excuse me, right?"

But I realized I was trying to fit into a mold that didn't fit me.

I mean, who says I should fit the mold anyway?

You can make your own.

So I decided to separate myself from this side and this side and create my own side and fit myself into a new mold.

Types are banal, but I feel there is beauty in everything.

So I want to keep this thought in your mind, it takes one person to realize that there is beauty in all things.

And you don't have to stand on one side of the spectrum or be on one side of the spectrum on the other. Nor do you have to fit into someone's mold, your mother's mold, or the person you're trying to fit into.

Be yourself.

Don't ask magazines or me what beauty is, find out for yourself.

Know it in your heart and create your own mold of what beauty is.

(applause)

So when you think of your child, your close friend, or your sweetheart, the word 'love' probably comes to mind and immediately another emotion rushes over you. Joy and hope, excitement, trust and security, and sometimes sadness and disappointment.

There may be no word in the dictionary that is more associated with us than love.

But given its central importance in our lives, isn't it interesting that we're not explicitly told how to love?

We form friendships, work through early romantic relationships, get married, and bring a baby home from the hospital with the hope that it will work out.

But the truth is that we often hurt or disrespect those we love.

It can also be subtle, such as guilt-ridden friends to spend time together, spying on your partner's emails, or being ashamed of your child's lack of effort in school.

100% of us will be victims of unhealthy relationships and 100% of us will do unhealthy things.

It's part of being human.

At its worst, the harm we inflict on those we love manifests itself in abuse and violence, with 1 in 3 women and 1 in 4 men experiencing relationship abuse in their lifetime.

Now, if you're like most people, when you hear these stats, you think, "Oh no, that doesn't happen to me."

My instinct is to shy away from the words “abuse” and “violence” and think that it happened to someone somewhere.

But the truth is, unhealthy relationships and abuse are all around us.

We simply call them by different names and ignore the connection.

Abuse sneaks up on us under the guise of unhealthy love.

I work for One Love, an organization founded by the family whose daughter Yeardley was killed by her ex-boyfriend.

This was a tragedy that no one expected, but in retrospect, it turns out that the warning signs were just there and no one understood what they were seeing.

Though described as insane, theatrical, and overdrinking, his behavior was not understood to be genuine, and was a clear sign of danger.

Her family realized that her death could have been prevented if someone had been educated about these signs.

So today, we are on a mission to make sure others have information that Yeardley and her friends didn't know.

We have three main goals. One is to give us all a language to talk about subjects that are very awkward and uncomfortable to discuss. Empower the entire front line, your friends, to help. And in the process, all of our capacities to love improve.

To that end, it's always important to start by uncovering the unhealthy signs we often miss, and our work is focused on creating content to start conversations with young people.

As you can imagine, most of our content is pretty serious given the subject matter, but today, with one of our more lighthearted yet thought-provoking pieces, "The Cuplets," we uncover five indicators of unhealthy love.

The first is strength.

(Video) Blue: I haven't seen you in a few days. i miss you

Orange: I missed you too. (#thatslove) Blue: I haven't seen you in five minutes. It feels like a lifetime.

What were you doing without me for the whole five minutes?

Orange: It's been three minutes. (#thatsnotlove) Katie Hood: Anyone aware of that? I don't know. that's right.

Abusive relationships are not abusive to begin with.

They start off feeling exciting and invigorating.

There is an intensity of affection and emotion, a rush.

It feels really good.

You will feel very lucky, like you hit the jackpot.

But in unhealthy love, these feelings go from exciting to overpowering and sometimes even a little stifling over time.

Feel it in your gut.

Maybe your new boyfriend or girlfriend said "I love you" sooner than you expected, or started showing up everywhere and texting and calling frequently.

Maybe he knows he had other things to do that day, but he's annoyed when you're slow to respond.

It's important to remember that it's not how a relationship begins that matters, but how it develops.

In the early stages of a new relationship, it's important to pay attention to your feelings.

Are you comfortable with the pace of intimate relationships?

Do you feel like you have space or room to breathe?

It's also very important to start practicing using your voice to talk about your needs.

Are your requests being honored?

The second marker is orphan.

(Video) Orange 2: Want to play together?

Orange 1: My boyfriend and I always have Monday fundays.

Orange 2: Do you want to spend time together?

Orange 1: My boyfriend and I always have Monday fundays.

Orange 2: What about tomorrow? Orange 1: Today is Snooze Day, Tuesday.

Orange 2: Wednesday? Orange 1: No Friends Day.

KH: For me, isolation is one of the most frequently overlooked and misunderstood signs of unhealthy love.

why?

Every new relationship starts with a strong desire to spend time together, so it's easy to miss when something changes.

Isolation creeps in as your new boyfriend or girlfriend begins to pull you away from your friends, family, and support system, and you begin to bond more strongly with them.

They might say things like, "Why are you hanging out with them? They're such losers" about your best friend, or about your family, "They want us to break up. They're totally against us."

To isolate is to sow the seeds of suspicion against anyone from your pre-relationship life.

Healthy love includes independence, two people who like to spend time together but still maintain connection with people and activities they previously cared about.

At first, you might spend all your waking hours together, but as time goes on, maintaining independence is key.

To do this, make a plan with your friend, stick to it, and encourage your partner to do the same.

A third indicator of unhealthy love is extreme jealousy.

(Video) Blue 2: What makes you so happy?

Blue 1: She just started following me on Instagram!

Blue 2: What are you so nervous about?

Blue 1: She started following me everywhere.

(#thatsnotlove) KH: As the honeymoon period begins to end, extreme jealousy can creep in.

Your partner needs to always know where you are and who you're with, and may become more demanding or follow you everywhere online or offline.

Extreme jealousy can lead to possessiveness and mistrust, often accusing others of flirting or cheating, and refusing to listen when you tell them it's nothing to worry about and that you just love them.

Jealousy is part of a relationship, but extreme jealousy is different.

There is a threatening, desperate and angry element to it.

Love shouldn't feel like this

The fourth marker is frivolous.

(Video) Blue: Do you want to spend time together? Orange: I have to study.

Blue: You get an A anyway. A is great. (#thatslove) Blue: Do you want to spend time together? Orange: I have to study.

Blue: You'll get F's anyway, F's of F's, F's of F... idiots. (#thatsnotlove) KH: Right.

Words are used as weapons in unhealthy relationships.

Conversations that used to be fun and carefree become mean and embarrassing.

Maybe your partner teases you in a way that hurts you, or tells stories or jokes at your expense to get a laugh.

If you try to explain that your feelings have been hurt, they will shut you up and accuse you of overreacting.

"Why are you so sensitive? What's wrong? Give me a break."

Hearing these words makes you go silent.

It may seem obvious, but your partner should be pushing you.

Their words should help you grow, not tear you down.

They must keep your secrets and be loyal.

Instead of losing confidence, you should become more confident.

Finally, the fifth marker is volatility.

(Video) ORANGE 1: I'm sorry we broke up.

Orange 2: I'm sad too. (#thatslove) Orange 1: If we broke up, I would be very depressed.

I would throw myself off this step.

I would! don't try to stop me!

(#thatsnotlove) KH: Frequent breakups and make-ups, highs and lows: As tensions rise, so does volatility.

Tears and frustration quarrels followed by emotional, hateful and hurtful comments such as "You are unworthy, I don't even know why I am with you!"

He immediately apologized and promised that this would never happen again.

By this point, you may be so used to this relationship roller coaster that you don't realize how unhealthy and possibly dangerous your relationship has become.

It can be very difficult to tell when unhealthy love veers into abuse, but it's safe to say that the more of these markers your relationship has, the more unhealthy and possibly dangerous your relationship can become.

And if your instincts are to break up and move away, which is the advice many of us give friends in unhealthy relationships, it's not always the best advice.

The moment of parting can be a real trigger for violence.

If you are worried that you are heading towards abuse or abuse, you should consult a professional to get advice on how to safely leave your home.

But it's not just romantic relationships, it's not just violence.

Understanding the signs of unhealthy love can help you audit and understand nearly every relationship in your life.

For the first time, you may understand why friendships disappoint, or how every interaction with a particular family member causes depression and anxiety.

You may begin to notice how your own fierceness and jealousy are causing problems with your colleagues at work.

Understanding is the first step to improvement, and while we can't make all unhealthy relationships healthy, some must be left behind, we can still do our part each day to make them better.

And here is the exciting news. Actually, this is not rocket science.

Open communication, mutual respect, kindness, patience - we can practice these every day.

Practice definitely makes you better, but I have to promise you that you won't get perfect.

I do this for a living, and I think and talk about healthy relationships every day, but I still do unhealthy things.

Just the other day, in the midst of arguing and arguing and complaining about breakfast, I completely forgot as I was about to send my four children out the front door.

I deliberately shouted in anger, "Everybody shut up and listen to me!"

you are the worst!

We'll cover screen time, desserts, and anything else you might enjoy in life! ”

(Laughter) Has anyone been there?

(Applause) Volatility, disrespect.

My eldest son turned and looked at me and said, "Mom, that's not love."

(Laughter) For a moment, I really wanted to kill him for calling out to me.

trust me.

But then I picked myself up and thought I was actually proud.

I'm proud he has the words to make me stop.

I want all children to understand the standards for how they are to be treated and have a language and a voice they can use when they don't meet those standards rather than just accepting them.

For too long, we've treated relationships as a soft topic, even though relationship skills are one of the most important and difficult things to build in life.

Not only can understanding the signs of unhealthiness help you avoid the rabbit hole that leads to unhealthy love, but understanding and practicing the art of getting healthy can improve almost every aspect of your life.

Love is an instinct and an emotion, but I am fully convinced that the ability to love better is a skill that we can all build and improve over time.

thank you.

(applause)

On the red tiles of her family's study, she danced and sang to the TV movie "Gypsy," starring Bette Midler.

(Singing) "I had a dream.

What a wonderful dream, Dad. ”

I sang this song with the desperation and burning desire of a nine-year-old who actually had a dream.

My dream was to become an actress.

And I certainly hadn't seen anyone like me on TV or in the movies. And indeed, all my family, friends, and teachers were constantly warning me that someone like me could never make it in Hollywood.

But I was American.

I have been taught to believe that anyone can achieve anything, regardless of the color of their skin, the fact that their parents are immigrants from Honduras, or the fact that they have no money.

My dream didn't have to be easy, it just had to be possible.

When I was 15, I had my first professional audition.

It was either a cable subscription or a bail commercial, but I don't remember.

(Laughter) I remember the casting director asking me, 'Can you do it again, but this time with a more Latino voice?'

"Hmm, I get it.

So you want me to do it in Spanish? ’ I asked.

"No, no, do it in English. Just make it Latin-sounding."

"Well, I'm Latino, so isn't that what Latino sounds like?"

There was a long, awkward silence, but at the end, "Okay, baby, don't worry, thanks for coming, bye-bye!"

It took me most of the drive home to realize that she was asking me to speak in broken English with the words "more Latin."

And I couldn't understand why the fact that I was an actual, real, bona fide Latino seemed so unimportant.

Anyway, I didn't get the job.

Gangster girlfriend, cocky shoplifter, pregnant chola number two, there were very few jobs that people would be interested in.

(Laughter) People like me had these roles.

They were seen as too brown, too fat, too poor, too unsophisticated.

These roles were stereotypes and nothing could be further from my own reality and the roles I dreamed of playing.

I wanted to play complex, multifaceted people, people who were at the center of their lives.

Not a cardboard cutout placed against someone else's background.

But when I dare to mention it to my manager, the manager is the one I'm paying to help me find opportunities. His answer was, "Somebody has to tell you that you have unrealistic expectations for that girl."

And he wasn't wrong.

I mean, I fired him and he wasn't wrong.

(Laughter) (Applause) Because every time I try to play a role that's not a poorly written stereotype, I'm told, "We're not going to diversely cast this role."

Or, "We love her, but she's too peculiarly ethnic."

Or, "Unfortunately, there is already one Latino in this movie."

I kept getting the same message over and over again.

That my identity was an obstacle I had to overcome.

So I thought, 'Come, obstacle.

I am American. My name is America.

I've been training my whole life for this, I'll just follow the scenario and try harder. ”

So I did too, working hard to overcome all the things people said were wrong about me.

I kept my curls straight and submissive, avoiding the sun's rays so my skin didn't get too brown.

I always tried to lose weight and bought fancy and expensive clothes.

I don't want people to look at me like I'm too fat, too brown, or a skinny Latina.

They will understand my abilities.

And maybe they will give me a chance.

And in an ironic twist of fate, I finally got the role that fulfilled all my dreams, but one that required me to be who I am.

Ana in "Real Women Have Curves" was a brown, skinny, fat Latino woman.

I had never seen someone like her, someone like me, at the center of her own life story.

I traveled across America and multiple countries with this film, and people of all ages, ethnicities, and body types found themselves in Anna.

A 17-year-old chubby Mexican-American girl battles cultural norms to make an unlikely dream a reality.

I've seen people actually want to see stories about people like me, despite what they've been told all along.

And my unrealistic expectations of seeing myself authentically represented in that culture were also the expectations of others.

"Real Women Have Curves" was a critical, cultural and financial success.

"Wow," I thought. "Hooray!"

We have proven that our story is worth it.

Now things are about to change. ”

But almost nothing happened, so I watched.

There was no watershed.

No one in the industry rushed to tell more stories about a starving, willing audience to pay to see.

Four years later, when I got to play Ugly Betty, I saw the same phenomenon.

"Ugly Betty" premiered to 16 million viewers in the United States and was nominated for 11 Emmy Awards in its first year.

(Applause.) But despite the success of "Ugly Betty," there hasn't been another TV show starring a Latino actress on American television for eight years.

It's been 12 years since I became the first and only Latino woman to win an Emmy in the Leading Leading Role category.

That's nothing to brag about.

That is a point of deep frustration.

Not because awards prove our worth, but because watching people succeed in the world teaches us how to look at ourselves, how to think about our worth, and how to dream for the future.

And every time I begin to doubt it, I am reminded of a little girl who lived in Swat Valley, Pakistan.

And somehow she got a few DVDs of American TV shows that reflected her dream of becoming a writer.

"I became interested in journalism when I saw how my words can make a difference and when I saw a DVD of Ugly Betty about life in an American magazine," Malala wrote in her autobiography.

(Applause.) Throughout my 17-year career, I've witnessed first-hand the power our voices have when they make their presence felt in our culture.

I've seen it.

I've lived it and we've all seen it.

In entertainment, politics, business and social change.

We cannot deny it -- existence creates possibility.

But over the past 17 years, I've also heard the same excuses as to why some of us can have a presence in that culture, while others can't.

Our stories have no audience, our experiences are not mainstream, and our voices are too financially risky.

Just a few years ago, an agent called me and explained why I wasn't getting a role in a movie.

He said, "They love you and want a really, really diverse cast, but the movie won't be funded until they cast the white roles first."

He delivered the message with a broken heart, and said in a tone that conveyed, "I understand how bad this is."

But in spite of this, like hundreds of times before, I felt tears running down my cheeks.

And then the pain of rejection wells up in me, and then the voice of shame scolds me. “You are a grown woman, so please stop crying about your work.”

I went through the process of accepting this failure as my own and then being deeply ashamed of my inability to overcome the obstacles over the years.

But now I hear a new voice.

A voice saying, "I'm tired."

that's enough. "

A voice that understood my tears and pain did not mean I would lose my job.

They were about what was actually said about me.

What executives, producers, directors, writers, agents, managers, teachers, friends and family have said about me throughout my life.

that I was a worthless person.

I thought that sunscreen and curling irons would change this deep-rooted sense of values.

But what I realized in that moment is that I'm not actually asking the system to change.

I was asking for it to be put in, but it's not the same.

I believed what the system believed about me, and I couldn't change what the system believed about me.

And I did.

Like everyone around me, I believed that it was impossible to be who I am in my dreams.

And I tried to keep myself inconspicuous.

What this has made clear to me is that it is possible to be someone who genuinely desires change and yet still maintains the status quo through their actions.

And what it led me to believe is that identifying good people and bad people doesn't bring about change.

With this conversation we can all solve the problem.

Because most of us are neither.

Change happens when each of us has the courage to question our basic values ​​and beliefs.

And take care that our actions lead to the best intentions.

I am just one of the millions of people who have been told they must resist the truth of who they are in order to fulfill their dreams and contribute their talents to the world.

I, too, am ready to stop resisting and start being my full and authentic self.

If I could go back and say something to that nine-year-old dancing and dreaming in the library, I would say that my identity is not my obstacle.

My identity is my super power.

Because the truth is, I am what the world looks like.

You are what the world looks like.

Collectively, we are what the world really is.

And we don't have to create a new reality for our system to reflect it.

They just have to stop resisting the world we already live in.

thank you.

(applause)

So I understand that this meeting was planned and the slogan was "From Was to Still".

And I'm drawing an illustration of Still.

Of course, I cannot agree with this. Because I'm 94 and still not working.

And whoever asks me, "Are you still doing this and that?"

I'm not doing it yet, I'm doing the same as usual, so I won't answer.

I still have - or did I still use that word? I didn't mean that.

(Laughter) I have a file named To Do. i have a plan

i have a customer I am working as usual.

So this considers my age.

I would like to introduce you to my work so that you can see what I do and why I am here.

It was around 1925.

They were all made in the last 75 years.

(Laughter) (Applause) But, of course, I've been working since I was 25, and I'm doing more or less what you see here. This is Castleton China.

It was an exhibition at the Museum of Modern Art in New York.

It is currently for sale at the Metropolitan Museum of Art.

It is still for sale at the Metropolitan Museum of Art.

This is my daughter and my portrait.

(Applause) These are just some of the things I've made.

We've made hundreds over the last 75 years.

I call myself "manufacturing".

I have a different job, so I wouldn't call myself an industrial designer.

Industrial designers want to create novel things.

Novelty is a commercial concept, not an aesthetic one.

I think the industrial design magazine was called Innovation.

Innovation is not part of the purpose of my work.

Well, people who make things. They make things more beautiful, more elegant and more comfortable than just a craftsman does.

I have a lot to say. I have to think about what to say.

Another way of describing our profession is that we are concerned with playful quests that actually pursue beauty.

That is to say, the search for playful beauty was called the first human activity.

Sarah Smith, professor of mathematics at the Massachusetts Institute of Technology, writes, "The playful search for beauty was the first human activity. All useful qualities and all material properties evolved from the playful search for beauty."

These are tiles. The word "playful" is a necessary aspect of our work. Because one of our problems is that we have to make and produce nice things all our lives. For me, it's been 75 years.

So how can we keep making things with the same joy as gifts for others without dying out?

Playfulness is therefore an important part of our quality as designers.

Let me tell you a few things about my life.

As I said earlier, I started doing this 75 years ago.

My first exhibition in the United States was at the 1500th Anniversary Exhibition in 1926. The Hungarian government sent me my hand-painted work as part of their exhibit.

My job has actually taken me to many countries and shown me wonderful parts of the world.

This wasn't what they brought me -- the work didn't take me -- because I wanted to make things specifically to see the world with them.

I'm very interested in seeing the world, making all these things and finally being able to see many countries and cultures.

I started working as an apprentice to a Hungarian craftsman, where I learned what the medieval guild system was like.

The guild system means that when I was an apprentice, I had to train myself to become a potter.

In my shop where I studied and learned, there was a traditional hierarchy of master, craftsman and apprentice, and I worked as an apprentice.

Work as an apprentice was very primitive.

This meant that I had to learn every aspect of pottery making by hand.

We smashed it with our feet as the clay flowed down the hillside.

After that, it was necessary to knead it. Then it kind of had to get messed up.

And now you're ready to pitch.

There I actually worked as an apprentice.

My husband took me to set up the oven. Because back then, this was part of making an oven, or setting an oven.

And finally, I received a document stating that I had successfully completed my apprenticeship and behaved morally. This document has been handed to me by the Roofers, Rail Diggers, Oven Setters, Chimney Sweeps and Potters Guild.

(Laughter) I also received a workbook at the time that explained my rights and working conditions. I still have that workbook.

First, he set up a shop in his garden, made pottery and sold it in the Budapest market.

And there I was sitting, my boyfriend at the time—I didn't mean a boyfriend in the sense of today—my boyfriend and I sat in the market and sold vases.

My mother thought this was not very appropriate and sat down with us to add some appropriateness to this activity.

(laughs) But after a while, a new factory was built in Budapest, a big pottery factory.

And I went there with some women and asked the director all sorts of questions.

Then the director asked me, "Why are you asking this question?"

I also have pottery, he said.

So he asked me, "Will you visit me?" I finally visited and explained that what I was doing in my shop was an anachronism and that the Industrial Revolution had broken out and that I should rather join the factory.

So he created an art department for me, where I worked for several months.

But everyone at the factory spent time in the art department.

The director there said that some women now have my designs cast and made in molds, which were also sold in America.

I remember it being quite successful.

However, the director, the chemist, the model maker, all cared more about the art department, my job, than about building the toilets, so I finally got a letter from the center, from the bank that owned the factory, telling me to set up the toilets behind the art department, and that was the end of my job.

This gave me the possibility. Because I am a traveler, and a traveler also takes a bag and goes to see the world.

So, as a journeyman, I put an advertisement in the newspaper about what I had studied. He said he was a realistic ceramic artist journeyman and was looking for a job as a journeyman.

And since there were several answers, I accepted the answer that I thought was furthest from home, practically half of America.

And it was Hamburg.

Then I first got this job in a pottery workshop in Hamburg, where everything was done on the potter's wheel and I worked in a shop with several potters.

And the first day I tried to sit on the turntables -- there were three or four turntables -- and one of them was a deaf-mute hunchback, and it smelled very bad, behind me.

So I gave him cologne every day, but he thought it was so good that he brought me bread and butter every day, and I had to eat it as a courtesy.

The first day I started working at this store, I had an amazing experience.

My colleagues were thoughtfully behind the wheel where I was to move the most beautifully modeled natural human organs.

(Laughter) After I brushed them off with a hand motion, they were so nice - I finally got accepted and worked there for about six months.

This was my first job.

At this rate you'll be here until midnight.

(Laughter) (Applause) So let's speed it up a bit. (Laughter) Moderator: Eva, we have about five minutes left.

(laughter) Eva Seisel: Are you sure?

Moderator: Yes, it certainly is.

EZ: Well, if you don't mind, I'll be speaking very fast in five minutes, so I have to tell you.

And in fact, my work has taken advantage of me to satisfy my curiosity, so I have been to many countries.

And above all, the other country I worked in was the Soviet Union, where I worked from '32 to '37, actually until '36.

Even though there was nothing to do, we finally arrived. I was a foreign expert.

I became an art director in the porcelain and glass industry, and eventually under Stalin's purges. When Stalin's purges began, I had no idea that hundreds of thousands of innocent people were being arrested.

So I was arrested fairly early in Stalin's purges and spent 16 months in a Russian prison.

The accusation was that I had successfully prepared an investigative report on Stalin's life.

This was a very dangerous accusation.

And if this is the end of my five minutes, I want to tell you that I actually survived, which was a surprise.

But since I'm here alive, and this is the end of the five minutes, I'll -- Moderator: Tell me when was the last time you were in Russia?

Haven't you been there recently?

EZ: Oh, actually this summer the Lomonosov factory was bought by an American company and they invited me.

They saw that I had been working in this factory for 33 years, so they came to my studio in Rockland County and brought 15 artists to visit.

And they invited me to come to their factory in Russia in July last summer to cook and design dishes.

And since I don't like traveling alone, my daughter, son-in-law, and granddaughter were also invited, so today was a nice trip to see Russia, which isn't a very happy and happy landscape.

I'm here now, what if this is the end? thank you.

(applause)

The devil has come to town.

But don't worry. All he wants to do is put on a magic show.

This absurd premise forms the central plot of Mikhail Bulgakov's masterpiece The Master and Margarita.

Written in Moscow in the 1930s, this surreal blend of political satire, historical fiction and occult mysticism has gone down as one of the best novels of the 20th century, and one of the strangest.

The story begins when a meeting of two Moscow literary elites is interrupted by a strange gentleman named Woland who claims to be a foreign scholar who has been invited to a presentation on black magic.

Readers are suddenly transported to 1st-century Jerusalem when a strange man engages two companions in a philosophical debate and makes eerie predictions about their fate.

Pontius Pilate reluctantly condemns Jesus of Nazareth to death.

As the story shifts between two settings, Woland and his henchmen, Azazero, Koroviev, Hera, and a giant cat named Behemoth, appear to possess terrifying magical powers.

Much of the novel's black humor comes not only from this diabolical prank, but also from the context in which it occurs.

Bulgakov's story takes place in the same environment in which it was written: the Soviet Union at the height of Stalin's era.

Artists and writers worked there under strict censorship and were subject to imprisonment, exile, and execution if deemed to undermine the state's ideology.

Even when approved, their work, like housing, travel, and everything else, was governed by a complex bureaucracy.

In the novel, Woland manipulates this system with the fabric of reality, with hilarious results.

Muscovites responded with petty selfishness when heads were separated from bodies and gold rained down from the sky, illustrating how Soviet society, despite its ideals, engendered greed and cynicism.

And the detached narration deliberately mixes the strangeness of supernatural events with the everyday absurdity of Soviet life.

So how could Bulgakov publish such a subversive novel under an oppressive regime?

Well...he didn't.

He worked on "The Master and Margarita" for over ten years.

But while Stalin's personal favors may have shielded Bulgakov from severe persecution, many of his plays and writings were kept out of production, effectively forcing him into silence, albeit in safety.

After the author's death in 1940, the manuscript remained unpublished.

A final censored version was printed in the 1960s, but copies of the unsummarized manuscript continued to circulate among underground literary circles.

The full text was published in 1973, more than 30 years after its completion.

Bulgakov's experiences with censorship and artistic setbacks give the second part of the novel an autobiographical feel, which eventually introduces its namesake.

"The Master" is an obscure author who has been working on a novel for years, but burned the manuscript after being rejected by the publisher, just as Bulgakov did with his own work.

But the real hero is the master's mistress Margarita.

Her devotion to her lover's abandoned dreams has a strange connection to the adventures of a diabolical company, bringing the story to a surreal climax.

Despite its dark humor and complex structure, The Master and Margarita's core is a meditation on art, love and salvation that never descends into cynicism.

And the long wait for the publication of this book, and its survival in the face of adversity, is a testament to what Woland said to the master, "Manuscripts don't burn."

One simple vitamin can reduce your risk of heart disease.

Eating chocolate reduces students' stress.

New drugs extend life for patients with rare diseases.

Health headlines like these appear every day, sometimes diametrically opposed to each other.

There may be a disconnect between the broad headline that grabs attention and the specific, incremental results of the medical research that it covers.

So how can you avoid being misled by glamorous headlines?

The best way to assess the credibility of a headline is to look at the original research that the headline reported on.

We have come up with hypothetical research scenarios for each of these three headings.

Continue reading the description of the first example. Then stop at the headline and answer the question.

These are simplified scenarios.

The actual research will detail many more factors and how they are accounted for, but for this exercise we will assume that you have all the information you need.

First, consider the cardiovascular effects of a particular vitamin, helsium.

The study found that participants who took Healthium had higher healthy cholesterol levels than those who took a placebo.

Their levels are now similar to those of people who have naturally high levels of this type of cholesterol.

Previous studies have shown that people with naturally high cholesterol levels are less likely to develop heart disease.

So what makes this headline misleading is that "Helcium reduces the risk of heart disease."

The problem with this headline is that the study didn't actually investigate whether Helcium reduces heart disease.

Only the effects of Helsium on levels of specific types of cholesterol were measured.

The fact that people with naturally high cholesterol levels have a lower risk of heart attack does not mean that the same is true for people who use healthium to raise their cholesterol levels.

Now that we've uncovered the Hellsium case, let's tackle a particularly fascinating mystery: the link between eating chocolate and stress.

This hypothetical study recruits 10 students.

Half of them start eating chocolate every day, but half of them abstain from chocolate.

As classmates, they all follow the same schedule.

By the end of the study, chocolate eaters were found to be less stressed than non-chocolate eaters.

What's wrong with this headline: "Eating chocolate reduces stress in students" It's hard to draw conclusions about students in general from a sample of 10 people.

This is because the smaller the number of participants in a random sample, the less likely it is that the sample as a whole closely represents the target population.

For example, if the wider student population is 50/50 male and 50% female, the probability of drawing a sample 10 that is 70% male and 30% skewed is about 12%.

With 100 samples, the probability is less than 0.0025%, and with 1000 samples, the probability is less than 6 x 10^-36.

Similarly, with a small number of participants, each individual's results could have a greater impact on the overall results, skewing overall trends.

Still, there are many valid reasons for scientists to conduct small-scale studies.

By starting with a small sample, you can assess whether you can expect good enough results to conduct a more comprehensive and costly study.

Also, some studies require a very limited number of participants for which it is not possible to recruit a large number of participants.

Reproducibility is key. If the paper draws conclusions from one small study, the conclusions can be questionable. However, a paper is more credible if it is based on many studies with similar results.

There is still one more puzzle.

In this scenario, a study is conducted to test a new drug against a rare, lethal disease.

In a sample of 2,000 patients, those who received a diagnosis and started taking the drug lived longer than those who took a placebo.

The question is a little different this time.

What else would you like to know before deciding whether the headline 'New drug extends life for rare disease patients' is justified?

Before you make this call, you'll want to know how much the drug has extended the patient's life.

In some cases, research results may be scientifically valid but have little relevance to real-world results.

For example, an actual clinical trial of a pancreatic cancer drug found it increased life expectancy by 10 days.

Next time you see an amazing medical headline, pay attention to the science it covers.

Even if the full paper is not freely available, a summary of the experimental design and results can be found in the freely available abstract or the body of the news article.

It's exciting to see scientific research in the news, and understanding research results is important.

What I want you to do is, really quickly, nod to the person on the right, then to the person on the left.

(Laughter) Well, maybe last winter, if you were a beehive, you or one of the two you nodded to would have died.

Well, it's a tremendous number of bees.

And this year, for the second year in a row, we lost over 30 percent of our colony. Alternatively, an estimated 30 percent of the colony was lost during the winter.

Well, that's a lot of bees, and that's really important.

And most of those losses are from what we know.

We know that varroa mite infests and causes a lot of loss. There is also the new phenomenon of colony collapse disorder that I talked about last year.

And here is a photo taken on the hills of the Central Valley last December.

And below that you'll see all these outdoor yards, or temporary yards. Colonies are brought in here until February, after which they are shipped to almond mills.

And a documentary writer who visited this place two months after I came here and saw this, described it as not a beehive, but a cemetery with empty white boxes with no bees left inside.

Here, in two sentences, we'd like to summarize the year of work we've been working on to find the cause of this.

And what we do know is that the bees are like having the flu.

And this flu wiped out the bee population.

In some cases, and indeed most of the year, this flu was caused by a virus new to us, or newly identified by us, called the Israeli acute paralysis virus.

A man in Israel first discovered the disease, hence the name, and he now deeply regrets calling it the disease. Of course, because it makes sense.

However, the virus appears to be fairly ubiquitous.

It's also clear that bees occasionally get infected with other viruses and other flus. So the question we still have, and the question that keeps us up at night, is why were bees suddenly so susceptible to this flu, and why are they so susceptible to these other diseases?

And I still don't have an answer to that and spend a lot of time trying to figure it out.

I think it's probably a combination of multiple factors.

We know from very large and dynamic work team activities that we are discovering different pesticides inside hives. And surprisingly, the healthiest hives can also contain the most pesticides. And we discover all these very strange things that we cannot begin to understand.

This opens up the whole idea of ​​examining colony health.

Of course, if you lose a lot of colonies, beekeepers can quickly replace them.

That's why we were able to recover from a huge loss.

If you lost 1 out of 3 cows during the winter, the National Guard would be called out.

What the beekeeper can do, however, is that if there is one surviving colony, it can be split in two.

And the half without a queen can buy a queen.

It will arrive by mail. You can come from Australia, Hawaii, Florida, and we can introduce you to the Queen.

And in fact, America was the first country to have a Queen Bee postal delivery, and in fact it has become part of the zip code that the Queen Bee must be delivered in the mail to make sure there are enough bees in this country.

If you just want a queen bee, you can also purchase a 3-pound package of bees that will be mailed to you. Of course, the post office is always very concerned when a 3-pound package of bees arrives.

You can place this in your hive to replace deadouts.

This meant that beekeepers were very good at replacing dead individuals and were able to compensate for their losses.

So, despite the fact that 30 percent of colonies are lost each year, the same number of colonies still exist in the country, about 2.4 million colonies.

Now, these losses are tragic in many ways, one of which is for beekeepers.

And it is very important to talk about beekeepers first. Because beekeepers are some of the most fascinating people you will ever meet.

If this were a group of beekeepers, everyone from life-or-death card-carrying NRA members to self-proclaimed quaint San Francisco backyard pig farms would be on board.

(Laughter) And all these people are in the same room, and they're all enthusiastic and get along, and they're all there because of their passion for bees.

There is now another commercial beekeeper in that community who makes a living solely from beekeeping.

And these tend to be the most independent, tenacious, intuitive, and inventive people you'll ever meet.

They are just charming. And they are the same all over the world.

Earlier this year, I had the opportunity to work in Haiti for two weeks.

If you've been to Haiti, Haiti is just a tragedy.

So, while there may be a hundred different explanations for why Haiti is a poor country, there is no excuse for such devastation.

But you met this beekeeper and I also met this beekeeper here and he is one of the most knowledgeable beekeepers I have ever met.

Although he has no formal education, he is very knowledgeable.

A project we were working on needed beeswax. He is very capable and was able to render the most amazing blocks of beeswax I have ever seen on this pasture from cow dung, tin cans and bales he used as a screen. And their ingenuity impresses.

There is also Dave Hackenberg who is the representative of CCD.

He was the first to identify and raise the alarm about the condition.

And he has a history of these trucks, moving bees up and down the coast.

And while a lot of people talk about trucks and migrating bees and that's bad, we've been doing it for thousands of years.

The ancient Egyptians transported bees up and down the Nile on rafts, so this idea of ​​a mobile bee army is nothing new.

And one of our real concerns about Colony Collapse Disorder is the fact that it costs a lot to replace dead colonies.

And you can do it one year in a row, or maybe two years in a row.

But if you lose 50% to 80% of your colony, you won't survive 3 years in a row. And we are really worried about losing this sector of the industry.

It is important in many ways, one of which is due to its agricultural culture.

And these migratory beekeepers are America's last nomads.

You know, they pick up nests. They move families once or twice a year.

And if you look to Dade City, Florida, you'll find all of the Pennsylvania beekeepers there.

And 32 miles down the road is Groveland, where all the Wisconsin beekeepers go.

And if I'm ever in the Central Valley in February, I'll go to this cafe, Kathy and Kate, at 10am.

And this is where all the beekeepers meet after spending the night moving the bees into the almond fields.

They all have breakfast and complain about everyone there. It's a great experience. I definitely recommend stopping by the diner at that time. Because it is a very important American experience.

And we see these families, nomadic families, father to son, father to son hurting.

And even though they are the kindest people ever, they are not people who like to ask for help.

When a man loses all his bees due to a truck overhaul, they all work together to provide 20 hives to make up for the lost colony.

So I think this is a very dynamic, historical and exciting community to be a part of.

Of course, honey isn't really important to bees.

And I highly recommend you, but all use honey.

In short, this is the most ethical sweetener, a dynamic and fun sweetener.

However, it is estimated that about 1 in 3 of the food we eat is directly or indirectly pollinated by bees.

Now, just to clarify, let's take a look at what I had for breakfast yesterday morning -- I should have had some cranberry juice, some fruit, some granola, and some whole wheat bread, I just realized I had Wonderbread with some jam and some coffee -- and if I had taken out all these ingredients -- except for the almonds I wasn't going to take out of the granola -- I wouldn't have gotten much if I had taken out all the ingredients that the bees pollinated indirectly or directly. on our plate.

So without the bees, we wouldn't starve, but obviously our diet would be reduced.

For bees, flowers are the fountain of life, and for flowers, bees are messengers of love.

This is a really nice expression. Because, as a matter of fact, bees are flower sex workers. They are paid for their services.

They are rewarded with pollen and nectar to move pollen, the male's sperm, from flower to flower.

And some flowers are self-pollinated. In other words, the pollen of a blooming flower cannot fertilize itself.

For example, an apple orchard might have 10 apples of one variety, but another apple tree with a different pollen type.

And bees are very loyal.

When out for pollination, or collecting pollen from one flower, it stays exclusively on that crop to help produce.

And of course they are made to carry this pollen.

They accumulate static electricity, which makes pollen jump to them and help spread the pollen from flower to flower.

But bees are in the minority.

Honey bees are not native to America. They were introduced along with the colonialists.

And in fact, there are more bees than mammals and birds combined.

In Pennsylvania alone, we've been researching bees for 150 years, and the last three years have been very intense.

We have identified over 400 bee species in Pennsylvania.

Since 1950, 32 species have not been confirmed or discovered in the state.

This could be due to us not sampling correctly, but I think it suggests something wrong with the pollinating power. And these bees are charming.

There is a bumblebee on the top.

And bumblebees are so-called eusocial. Not truly sociable, as only the queen bee is social during winter.

There are also sweat bees, but these are little gems flying around.

They are like little flies that fly around.

Then there is another kind of bee. We call them stealing parasites. It's a very fancy way of saying it, but it's malicious, it's a killer. What words am I looking for? Murder -- AUDIENCE: Bees?

Dennis van Engelsdorp: Bees. I got it. Thank you.

(Laughter) What these bees are doing is sitting there. This solitary bee burrows into the ground or burrows into branches to gather pollen into balls, onto which it lays eggs.

Well, these bees hang out in that hole, wait for their mother to fly away, go inside, eat the eggs, and lay their own eggs there. So they do no work.

In fact, knowing that you have these larvae bees means you have a healthy environment because they are at the top of the food chain.

And indeed, there is now a Red List of pollinators we fear are disappearing, and on top of that list are many of these invasive parasites, as well as bumblebees.

In fact, if you live on the West Coast, visit the website here. I am seriously looking for someone to look for some bumblebee pieces. Because there are also extinct bumblebees. Or maybe the population is declining.

So it's not just bees that have problems, we don't understand these native pollinators and every other part of our community.

And of course, bees aren't the only important factor here.

There are other pollinating animals such as bats, but bats are also in trouble.

And I'm glad I'm a bee person instead of a bat person because I don't have the money to study the bat problem.

And bats are dying at an alarming rate.

The white-nose syndrome wiped out the bat population.

Suppose there is a cave in New York with 15,000 bats, and 1,000 remain. That's like San Francisco becoming half the county's population in three years.

It's unbelievable. And there is no money to do it.

But the good news is that I think I know what causes all these symptoms. The cause is NDD (Natural Deficiency Disorder).

I think it means that our society has forgotten the connection with nature.

And I believe that if we reconnect with nature, we will have the resources and attention to solve these problems.

And I believe there is an easy cure for NDD.

That means creating a meadow, not a lawn.

I think we have lost our connection and this is a great way to reconnect with our environment.

I've had the opportunity to live by the grasslands for a while now, and it's very charming.

And if you look at the history of turf, it's actually pretty tragic.

A few hundred years ago, grass was a symbol of prestige, so only the very rich could really keep this green, the desert. The desert is completely barren.

In 2001, Americans used 11 percent of all pesticide use on lawns.

5% of greenhouse gases are generated by lawn mowing.

So it's incredible the amount of resources we've spent maintaining our useless biological system, the lawn.

Therefore, this idea should be reconsidered.

In fact, World War I had sheep in front of the White House to help pay for the war, and that's probably not a bad idea. It wouldn't be a bad idea.

I'm not saying this because I'm totally against lawn mowing.

I think there are probably some benefits to keeping the lawn size limited, and I think it's encouraged to do so.

But I also want to reinforce some of the ideas heard here. Because having a pasture, or living near a pasture, is transformative.

It's amazing how we can connect with what's out there.

These milkweed plants have grown on my pasture over the past four years. Observe it in addition to observing the various plants and insects that come to these flowers. You've heard about the relationship with wine, and this relationship that wine has as it matures and develops different aromas.

And this is companionship, this is a relationship that never dries up.

Drink this wine and you'll never run out of companions.

And I recommend watching it.

Well, not all of us have pastures or lawns that can be remodeled. So, of course, you can always grow meadows in pots.

Bees can apparently be gateways to other things.

So I'm not saying you should plant pots in meadows, I mean you should plant pots in meadows.

But you can also have this amazing community of beekeepers living on the rooftops of cities and buildings. This is in Paris, where beekeepers live.

And since the beehive is the most amazing and incredible thing, everyone should open it.

And if you want to cure NDD (Natural Deficiency Disorder), I think this is a great way to go.

Get a beehive to grow a meadow and watch life come back to your life.

So, what we can do, if we do this, I think we can definitely achieve our future, a more perfect future. That includes beekeepers, it includes bees, and their pastures.

And that journey, the journey of change that takes place in growing pastures, keeping bees, and observing native bees there, is a very exciting one.

And I hope you can experience it too and talk to me about it someday.

Thank you for being here. thank you very much.

Seafood is an important source of protein and nutrition for three billion people worldwide.

However, a recent study found that 33% of wild fisheries are overfished, with the remaining 60% being caught at full capacity.

In fact, more than half of the seafood we eat – from seafood and shellfish to seaweed and algae – is not wild-caught.

Cultivated by aquaculture or aquaculture.

Aquaculture is one of the fastest growing food industries, with its volume increasing by 5.8% each year.

However, different aquaculture methods come with different benefits and challenges. Some of them reflect serious problems we have seen in industrial agriculture.

So how can we avoid repeating the mistakes we made on land and at sea?

What aquaculture approaches are we currently using, and what does a sustainable way to farm the ocean really look like?

One of the most common aquaculture methods uses large cages made of nets to farm fish offshore in floating cages measuring about 1000 square meters.

Commonly farmed off the coast of Chile and in the fjords of Norway, these fish, like many industrially farmed animals, occupy stressful, overcrowded pens.

They produce large amounts of waste, pollute surrounding areas and can spread disease to wild species.

To make matters worse, antibiotics used to fight disease are not fully absorbed by fish and are excreted into the environment.

Net pens also pose an escape hazard, releasing vast numbers of fish competing for resources and undermining local gene pools with genes adapted to capture.

Escaped fish can even destroy local ecosystems as invasive species.

Other technologies, such as the artificial coastal ponds commonly used for shrimp farming in Southeast Asia, pose additional environmental problems.

Like fences, these ponds are prone to pollution and disease.

Its construction also frequently destroys important ecosystems such as mangroves and wetlands that protect coastal areas from storms, provide habitat and absorb large amounts of greenhouse gases.

One way to solve these problems is to farm fish on land in a fully contained system.

Tanks and raceways can recirculate and filter water to prevent contamination.

But even fully contained facilities still struggle with another major hurdle: fishmeal.

About 10% of the seafood caught worldwide is used as animal feed, including carnivorous farmed fish.

Researchers are working to develop fish feeds made from proteins from insects and plants, but so far many inland fish farms have led to overfishing.

All these obstacles make sustainable aquaculture feel like a long way off, but innovative farmers are finding new ways to responsibly farm the oceans.

The most promising solution may be to look down the food chain.

Instead of cramming cages with large carnivorous fish, you can work with the natural ocean system to produce large amounts of shellfish and seaweed.

These low-maintenance plants and animals do not need to be fed at all.

In fact, they naturally improve water quality by filtering the water as they take in the sunlight and nutrients in the seawater.

By absorbing carbon through photosynthesis, these farms help combat climate change and reduce local ocean acidification while creating habitats for other species to thrive.

A shift to restorative marine aquaculture could provide good jobs for coastal communities and support healthy plant- and shellfish-based diets with remarkably low carbon footprints.

In just five months, 4,000 square meters of sea produce 25 tons of seaweed and 250,000 shellfish.

With the right distribution network, a series of small farms together could be the size of Washington state and feed the planet.

Farms like this are already popping up all over the world, and a new generation of farmers is rising up in pursuit of a more sustainable future.

Done properly, regenerative marine aquaculture can play a key role in helping our oceans, our climate and ourselves.

"The Opposite Game" by Patricia Maisch Today my students and I will play the Opposite Game using lines from Emily Dickinson. My life stood a loaded gun, it's over, I write it on the board and pause for them to summon the antonym – did my your life stand death? Sit an empty gun heavily loaded?

gun.

In a moment much like the moment between the lightning and the sound, the children just stared at me, and then came the stormy, hailstormy answer – said Flower. No, the book, says another. It's stupid, third to cry, the opposite of a gun is a pillow. Or maybe there's a hug but it's not a book, it's not a book at all. With this, the other members gathered their thoughts and suddenly yelled at each other. no one can agree. Every student has a final answer. It's a song, a prayer, a promise like a wedding ring, and later a baby is born. Or what is that person who gives birth to babies?

Midwife? Yes, I am a midwife. No, it's not. You are so wrong that you will never be right again. It's a whisper, a star, saying "I love you" to your hand, and touching someone's ear. are you crazy? Are you the president of Bakaland? When is the election?

It's a teddy bear, a sword and a perfect perfect peach.

Go back to the first one. This is a flower, a white rose.

When the bell rings, he reaches for the eraser, but the girl steals it from his hand. Nothing has been decided, she says, "It's not over here." Leave all the answers on the board. The next day some of them stopped talking to each other and took sides.

There is a flower club. and a kitten club. And two boys who call themselves Snowballs. The rest stuck with the original game and tried to write something like poetry.

It's a diamond, it's a dance, opposite a gun is a French museum.

It is the moon, the mirror, the bell, the listener.

The altercation started again, more yelling, and eventually a new club was founded. For the first time, I dared to push them.

You're probably right, I say.

Well, maybe. Maybe that's all we said. Maybe that's all we didn't say. It's a space for words and words.

they are looking at each other now. It's what's in this room, what's outside this room, what's across the street, and what's in the sky.

Everyone on campus, in shopping malls, and waiting in hospitals. and at the post office. And yes, this is also a flower. all flowers. the entire garden.

Opposition to a gun is the same no matter where you point it.

Don't write that on the blackboard, they say. Just say a poem.

Your death will remain in many empty poems.

My parents gave me the wonderful name Baratunde Rafik Thurston.

Well, Baratunde is based on a Yoruba name from Nigeria, but we are not Nigerians.

(Laughs) That's how black my mother was.

(Laughter) "Give this boy as black a name as possible. What does the book say?"

(laughter) Rafiq is an Arabic name, but we are not Arabs.

My mother just wanted it to be harder for me to fly in the 21st century.

(Laughter) She foresaw America going to chauvinism.

She was a black futurist.

(Laughter) Thurston is a British name, but we are not British.

But I want to speak out against the generational, inhuman economic system of America's chattel slavery.

Thurston would also be a great name for Starbucks.

It really speeds up the process.

(Laughter.) My mother was a Renaissance woman.

Arnita Lorraine Thurston was a computer programmer, former domestic worker, sexual assault survivor, artist, and activist.

She prepared me for the world with classes in black history, martial arts, and urban farming, then sent me to the private Sidwell Friends School in seventh grade. This is the school where the President of the United States sends his daughter to, and he sent me like this.

(Laughter) I had two major challenges going to that school. It's about not losing your blackness and not losing your glasses.

Both have now been achieved.

(Laughter) Sidwell was a great place to learn art and science, but I also learned how to live among white people.

It will prepare you for the rest of your life at Harvard, corporate consulting, or a job on The Daily Show or The Onion.

I'd like to write down many of these lessons in my memoir How To Be Black, but if you haven't read it yet, be racist. Because (laughter) you have a lot of time to read the book.

But America insists on reminding and teaching me what it means to be black in America.

It's December 2018 and I'm in suburban Wisconsin with my fiancée.

We are visiting her parents and they are both white so she is also white.

That's how it works. I am not making the rules.

(Laughter) She drank, so I gave her a ride in her parents' car, but the police stopped her.

I'm scared.

Flashing lights to indicate compliance.

I slowly pull over under the brightest streetlight I can find, in case I need witnesses or dashcam footage.

We took out our ID and car registration, rolled it out, rolled down the windows, put our hands on the steering wheel, all before the police got out of the car.

This is how you stay alive.

As I wait, I think of these headlines - 'Police shoot dead another unarmed black man' - I don't want to join them.

The good news is our police officers were friendly.

She said our tags had expired.

So, white parents, if your child is associated with someone rated Dwayne "The Rock" Johnson or darker, you need to have that car inspected. Please update the documents each time we visit.

It's just common courtesy.

(Laughter) (Applause) I was lucky.

We had a law enforcement expert come in.

I survived something I didn't have to survive.

And I think of this series of stories -- "Police shoot another unarmed black man" -- and that season when those stories popped up all over the place.

As I scrolled through my feed, I saw pictures announcing the birth of the baby.

You'll see an ad for a product you just whispered to a friend yesterday.

I saw a video of a police officer shooting someone who looked a lot like me.

And I'd also like to see a thought-out article on how millennials replaced sex with avocado toast.

(Laughter) It was a confusing time.

Those stories kept popping up, but in 2018 they were replaced by other kinds of stories, like "White Woman Calls Cops for Black Woman Waiting for Uber."

It was Brooklyn Becky.

Then there was "White woman calls police on 8-year-old black girl selling water."

It was Permit Patty.

Then there was “Woman Calls Police Over Black Family BBQing On Oakland Lake”.

It was the now infamous BBQ Becky.

And I would argue that these stories of being black and yet living are actually progress.

We once found out about it after a police extrajudicial murder.

Now we have videos of people calling 911.

We are upstream closer to the problem and closer to the solution.

So I started collecting and collecting as many of these stories as I could.

I have built an evolving database at baratunde.com/livingwhileblack.

Seeking understanding, I realized that the process was actually schematizing the sentences to make sense of these headlines.

And I would like to thank Sidwell's English teacher Erica Berry and all the English teachers.

You gave us the tools to fight for our own freedom.

What I found was the process of deconstructing the headlines and understanding the coherent layers of each. In other words, the subject takes action against a target engaged in some activity, so ``a white woman calls the police an 8-year-old black girl'' is the same as ``a white man calls a black woman using a neighborhood pool to the police'' is the same as ``a woman calls the police a black Oregon legislator who is campaigning in a constituency.''

They are the same.

By schematizing sentences, I was able to schematize the white supremacy that allows such sentences to be true. Now let's pause to define the terms.

When I say "white supremacy," I'm not just talking about Nazis and white power activists, and I'm not saying all white people are racist.

What I am referring to is a system of structural advantage that gives whites an advantage over others in social, economic, and political spheres.

It's what Brian Stevenson of the Equal Justice Initiative calls the story of racial differences, the story we tell ourselves to justify things like slavery, Jim Crow, and mass incarceration.

So when I saw this pattern repeated, I was maddened, but also inspired to create a game that could turn this traumatic exposure into a more healing experience: a game of words.

We will talk through the game.

The first level is the training level and requires your participation.

Our aim is to determine if this is real or fake.

Did this happen or didn't it happen?

For example: "Catholic University Librarian Reported Student to Police for 'Arguing'." Clap your hands if you think this is true.

(Applause.) Clap your hands if you think this is fake.

(Applause.) Unfortunately, the reality is, and as a point of information, discussing it in the law library is just the right place to do it.

(laughter) This student should be promoted to professor.

Now that the training level is complete, let's move on to the actual level.

Level 1, our objective is simple. It's about reversing the roles.

So "a woman calls a black Oregon legislator to the police" becomes "a black Oregon legislator calls a woman to the cops."

So "white man calls police on black woman using neighborhood pool" becomes "black woman calls police on white man using neighborhood pool".

How do you like to overturn racist apples?

Level 1 is now complete. Level up to level 2. The aim here is to make the reversal more believable.

To be honest, it's not unreasonable enough for a black woman to call the police on a white man using a pool, but what if the white man tries to touch her hair without asking, or makes oat milk while riding a unicycle, or just talks to everyone during a meeting?

(laughter) We've all been there, haven't we?

Seriously, we've all been there.

Level 2 is now complete.

But it also contains a caveat. Simply reversing the tide of injustice is not justice.

It's revenge, it's not our mission, it's another game. Then level up to level 3. The purpose is to change behavior. This is also known as "Calling the police isn't the only option, oh my gosh what's going on!"

(Applause.) And we have to pause the game to remind ourselves of the structure.

A subject performs an action on a target engaged in some activity.

"White woman calls police for black property investor inspecting her property."

“California Safeway calls police on black woman who donated food to homeless.”

"Gold Club called police twice for black women playing too slowly."

In all these cases, the subject is usually white, the target is usually black, and the activity can be anything from sitting in a Starbucks, using the wrong kind of barbecue, taking a nap, to walking "excited" on the way to work (I just call it "walking to work").

(Laughter.) And my personal favorite is not to stop my dog ​​hitting his dog, but this is clearly a dog police case, not human police.

All these activities lead to life.

Our existence is interpreted as a crime.

Now, this is the moment in the presentation that I must say is that it's not all about race.

Crime is a problem and should be reported, but ask yourself if armed men need to show up to fix this situation. Because when they show up to me things are different.

We know police officers use violence more against blacks than whites, and we are learning the role of 911 in this.

Thanks to preliminary research by the Center for Police Equity, we have learned that in some cities most of the interaction between police and citizens is due to 911 calls rather than police stoppages, and that most of the violence, the use of force against citizens by police, is in response to those calls.

Moreover, when police responding to calls use force, which is increasing in areas where the proportion of the white population is also increasing, aka gentrification, aka unicycle and oat milk, aka BBQ Becky, when she feels threatened, she becomes a threat to me in my neighborhood, which forces me and people like me to police themselves.

We quiet ourselves, walk on eggshells, and perhaps park on the side of the road under the brightest light we can find so that our murders show up nicely on camera. And we do so because we live in a system in which white people can too easily invoke lethal violence to secure their own comfort.

(Applause.) California Safeway didn't just call the police for black women donating food to the homeless.

They ordered armed and unaccountable men to attack her.

They essentially called for drone strikes.

This is weaponized discomfort, and it's nothing new.

Between 1877 and 1950, at least 4,400 lynchings of racial terror against blacks were documented in the United States.

It also had a headline.

"Reverend T.A. Allen was lynched for organizing local sharecroppers in Hernando, Mississippi."

"Oliver Moore was lynched for threatening a white girl in Edgecombe County, North Carolina."

"Nathan Byrd was lynched near Lurin, Texas for refusing to turn his son over to a mob."

Whether the act is “lynching” or “calling the police,” behavior needs to change.

Now that the distance between us has closed, let's go back to the game, the mission.

The purpose of Level 3 is to change behavior.

So what if instead of "calling the police on a black woman donating food to the homeless," California Safeway simply thanked her?

Being grateful is much cheaper than having law enforcement on the scene.

(Applause.) Or, alternatively, we could give her food that would otherwise go to waste, giving her more credibility as a citizen.

Alternatively, a white woman who called the police on an 8-year-old black girl could have bought all the inventory from the little black girl and helped small businesses.

And the white woman who reported the black real estate investor to the police also agrees that we would all be better off if she ignored him and went about her own damn business.

(Laughter) Taking care of yourself is a great choice, a great choice.

Choose more often.

Level 3 is complete, but there is a final bonus level whose objective is inclusion.

I've seen headlines like "Powerful people masturbate in front of young women who visit their offices."

What a strange choice for those in power to make.

There are many other actions available to him.

(Laughter) 'Listen', 'Mentor', 'Inspired, start a joint venture, now we're all rich'.

(Laughter) I want to live in a world where everyone is rich now, but because of his wrong choices, we are all in a poorer world.

You don't have to do it this way.

This wordplay served as a reminder that white supremacy, like misogyny and any systemic abuse of power, has structure.

Structure is what makes them systematic.

I am asking people here to look at that structure and where their power lies and, more importantly, our humanity targeted by this structure.

I am here because I was loved, invested, protected and lucky. I went to the right school, so I'm half famous, mostly happy, and meditate twice a day. Yet I am tired of walking around in fear because I know that someone seeing me as a threat could be a threat to my life.

I am tired of carrying the invisible burden of other people's fears. And most of us do, and we don't need to. Because this can change, it can change behavior, which can change stories and change the systems that allow those stories to happen.

A system is just a collective story that we all agree on.

Writing a better reality that we can all partake in as we change them.

We are asking you to exercise your power to choose.

I would like to ask you to upgrade.

thank you.

My name is Baratunde Rafik Thurston.

(applause)

This is a strange and wonderful brain that produces the idea of ​​a kind of alternative intelligence on earth.

This is a brain formed within a very strange body, with the equivalent of small satellite brains distributed throughout the body.

How different is it from the human brain?

It's so different that my colleagues and I seem to have a hard time understanding how that brain works.

But what we can say for sure is that this brain can do wonders.

So who does this brain belong to?

Come join me for a short dive into the ocean where life began and take a peek.

As you may have seen before, we are on the back side of a reef and there are rocks and lots of sand and fish swimming around...

And suddenly this octopus appeared, glowing white and squirting ink on my face.

In reverse slow motion you can see rings appearing around the eyes and then patterns appearing on the skin.

And watch the 3D texture of the skin change to create this beautiful 3D camouflage in action.

In other words, the skin has 25 million colored organs called chromatophores, and all the bumps there are called papillae, and they are all nerve-controlled and can change in an instant.

I would argue that dynamic camouflage is a form of "intelligence".

The level of skin complexity with quick precision changes is truly amazing.

So what can you do with this skin?

Now, let's take a moment to think about what skin can do besides camouflage.

Here you will see a mimic octopus and patterns.

Sudden and dramatic changes. It's a signal, not a camouflage.

Then it goes back to the usual pattern.

We then see a Broad Crab Squid showing a passing cloud display as it approaches its crab prey.

And finally, when a flashy, camouflaged squid appears, it immediately switches to this bright warning sign.

What we have here is a sliding scale of expression, a continuum between conspicuity and camouflage, so to speak.

And this requires a lot of control.

Well, what do you think?

The brain is very good at controlling.

The octopus brain shown here has 35 lobes and 80 million tiny cells.

That's interesting, but what's really strange is that there are even more neurons in this animal's skin, especially as shown in yellow.

The skin has 300 million neurons, while the brain itself has only four times that number, 80 million.

As you can see, each of the eight arms actually has one small satellite brain and the equivalent of a spinal cord.

This is a very unusual way of building the nervous system in the body.

So what is that brain good for?

That brain has to outwit other big, smart brains that want to eat it, including porpoises, seals, barracuda, sharks, and even us humans.

So decision-making is one thing this brain has to do, and it works very well.

Here, this octopus can be seen roaming about, only to suddenly stop and create the perfect camouflage.

This is really amazing. Because when these animals forage in the wild, they have to make over 100 camouflage decisions during a two-hour foraging period, which they do twice a day.

So, decision.

They also think about where they will go and how they will get home.

So it's a matter of decision making.

This camouflage can be tested by pulling it out from under the rug to give it a checkered pattern, like the squid you see behind me. Plus, we do our best to match patterns with a little ad-libbing, using weird visual information.

Therefore, other cognitive skills are also important.

Squids have a different kind of smarts.

They have very complicated and interesting sex lives.

They have quarrels, flirting, courtship, spousal protection, and deception.

Sound familiar?

(Laughter) And it's really amazing that these animals have the intuitive ability to do these things.

You can see a male and a female here.

The male on the left used to fight with other males to mate with the female, but now shows a double pattern.

He shows courtship and love on her side and fights on the other.

Watch him as she changes places -- (laughter) and you'll see that he fluidly shifts his courtship pattern to the side of the woman.

Therefore, this kind of dual signaling at the same time as a change in behavioral context is truly extraordinary.

requires a lot of brain power.

Now, the other way to look at this is, well, maybe we have 50 million years of evidence for two-faced men.

(Laughter) Okay, let's move on.

(Laughter) Reef octopuses have a tough job of going to many places and remembering and finding their burrows.

And they do this very well.

They have short and long term memory and learn things in 3-5 attempts. This is a good brain.

They also have an exceptionally good spatial memory.

They may even stop feeding and return in a straight line to the burrow.

A diver watching it gets completely lost, but can find his way back, so it's a really sophisticated memory.

Now, let's look at squid's sleep behavior in terms of cognitive performance.

Especially on the right side you can see that the eyes are twitching.

This is a kind of dream of rapid eye movements that was thought to be done only by mammals and birds.

You can see the fake color I put in to see the skin pattern flashing, and this is what often happens.

But that's not normal waking behavior. It's all different.

Well, dreams are when memories are anchored, so perhaps this is what happens in squid.

Now, another form of memory that is really unusual is episodic memory.

This means that humans need four years of brain development to remember what happened during a particular event and when and where it happened.

The "when" part is especially difficult, but these kids can do it.

But guess what?

Recently, it turned out that clever squid also have this ability. In an experiment last summer, when squid were fed different foods at different times, they had to match up exactly where it was and when it was last seen.

Foraging must then be guided to the rate at which different types of food are replenished at different locations.

Sound complicated?

It was so complicated that I could hardly understand what the experiment was about.

So this is a very advanced cognitive process.

Now, speaking of brains and evolution at this point, on the right is the pathway of vertebrate brain evolution and we all have superior brains.

I think everyone will admit that.

But if you look to the left, part of the evolutionary pathway that led to octopuses outlined here, both converge on complex behavior and some form of intelligence.

The last common point between these two lineages was 600 million years ago, a C. elegans with very few neurons, so the pathways were highly divergent, yet complex behaviors converged.

I have a basic question here. Are octopus brain structures fundamentally different from vertebrate lineages down to the smallest level?

We don't know the answer at this point, but if the answer turns out to be yes, one might wonder if there are different evolutionary pathways to producing intelligence on Earth, and that the artificial intelligence community would be interested in those mechanisms.

Now, let's talk a little bit about genetics.

We have a genome, we have DNA, DNA is transcribed into RNA, RNA translates it into protein, and that is how we exist.

Well, cephalopods do it differently.

They have a large genome, they have DNA, they transcribe it into RNA, but now something dramatically different happens.

They're editing that RNA at astronomical, bizarre speeds, 100 times faster than humans and other animals do.

And it produces a lot of protein.

And where are most of them?

nervous system.

So perhaps this could be an unconventional way for animals to evolve behavioral plasticity.

This involves a lot of guesswork, but it gives you something to think about.

I'd like to share a little bit of my experience in trying to get this kind of information using my and my colleagues' wisdom.

We dive, but we can't stay underwater forever because we can't breathe. Therefore, it is necessary to act efficiently.

Being fully sensory immersed in that world helps us understand what these animals are really doing. And when you really start to understand that octopuses are thinking, thoughtful, inquisitive animals, I have to say that being there and communicating with octopuses and divers is truly an amazing experience.

And this is the kind of thing that really inspires me endlessly.

Let's go back to smart skins for a while.

This is a squid and camouflage pattern.

If you zoom down you can see that there are beautiful pigments and reflectors.

The chromatophores open and close very quickly.

And in the next layer of skin something very interesting happens.

The chromatophores are closed and you can see this magical iridescent glow coming out of the skin.

This is also neurally controlled, and the combination of the two gives us a high-resolution view of the squid's skin. You get this beautiful pigmented color and even a very nice faint redness.

So how can you put this information to good use?

I talked about those skin bumps, the nipples.

This is a giant squid from Australia.

It features smooth skin and a prominent pattern.

Take 5 consecutive photos at 1 second intervals to observe the changes in this animal. One, two, three, four, five, and now I'm seaweed.

And you'll be back in no time to see smoother, more noticeable skin.

This is a really nice, changing skin.

You can see more details here.

If you raise the periscope, you can see beautiful nipples.

And if you look a little closer, you can see that the individual nipples are raised. There are small bumps there, nipples on nipples, etc.

All species have dozens of different shapes and sizes of protrusions, which are neurally fine-tuned to create controlled camouflage.

So now some of my fellow engineers at Cornell saw our work and said, 'I think we can make some of these.'

This is because soft materials with controlled shapes in this way are extremely rare in industry and society.

And they went ahead and worked with us to create the first samples of soft material artificial nipples shown here.

And you can see them puff up into different shapes. And if you press it with your finger, you will find that it is a little flexible as it is.

Here's an example of how it works.

Now, I would like to move on to fabric colors, which I think have many applications.

See the kaleidoscope of dynamically controlled pigment and reflector colors found in cephalopods.

Now that we know enough about how they work, we can start applying this not only to fabrics, but perhaps to modifiable cosmetics.

Moreover, the recent discovery of light-sensing molecules in octopus skin may eventually pave the way for smart materials that sense and respond to themselves.

Well, this form of biotechnology, or biomimicry, has the potential to change the way you see the world, even on water.

Consider, for example, the body-distributed brain and behavior of an octopus, or artificial intelligence inspired by the intelligent skin of a squid translated into cutting-edge fashion.

Well, how do we get there?

Perhaps all we have to do is start getting a little smarter about how smart cephalopods are.

thank you.

(applause)

These rocks have been crashing into the Earth for about 3 billion years and are responsible for much of what happens on Earth.

This is an example of a real meteorite, and the speed and heat of the meteorite hitting the Earth allows us to see all of the iron melting, and how much of the iron survives to melt.

From a meteorite from outer space came the original Sputnik.

It is one of only seven Sputniks to survive in space.

This is not a copy.

The Space Age began 50 years ago in October. It was exactly like Sputnik.

And it wouldn't be fun to talk about the space age without seeing the flag that was brought to the moon on Apollo 11 and returned.

Each astronaut was to carry about ten silk flags in his personal kit.

They bring them back and mount them.

So this was actually transported to the moon and back.

I'm looking forward to it.

Of course, the early days of books are important.

And it wouldn't be fun to talk about the early days of books without having a Guttenberg Bible.

You can see how portable and convenient it was to have your own Guttenberg in 1455.

But it's not that book that's interesting about the Guttenberg Bible and the dawn of this technology.

As you know, this book was not driven by reading.

In 1455 no one could read.

So why was the printing press so successful?

This is the original page of the Guttenberg Bible.

So what you're looking at here is the first printed book with movable type in human history, 550 years ago.

We are definitely living in an era where e-paper will replace e-paper.

But why is this so interesting? I'll tell you a quick story here.

It turns out that in the 1450s, the Catholic Church needed money, so they actually hand-wrote words of forgiveness, called indulgences, on paper.

These traveled all over Europe and were sold in hundreds and thousands.

They got you out of Purgatory faster.

And when the printing press was invented, they discovered they could print indulgences. This is the same as printing money.

So all of Western Europe began buying printing presses in 1455. It was to print thousands, then hundreds of thousands, and eventually millions of tiny pieces of paper that would take people from hell to heaven.

That's why the printing press was so successful, and why Martin Luther nailed the 90 Theses. Because he complained that the Catholic Church was going on a rampage, printing indulgences and selling them in every town, village and city all over Western Europe.

In other words, the printers, ladies and gentlemen, were completely driven by the printing of forgiveness and had nothing to do with reading.

See you tomorrow. I also prepared a picture of the library for those who requested a picture.

I plan to eat tomorrow.

(Applause) Instead of showing things from the stage, I'm going to do something special for the first time.

I will show you what the library actually looks like.

So I am married to the most amazing woman in the world.

We'll see why in a moment. Because this is what I said I wanted to make when I went to see Irene.

This is the library of human imagination.

The room itself has three floors.

5,000 years of human imagination are computer-controlled in glass panels.

The room is a theater. Color changes.

And throughout the library there are different objects, different spaces.

It looks like an Escher print.

This is part of the lower part of the library, and the exhibits are constantly changing.

you can walk through. You can touch it.

You can see exactly how much this type of item will fit in your room.

I have my own Saturn V.

Everyone should have one. (Laughter) Here you can see books and objects in the lower floors of the library.

Glass panels have something of an imaginative history.

Walk across a glass bridge suspended in space.

So it's a leap of the imagination.

How do you create one?

Part of the question I answered is whether we are created by surrounding ourselves with stimuli: human achievements, history, what makes us human, passionate discoveries, dinosaur bones that lived long ago, space maps that we have experienced, and ultimately corridors that ignite our minds and imaginations.

I hope to show you a further object or two from the stage tomorrow, but today I just want to say thank you to all the people who came and spoke to us.

Eileen and I are excited to open up our home and share it with the TED community.

(Applause) TED is all about patterns in the clouds.

Everything is a connection.

It's about seeing what everyone else has seen before, and thinking about them in ways no one has thought.

And that is discovery and imagination.

For example, let's look at the DNA molecule model here.

None of us have actually seen it, but we know it exists because we have been taught to understand this molecule.

But you can also see the Enigma Machine, an encryption and decryption machine used by the Nazis during World War II.

Now, you might say, what does this have to do with this.

Well, this is live code, this is dead code.

These two molecules encode and decode.

Yet when you look at them, you see machines and molecules.

But once you look at them with a new perspective, you realize that both of these things are actually connected.

And this is largely why they are connected.

You see, this is a model of the human brain, right?

It's rare because we never actually see the brain.

You can see the skull. But there it is.

All imagination—everything we think, feel, and perceive—is born through the human brain.

And when we create new patterns in this brain, shape it in new ways, it never returns to its original shape.

Here's a quick example.

We think of the Internet. We think about information flowing on the Internet.

And we never think about hidden connections.

But I brought a lump of coal here. Here is one lump of coal.

And what does a lump of coal have to do with the internet?

As you know, it takes the energy of 1 coal to move 1 megabyte of information over the internet.

So every time you download a file, each megabyte becomes a lump of coal.

So a 200 megabyte file would look like this: OK?

So next time you download a gigabyte or two, it won't be free.

Connectivity is the energy it takes to run the web and make everything we think possible possible.

Thank you Chris.

(applause)

The world is close to achieving one of the most important public health goals of our time: eradicating HIV.

For that, you don't even need to cure the disease.

We just need to stop HIV transmission until it's finally gone.

At one time, this goal would have seemed impossible.

HIV has killed millions and is one of the most devastating diseases mankind has ever known.

But we are now at a stage where new advances, such as the once-daily pill, are helping to tackle HIV in an effective way.

HIV is a retrovirus. That is, a copy of HIV itself is integrated into the infected cell's DNA, allowing it to replicate and infect other cells.

HIV has evolved various ways to evade the human immune system, making it difficult to cure.

However, by developing ways to stop HIV from replicating, the spread of HIV itself can be stopped.

That's where antiretroviral drugs, aka ARVs, come in.

ARVs are a group of drugs that work in different ways to fight HIV.

Some block HIV's access to immune cells, while others stop the virus from replicating itself.

ARVs work prophylactically even in people who are not infected with HIV.

This type of approach is called pre-exposure prophylaxis (PrEP).

PrEP works by accumulating in the human body and preventing HIV colonization.

This means that HIV-negative people who are at risk of contracting HIV can take certain ARVs to protect themselves before they become infected.

This is where it gets particularly interesting. For HIV-infected people, ARVs can also dramatically reduce HIV transmission.

This is called “preventive treatment”. Globally, this could end the HIV epidemic.

It is based on the idea that HIV-infected people taking ARVs can reduce the levels of the virus in their bodies to undetectable levels.

That doesn't mean the virus has disappeared. It may still be lurking inside the cell, ready to reactivate if treatment is discontinued.

However, HIV cannot be detected as long as it is in a latent state by drugs.

And if HIV cannot be detected, it cannot be transmitted.

In theory, this means that by testing everyone at risk for HIV and treating those who test positive, we can stop transmission and ultimately eradicate HIV.

But in the real world things are more complicated.

Many at-risk HIV-negative people worldwide do not have access to PrEP or ARVs, and people living with HIV may experience difficulties taking ARVs.

These problems are often most acute in countries with the highest burden of HIV infection.

The availability of these drugs depends on access to a functioning healthcare system, which not everyone has.

This is one of the reasons why a significant investment of resources will be required to improve these systems if the HIV epidemic is to be permanently halted.

A study conducted by UNAIDS estimates that achieving an almost 90% reduction in new HIV infections by 2030 will require between $20 billion and $30 billion annually.

This investment will initially allow more people to get tested, and more people to get and stay on treatment.

Achieving this goal and improving healthcare in general is in the best interest of everyone, from individuals to society as a whole.

We have a roadmap to ending the HIV epidemic in the near future and potentially eradicating the disease entirely in a few generations.

Between 1996 and 2017, the number of new HIV infections was nearly halved, and ARV treatments have enabled millions of people still living with the virus to live longer, healthier lives.

With continued and increased investment, HIV prevalence can be kept low enough to end HIV once and for all.

An HIV-free world is no longer inconceivable and closer than ever.

Just play a simple video clip.

Video: On December 5, 1985, a bottle of 1787 Lafite was sold for £105,000. This is nine times the previous world record.

The buyer was Kip Forbes, the son of one of the 20th century's most colorful billionaires.

The original owner of this bottle turned out to be one of the most enthusiastic wine lovers of the 18th century.

Château Lafite is one of the world's finest wines and the prince of every wine cellar.

Benjamin Wallace: Well, that's all for the videotape of the event that sparked one of the longest-running mysteries in the modern wine world.

And that mystery existed thanks to a gentleman named Hardy Rodenstock.

In 1985, he announced his amazing discovery to his friends in the wine industry.

Some Parisian workers broke through a brick wall and stumbled across this wine stash. This was apparently the property of Thomas Jefferson. 1787, 1784.

He did not reveal the exact number of bottles, nor did he reveal the exact location of the building, nor did he reveal exactly who owns the building.

The mystery continued for about 20 years.

In 2005 it finally started to get resolved thanks to this guy.

Bill Koch, a Florida billionaire who owned four bottles of Jefferson's, came under suspicion.

And in the end, he spent over $1 million, hiring ex-FBI and ex-Scotland Yard agents, to try and find out.

There is now ample evidence to show that Hardy Rodenstock is a fraud and that Jefferson's bottle is a fake.

But in those 20 years, an incredible number of truly recognizable and accomplished figures in the wine world have, in a way, been drawn into the orbit of these bottles.

I think they wanted to believe that the most expensive wine in the world must be the best wine in the world, the rarest wine in the world.

I became more and more of a kind of voyeuristic interest. Why do people spend such a ridiculous amount of money on so much more than just wine and they live better off than I do?

So I decided to embark on a quest.

With the generous patronage of the magazines I write for from time to time, I decided to sample the best, most expensive, or most coveted items from about a dozen categories. As you can imagine, this was a very arduous quest.

(Laughter) This was the first.

A lot of the Kobe beef you see in America is not real.

It may come from Wagyu beef, but it doesn't come from Hyogo prefecture in the original Japanese Appalachians.

There are very few places in the US where you can taste the real Kobe, and Wolfgang Puck's restaurant The Cut in Los Angeles is one of them.

Went there and ordered the 8 oz ribeye for $160.

When it arrived, it was very small.

And I was furious.

$160 for this? It was that kind of feeling.

And when I took a bite, I wished it was smaller because Kobe beef is so rich.

It's like foie gras, not even steak.

I could hardly finish it.

I was really happy when I finished.

(Laughter) Well, the photographer who took the photos for this project had his dog posing in a lot of the pictures for some reason. That's why this character will appear repeatedly.

I guess this tells you that I didn't think it was really worth the price.

white truffle.

One of the world's most expensive luxury foods by weight.

To try this, I went to the Mario Batali restaurant in Manhattan's Del Post.

A waiter came out with a pinch of white truffle and a shaver, rubbed it on my pasta and said, "Do you like truffles, Mr. Signore?"

And the charm of white truffle is in its fragrance.

Actually, it's not to their liking. It's not in their texture.

It's in the smell.

As these white pearlescent flakes hit the noodles, this unforgettable, wonderful nutty, mushroomy aroma wafted through the air.

It disappeared after 10 seconds.

And my pasta was left with these little ugly flakes, but you know, it served its purpose, so I'm afraid to say this was a disappointment for me too.

There were some, some of which were disappointing.

(Laughter) Right.

The magazine wouldn't pay me to go there.

(Laughter) But they gave me a tour.

And this hotel suite is 4,300 square feet.

You can enjoy 360 degree views.

There are 4 balconies.

Designed by architect I.M. Pei.

Comes with its own Rolls-Royce and driver.

There is a dedicated wine cellar, and you can draw freely.

When I took the tour, it actually included some Opus Ones, which was nice to see.

$30,000 per night in a hotel.

Soap made from silver nanoparticles with antibacterial properties.

I washed my face with this this morning in preparation for this.

And, you know, it was a little ticklish and smelled good, but I have to say that no one here today has complimented me on the cleanliness of my face.

(Laughter) But again, nobody complimented me on the jeans I was wearing.

These were purchased by GQ -- I own these -- but let me tell you, not only did I get no compliments from any of you guys, but in the months I've owned and worn these, no one has.

I don't think the value of something should be measured by whether it is complimented or not, but for fashion items and clothing, I think it is a reasonable standard.

However, these take a lot of effort.

Hand-picked organic Zimbabwean cotton is woven on a shuttle loom and hand-dipped 24 times in natural indigo.

But no compliments.

(laughs) Thank you.

Armando Manni, a former film director, makes this olive oil from the olives that grow on a single slope in Tuscany.

And every effort is made to protect the olive oil from oxygen and light.

He uses small bottles, the glass is tinted and the olive oil is infused with inert gas.

And he actually -- when he releases a batch, he periodically runs molecular analyses, and posts the results online. So you can go online and look at the batch number to see how the phenolic is growing and assess its freshness.

I did a blind tasting test of this with 20 people and 5 other olive oils.

It was delicious. It tasted interesting.

It was very green and very spicy.

However, it came last in the blind tasting test.

The first olive oil that came was actually a bottle of Whole Foods 365 olive oil that had been oxidizing next to the stove for six months.

(laughter) A recurring theme is that a lot of these things came from Japan. You'll start noticing it soon enough.

I don't golf, so I wasn't able to actually road test these, but I interviewed the guy who owns them.

Even the people who sell these clubs, I mean, they have a 4-axis shaft, and they're going to tell you that they're minimizing club speed loss and you can hit the ball farther, but they're going to say, look, look, you're not getting $57,000 worth of performance out of these clubs.

You are paying for the luxury of being encrusted with gold and platinum.

Those owners I interviewed certainly said they got a lot of pleasure out of them.

Oh yeah, do you know this?

This coffee is made with a very unique method.

Luwak is the Asian palm civet.

A tree-dwelling cat that comes down at night to roam the coffee plantations.

And apparently very picky, focusing only on the ripest coffee cherries.

Then the enzymes in the cat's digestive tract seep into the beans, and the people who do the enviable job of collecting cat carcasses travel through the woods to collect the result and process it into coffee. However, you can actually buy it in its raw state as well.

That is correct.

It doesn't matter -- (laughs) Japan does weird things about toilets.

(Laughter) I have an MP3 player in my bathroom now.

Some even come with a fragrance dispenser.

Some actually analyze the contents of the bowl and email the results to the doctor.

It's like a home medical center, and that's the direction Japanese toilet technology is headed.

This model doesn't have those extras, but when it comes to pure functionality, it's almost the best model, the Neorest 600.

To try this out, I went to the Manhattan showroom of the manufacturer TOTO, although I couldn't find a rental company. There is a restroom outside the showroom and I used it.

It's fully automated and the seat raises as you walk towards it.

The seat is preheated.

There are water jets to clean.

There are air jets that dry you.

It will automatically flash when you stand up.

Automatically cleans when the lid is closed.

I truly believe that this is not only a technological advancement, but also a cultural advancement.

In other words, it is a toilet that does not use hands and does not use toilet paper.

And I would love to get one of these.

(Laughs) This is also a work that was not lent.

This bed is owned by Tom Cruise.

At the end there is a small plate with each purchaser's name engraved on it.

(Laughter) To test this out, the manufacturer let me and my wife spend the night in their showroom in Manhattan.

The light was so bright from outside the street that we had to hire security guards or something.

But anyway, we had a great night's sleep.

And we spend one-third of our lives in bed.

I don't think it's such a bad deal.

(laughs) It was fun.

It is the fastest road-legal car in the world and the most expensive production car.

I ended up driving it with an attendant who is a professional racing driver from the company, driving it through the canyons outside of Los Angeles and down the Pacific Coast Highway.

And, you know, when we stopped at a traffic light, the people in the cars next to us bowed with respect.

And it was really amazing.

It was a very smooth ride.

Most cars I drive start to rattle after 80.

As I was changing lanes on the freeway, the driver, this attendant, said, "Look, I was just going 110 miles an hour."

And I had no idea I was one of those obnoxious people I sometimes see weaving in and out of traffic. Because it was too smooth.

If I were a millionaire, I would get it.

(Laughter) It's a completely free video, but it just shows you one of the pitfalls of advanced technology.

This is Tom Cruise arriving at the Mission: Impossible III premiere.

The scene where he tries to open the door is exactly "Mission: Impossible IV".

There was one thing I couldn't get my hands on. It was a 1947 Cheval Blanc.

The '47 Cheval Blanc is perhaps the most mythologized wine of the 20th century.

Cheval Blanc is unique in Bordeaux in that it contains a significant proportion of Cabernet Franc grapes.

1947 was a legendary vintage, especially on the right bank of Bordeaux.

And just that vintage and its chateau together took on this aura and eventually created a sort of cult following.

But I am 60 years old.

There are hardly any left.

I don't know if what's left is real, but it's considered the most counterfeit wine in the world.

Not many people are willing to open one more bottle for journalists.

So I was about to give up on getting any of these.

I gave the tentacles to retailers and auctioneers, but they were empty.

Then I got an email from a guy named Bipin Desai.

Bipin Desai is from the University of California. "We have a tasting coming up soon that will offer 47-year-old Cheval Blanc," said the Riverside theoretical physicist and prominent organizer of rare wine tastings.

And it was going to be a double vertical - 30 vintages of Cheval Blanc and 30 vintages of Yquem.

And it was an invitation I couldn't refuse.

I went

I had four meals for three days.

And opened '47 for Saturday lunch.

You see, it had a fragrant softness and a hint of linseed oil.

Then I tasted it, and it had this kind of smooth, sporty richness that is characteristic of this wine – it resembles port wine in many ways.

Some people at my table thought it was great.

Some people were a little less impressed.

And I was less than impressed.

And I wouldn't call my taste a layman's. So that doesn't necessarily mean I wasn't impressed, but I wasn't the only one who had that reaction.

And it wasn't just that wine.

Any of the wines served at this tasting, if I had been served at a dinner party, would have been the wine experience of a lifetime and incredibly memorable.

But 60 great bottles of wine over three days blurred everything and made it an almost grueling experience.

And I'd like to end with a very interesting study published earlier this year by researchers from Stanford University and Caltech.

The subjects were then given the same wine with different price tags.

Many people said they prefer expensive wines. I thought it was the same wine but a different wine more expensive.

What was unexpected, however, was that when these researchers took MRI scans of the brain while people were drinking wine, not only did they say they enjoyed the more expensively labeled wine more, but their brains actually recorded that they felt more pleasure with the same wine with the higher price label.

thank you.

Now imagine you just got a text message from your friend. Its contents are...

"You won't believe what just happened. I'm so angry right now!"

So you do your duty as a friend and ask for details.

They tell us what happened to them at the gym, at work, or on a date last night.

And you listen and try to understand why they are so angry.

You may secretly decide whether you should be so angry.

(Laughter) And maybe they'll even give me some suggestions.

Now, in that moment, you're essentially doing what I have to do every day, because I'm an anger researcher, and as an anger researcher, I spend a good chunk of my professional life—just kidding, my personal life too—studying why people get angry.

I study what they think when they are angry and even what they do when they are angry. It can lead to fights, smashing things, and even yelling at people in all caps on the internet.

(Laughter) And as you can imagine, when people hear that I'm an anger researcher, they want to talk to me about their anger, and they want to share their anger stories with me.

Not because you need a therapist, but because anger is actually universal.

It's something we all feel and can relate to.

We've felt it since the first months of life, when we didn't get what we wanted with protest cries of "What do you mean you don't pick up the rattle? Dad, you want it!"

(Laughter) We feel it throughout our teenage years, as my mother certainly attests with me.

I'm sorry, mother.

We feel it to the end.

In fact, the worst moments in life are accompanied by anger.

It's a natural and expected part of our grief.

But it also happens in the best moments of our lives. Special occasions such as weddings and vacations are often marred by everyday frustrations such as bad weather or travel delays that make the moment feel terrifying but ultimately forgotten when things go well.

I have a lot of conversations about anger with people, and through those conversations, I've learned that a lot of people, and I'm sure a lot of people in this room right now, think anger is a problem.

Understand how it interferes with your life, how it hurts relationships, and possibly how terrifying it is.

It's all understandable, but I see anger a little differently. Today I want to tell you something really important about your anger. That's it. Anger is a powerful and healthy force in your life.

It would be nice if you could feel it.

you have to feel it.

But to understand all of this, we need to really back up and talk about why we get angry in the first place.

A lot of it goes back to the work of an anger researcher named Dr. Jerry Deffenbacker, who wrote about this in 1996 in a chapter in his book on how to deal with problematic anger.

Well, most of us, and probably most of you, feel as simple as this. It means "getting angry when provoked".

You hear it in the language people use.

They say things like, "I'm mad when people drive so slowly" or "I'm mad that she forgot to bring out the milk again."

Or my favorite saying, "I don't have anger issues. People just need to stop making fun of me."

(Laughter) Now, in the spirit of better understanding those types of provocations, I ask many, including friends, colleagues, and even family members,

what makes you angry? ”

By the way, one of the perks of being an anger researcher is that I've spent over a decade compiling a comprehensive list of all the things that really annoy my colleagues.

just in case you need it.

(Laughter) But their answer is interesting. Because they say things like 'when the sports team loses' or 'who chews too loud'.

By the way, it's surprisingly common.

"The one who walks too slow", that's mine.

And of course the "roundabout".

Roundabout -- (Laughter) I'll be honest, there's nothing like roundabout anger.

(Laughter) Sometimes their answers are not trivial.

Sometimes we talk about big global issues facing us all, such as racism and sexism, bullying and environmental destruction.

But sometimes their answers are very specific, sometimes even strangely specific.

"Those wet lines on your shirt when you accidentally lean against a public restroom counter."

(Laughter) It's very disgusting, isn't it?

(Laughter) Or, "Flash drives: there are only two ways to connect, so why do I always have to try three times?"

(Laughter) Now, whether it's minor or major, general or specific, we can look at these examples and uncover some common themes.

We get angry when situations make us feel uncomfortable, feel unfair, hinder our goals, could have been avoided, or make us feel helpless.

This is a recipe for anger.

But we also see that anger is probably not the only thing we feel in situations like this.

Anger does not occur in isolation.

We can feel fear, sadness, anger, and many other emotions at the same time.

But the problem is that these provocations do not make us angry.

At least we know that, not just ourselves. If so, we would all be mad at the same thing, but we are not.

There must be something else going on because the reason I am angry is not the reason you are angry.

is it something else?

Well, we know what we are doing and feeling in that moment of provocation matters.

We call this the pre-anger state. Are you hungry, are you tired, are you worried about something else, are you going to be late for something?

The provocation feels even worse when you are feeling that way.

But what matters most is not the provocation, not the pre-anger state, it is how we interpret the provocation and how we understand it in our lives.

When something happens to us, we first decide whether it is a good thing or a bad thing.

Is it fair or unfair, blameworthy or punishable?

That is the first evaluation, when you evaluate the event itself.

We decide what it means in the context of our life, and when it's done, how bad it is.

This is the secondary evaluation.

We say, "Is this the worst thing that ever happened or can I handle this?"

Now, to illustrate that, imagine you're driving somewhere.

Before I go any further, let me say that if I were an evil genius and wanted to create a situation that would make you angry, it would be a lot like driving a car.

(laughs) It's true.

By definition, you're on your way somewhere, so everything that happens—the traffic jams, the other drivers, the roadworks—feels like it's getting in the way of your goals.

Some traffic rules are written and some are unwritten, and while those rules are routinely violated in front of our eyes, they usually do not have serious consequences.

And who is violating those rules?

Anonymous strangers, people you'll never see again, are very easy targets for your anger.

(Laughter.) I mean, you're driving somewhere, and therefore you're driving in anger, and the person in front of you is driving well below the speed limit.

And it's frustrating because I don't quite understand why they're driving so slowly.

That is the primary evaluation.

You saw this and said it was bad and worthy of condemnation.

But maybe you decide it's not a big deal.

It's a secondary evaluation. don't get angry

But now imagine you're on your way to a job interview.

What he's doing hasn't changed, right?

Therefore, the primary rating remains unchanged. Still bad, still to blame.

But you certainly have the ability to deal with it.

Because suddenly you will be late for the interview.

Suddenly you can't get your dream job, the job that was supposed to give you a lot of money.

(Laughter) Someone else will get your dream job and you will go bankrupt.

I'll be poor

You might as well quit now, turn around, and move in with your parents.

(laughter) Why?

"Because of that person in front of me.

This is not a human, it is a monster. ”

(Laughter) And this monster is here to ruin your life.

(Laughter) This thought process, called catastrophic, is what makes things so bad.

And this is one of the main thoughts we find associated with chronic anger.

But there are also a few others.

False attribution of causality.

Angry people tend to shift blame onto irrelevant areas.

Not only people, but in fact inanimate objects as well.

If that sounds silly, remember the last time you lost your car keys and said, "Where did those car keys go?"

I know they escaped alone.

(Laughter) They tend to overgeneralize and use words like “always,” “never,” “every time,” “this always happens to me,” “you never get what you want,” or “you hit every traffic light on your way here today.”

Demanding: They put their own needs ahead of those of others. "I don't care why this person is driving so slowly. He needs to speed up or move to get to this interview."

And finally, the inflammatory labeling.

They call people idiots, idiots, monsters, or a lot of things they've been told not to say during this TED talk.

(Laughter) So psychologists have long called these cognitive distortions, or even irrational beliefs.

And yeah, sometimes they're irrational.

Probably in most cases too.

But in some cases, these thoughts are perfectly reasonable.

There is injustice in the world.

Some people are cruel and selfish, but it's not only good to be angry when you're treated badly, it's right to be angry when you're treated badly.

If there's one thing I want you to remember from my talk today, it's this. Anger exists within you as an emotion. That's because anger provided an evolutionary advantage to both human and non-human ancestors.

Anger warns of injustice just as fear warns of danger.

This is one of the ways your brain tells you that you've had enough.

In addition, it gives us the energy to confront that injustice.

Think for a moment about the last time you got angry.

My heart rate went up.

I started breathing faster and sweating.

It's the sympathetic nervous system, also known as the fight-or-flight system, and it works to provide you with the energy you need to respond.

And that's just what you noticed.

At the same time, your digestive system slows down, allowing you to conserve energy.

That's why I was thirsty.

And the blood vessels dilated to deliver blood to the extremities.

That's why your face turned red.

It's all part of the complex patterns of physiological experience that exist today. For they helped your ancestors deal with the cruel and unforgiving forces of nature.

And the problem is that physical fighting, which your ancestors used to deal with anger, is no longer rational or appropriate.

You cannot and should not swing your club every time you are provoked.

(Laughter) But here's the good news.

You have someone who can do what your non-human ancestors could not.

And that is the ability to regulate one's emotions.

When you want to lash out, you can stop yourself and channel your anger into something more productive.

When we talk about anger, we often talk about how to avoid getting angry.

We tell people to calm down or relax.

We even tell people to let it go.

And all of it assumes that anger is bad and that it's wrong to feel angry.

But instead, I like to think of anger as motivation.

Just as thirst makes us want to drink water, and hunger makes us want to eat, anger can be a motivation to respond to injustice.

Because you don't have to think too hard to find out what to be angry about.

Going back to the beginning, yes, some of those things are stupid and not worth getting angry about.

But racism, sexism, bullying, environmental destruction, they're real, they're terrible, and the only way to fix them is to get angry first, then channel that anger back.

And there is no need to fight back with aggression, hostility or violence.

There are endless ways to express anger.

We can protest, we can write letters to our editors, we can donate and volunteer for causes, we can create art, we can create literature, we can create poetry and music, we can create communities that care for each other and do not allow atrocities to occur.

So the next time you feel angry, I want you to listen to what that anger is telling you instead of trying to suppress it.

And I want you to turn it into something positive and productive.

thank you.

(applause)

A random sample of 10,000 people has 9,999 things in common. That is, their business interests are at or near the surface.

Weird people are astronomers, and I'm one of those weird races.

(Laughter) My talk will be in two parts. I speak first as an astronomer and second as a concerned member of the human race.

But let's start by remembering that Darwin showed us to be the result of four billion years of evolution.

And what we're trying to do in astronomy and cosmology is go back to before Darwin's simple beginnings and set our Earth in a cosmic context.

Let's look at some slides.

This is a comet impact that happened last week.

If they had sent nukes, it would have been even more spectacular than what actually happened last Monday.

So this is another NASA project.

It's Mars in the European Mars Express, and New Years.

This artist's impression came true when a parachute landed on Titan, the giant moon of Saturn.

It landed on the surface. This photo was taken on the way down the mountain.

It looks like a coastline.

That's true, but the ocean is liquid methane and its temperature is minus 170 degrees Celsius.

Look beyond the solar system and you'll see that stars aren't just points of twinkling light.

Each is like the sun, with the planets orbiting around it.

And you can also see places where stars are forming, like the Eagle Nebula. We watch stars die.

Six billion years from now the Sun will be like that.

And some stars die spectacularly in supernova explosions, leaving behind such debris.

On an even larger scale, we can see entire galaxies of stars.

We observe entire ecosystems where gas is recycled.

And to cosmologists, these galaxies are little more than atoms in a large universe.

This photo shows a patch of sky so small that about 100 similar patches are needed to cover the full moon in the sky.

Looking through a small telescope, this looks like nothing at all, but here you can see hundreds of tiny faint smudges.

Each is a galaxy just like ours and the Andromeda galaxy, but they appear so small and faint because their light takes 10 billion light years to reach us.

There are probably no planets around the stars in these galaxies.

It is highly unlikely that life exists there. That's because the nuclear fusion of stars didn't have time to create the building blocks of planets and life: silicon, carbon, and iron.

We believe that all of this arose from the Big Bang, a state of high temperature and density. So how did that amorphous Big Bang transform into our complex universe?

I'm going to show you a movie simulation that's 16 to the power of 10 faster than real time. This shows a portion of the universe with the expansion subtracted.

But, as you know, at the bottom, as time passes in gigayears, we can see structures evolve and develop, taking advantage of small, dense irregularities with low gravity.

And in 13 billion years we will have something very similar to our universe.

And then compare such a simulated universe with what we actually see in the sky.

Although we can trace it back to the early stages of the Big Bang, we still don't know what exploded or why.

That is the challenge of 21st century science.

If my research group had a logo, it would be this photo. Ouroboros. On the left we see the microscopic world, the quantum world, and on the right we see the vast universe of planets, stars and galaxies.

But we do know that our universe is unified, that is, there is a connection between left and right.

The everyday world is defined by atoms, or how atoms combine to make molecules.

Stars are fueled by how the nuclei of their atoms react.

And as we've learned over the last few years, galaxies are held together by the gravitational pull of so-called dark matter, particles in giant swarms much smaller than atomic nuclei.

But I want to know the synthesis symbolized at the top.

You can understand the quantum micro world.

On the right side, gravity keeps the sway. Einstein explained so.

However, the unfinished task of science in the 21st century is to connect the universe and the micro world with a unified theory. It is, so to speak, gastronomically symbolized at the top of the overall picture. (Laughter) And until we have that integration, we cannot understand the beginning of the universe. Because when our universe itself was the size of an atom, quantum effects could shake everything up.

So we need a theory that integrates the very big and the very small, but we don't have it yet.

One thought, by the way, I had red flags, and I'm going to guess from this, is that our Big Bang wasn't the only one.

One idea is that our three-dimensional universe could be embedded in a higher dimensional space, as you can imagine on these papers.

You can imagine that one ant thinks it's in a two-dimensional universe and is unaware of the other ant colony.

That is, there could be another universe just a millimeter away from ours, but that millimeter is measured in the fourth spatial dimension, and we are trapped in the third, so we don't notice it.

Therefore, we believe there may be much more to physical reality than what we usually call the universe: the aftermath of the Big Bang. And here is another photo.

Our universe is depicted in the lower right, not beyond the horizon, but even it is, so to speak, a bubble in a much larger reality.

Many suspect that just as the solar system we believe has gone from one to many, from one galaxy to many, we must go from one Big Bang to many Big Bangs, and perhaps these many Big Bangs exhibit very diverse characteristics.

Now let's go back to this picture.

The top symbolizes one challenge, while the bottom symbolizes another challenge to science.

We want to understand the very complex, not just the integration of the very big and the very small.

And the most complex is ourselves, halfway between atoms and stars.

We rely on stars to make atoms.

We rely on chemistry to determine complex structures.

In order to stack layers of complex structures, they must be clearly larger than atoms.

Compared to stars and planets, we must obviously be small. Otherwise it will be crushed by gravity. And in fact we are somewhere in between.

It takes as many human bodies as there are atoms in each of us to make up the sun.

The geometric mean of the mass of the proton and the mass of the Sun is 50 kilograms, which is within twice the mass of each person here.

Well, most people, anyway.

The science of complexity is probably the biggest challenge of all, bigger than the very small ones on the left and the very big ones on the right.

And it is this science that is not only enlightening our understanding of the living world, it is transforming our world faster than ever before.

And more than that, it is causing new kinds of change.

Then, moving to the second half of the lecture, I touched on the book "Our Last Century."

If I weren't a modest Englishman, I'd mention the book myself and add that it's available in paperback.

(Laughter.) In America, the day was called "Our Final Hour" because Americans like instant gratification.

(Laughter) But my theme is that this century, science has not only changed the world faster than it has in the past, but it has changed the world in new and different ways.

Targeted drugs, genetic modification, artificial intelligence, and even brain implants can change humans themselves. And the human physique and personality have not changed for thousands of years.

That may change in this century.

It's new in our history.

And the impact humans are having on the global environment, such as the greenhouse effect and mass extinctions, is unprecedented.

This is what makes the coming century challenging.

Biotechnology and cybertechnology are green in that they offer great future potential while reducing pressure on energy and resources.

But they have a dark side.

In our interconnected world, new technologies may allow just one zealot or freak with the mindset of those who design computer viruses today to cause something in the event of a disaster.

In fact, catastrophes can simply arise from technical bad luck, errors rather than fear.

And when that downside could have a global impact, even the slightest chance of catastrophe is unacceptable.

In fact, a few years ago, Bill Joy wrote an article expressing great concern about robots taking over us and more.

I don't agree with all of that, but it's interesting he had a simple solution.

It was what he called "fine-grained renunciation."

He wanted to quit the dangerous kind of science and leave the good parts behind. Well, this is ridiculously simple for two reasons.

First, scientific discoveries have not only dangerous consequences, but also benign consequences.

Also, when scientists make a discovery, they usually have no idea what its application will be.

What this means is that to reap the benefits of science, you must accept the risks.

We must accept that danger exists.

And I think we have to go back to the post-war, post-World War II days when the nuclear scientists involved in building the atomic bomb often feared that they should do everything in their power to warn the world of danger.

And they were inspired not by the young Einstein, who did great work on the theory of relativity, but by the poster and T-shirt icon of old Einstein, who failed in his scientific efforts to unify the laws of physics.

he was precocious. But he was a moral compass and an inspiration to scientists involved in arms control.

And perhaps the greatest living person is Joe Rothblatt, the man I am honored to know.

As you can see, there's an equally messy office there.

He is 96 and founded the Pugwash movement.

As a final act, he persuaded Einstein to sign Bertrand Russell's famous memorandum.

And he gave the example of a concerned scientist.

And I think we need modern people like Joseph Rothblatt to make the best use of science and choose which doors to open and which ones to keep closed.

We need not only physicists in motion, but also biologists, computer experts and environmental activists.

And I think academics and independent entrepreneurs have a special duty. Because they have more freedom than civil servants and office workers who are subject to commercial pressure.

I wrote Our Final Century as a scientist, just as an ordinary scientist. But I think there's one thing that being a cosmologist has provided me with a special perspective. That is, it offers a perception of the immense future.

The extraordinary time span of evolutionary past is now part of common culture—outside the American bible belt, anyway—(laughter), but most people, even those familiar with evolution, are unaware that even more time is ahead.

The sun has been shining for 4.5 billion years, but it will take another 6 billion years before it runs out of fuel.

In that schematic, a kind of time-lapse photography, we're halfway there.

And it will take another 6 billion years for that to happen, and any remaining life on Earth will have evaporated.

We tend to imagine humans out there, experiencing the end of the Sun, but the life and intelligence that will be present at that time will be as different from ours as the bacteria.

We still have a tremendous way to go in unraveling intelligence and complexity here on Earth and perhaps far beyond.

Therefore, we are still at the beginning of the emergence of complexity on Earth and beyond.

Expressing the lifespan of the earth in one year, for example, the 21st century, from the birth of the earth in January to December, is a quarter of a second in June, or a fraction of a year.

But even from this serpentine cosmic perspective, this century is very special, the first century in which humans can change themselves and their home planet.

I should have shown this earlier, but humans aren't the witnesses to the end of the Sun. It would be a creature as different as us and bacteria.

When Einstein died in 1955, one of the striking tributes to his global standing was this cartoon by Harbrock for The Washington Post.

The plaque says "Albert Einstein used to live here".

And I would like to end with a vignette, so to speak, inspired by this image.

We've been familiar with this image for 40 years. The ephemeral beauty of land, sea and clouds contrasts with the stark lunar landscape where astronauts have left their footprints.

But let's assume that some aliens have watched our pale blue dot in space from afar, not just for 40 years, but for Earth's entire 4.5 billion year history.

what did they see?

Over nearly all of that vast amount of time, the Earth's appearance would have changed very gradually.

The only sudden global change would be a massive asteroid impact or a volcanic supereruption.

Nothing happens out of the blue, except for those brief traumas.

Continental land masses drifted away.

The ice surface increased and decreased.

New species appeared, evolved, and died out.

But during the tiny fraction of Earth's history, the last millionth of a thousand years, vegetation patterns changed much faster than before.

This marked the beginning of agriculture.

Change accelerated as the human population increased.

Then, more suddenly, another thing happened.

Within just 50 years, or 100 millionths of the Earth's age, the amount of carbon dioxide in the atmosphere began to increase at an eerie rate.

This planet has become a powerful source of radio waves, the total output from all television, cell phone and radar transmissions. And then something else happened.

A metal object, albeit a very small one, weighing a few tons at most, escaped into orbit around the Earth.

Some have traveled to the moon and planets.

Advanced extraterrestrial races watching our solar system from afar could confidently predict the eventual destruction of our planet in the next 6 billion years.

But could we have predicted this unprecedented surge in less than half the Earth's lifetime?

Do these anthropogenic changes collectively account for less than one millionth of a lifetime passed and seem to be happening at breakneck speed?

If they stay vigilant, what will these fictional aliens witness in the next hundred years?

Will some kind of spasm shut down the Earth's future?

Or will the biosphere stabilize?

Or will some metallic object launched from Earth spawn a new oasis, a post-human life somewhere else?

The science that young Einstein did will last as long as our civilization lasts, but if civilization is to survive, it needs the wisdom of old Einstein, human, global and visionary.

And what happens in this incomparably important century will reverberate far into the future, and perhaps far beyond the Earth, as depicted here.

thank you very much.

(applause)

We all make decisions every day. We want to know what's right, from the financial to the gastronomic to the professional to the romantic sphere.

And indeed, it would be a great gift if someone could teach us how to do exactly the right thing all the time.

In fact, it turns out that this gift was given to the world in 1738 by the Dutch polymath Daniel Bernoulli.

And what I want to talk to you about today is what that gift is. I also want to explain why it doesn't bring any change.

Well, this is Bernoulli's gift. This is a direct quote.

If it looks Greek, it's because it's Greek.

But a simple English translation—far less accurate, but capturing the gist of what Bernoulli meant—was: The expected value of our action, the good we can expect to get, is the product of two simple things: the probability that this action will get us something, and the value of its benefits to us.

In a way, what Bernoulli was saying is that if you can extrapolate and multiply these two things, you will always know exactly how to act.

Now, this simple equation is pretty familiar, even for those who don't like equations.

Here is an example. If I said to you, "Let's play a little coin toss game. I'll flip a coin and if it comes up heads, I'll pay you $10. But you have to pay $4 for the privilege of playing with me." Because I know that the odds of you winning are 1 in 2, and if you win, your profit is $10, and if you multiply that by 5, you know that's more than I charge you to play. So the answer is yes.

This is what statisticians professionally call "a very good bet."

Now, while this idea is simple when applied to coin tossing, it's actually not so simple in everyday life.

People are very bad at estimating both of these things, and that's what I want to talk to you about today.

There are two kinds of mistakes that people make when trying to decide what is the right thing to do. They are errors in estimating the probability of success and errors in estimating the value of one's own success.

Well, first of all, I would like to talk about the first one.

Calculating odds seems like a fairly easy thing to do. The dice has 6 sides, the coin has 2 sides, and the deck has 52 cards.

We all know how likely it is to draw an ace of spades or to flip the table.

But as it turns out, applying this to everyday life is not easy. That's why Americans spend more, and thus lose more, on gambling than on all other pastimes combined.

The reason is that this is not how people do the odds.

The way people calculate odds, we need to talk a little bit about pigs first.

Now, I would like to ask you, do you think there are more dogs and pigs on leashes observed in Oxford on a given day?

And, of course, we all know that the answer is a dog.

And when you know that the answer is a dog, it is only when you immediately look back in your memory when you saw a dog or a pig on a leash.

Seeing a dog was easy to remember, but seeing a pig was not so easy. And you thought that if a dog on a leash came to mind more readily, then a dog on a leash was more likely.

This is not a bad rule of thumb, unless it is.

For example, this is a word puzzle.

Are there any four-letter English words with an R in the third, or any other English words with an R in the first?

Well, a very quick check of memory and a cursory scan makes it very easy to say to yourself "Ring, Run, Run", but very difficult to say "Pare, Park" to yourself. They come more slowly.

But in fact, there are far more words in English with an R in the third than the first.

Words with a third R slowly popping into your head aren't because they're unlikely, improbable, or infrequent.

Because the mind remembers the first letter of the word.

You kind of scream that sound, S--and the words come.

It's like a dictionary. It's hard to look up with the 3rd letter.

So this is an example of how this idea of ​​things coming to mind quickly can give you that sense of possibility—how this idea can mislead you. But it's not just puzzles.

For example, if asked to estimate the odds of Americans dying in a variety of interesting ways, these are estimates of annual deaths per 200 million US citizens.

And these are ordinary people like you who are asked to guess how many people will die from tornadoes, fireworks, asthma, drowning, and more.

Compare these with the actual numbers.

Now, we see a very interesting pattern here. First, two things are grossly overrated: tornadoes and fireworks.

Two things are greatly underestimated: drowning and death from asthma. why?

When was the last time you picked up a newspaper and the headline was "Asthma Kills Boy"?

It's not funny because it happens so often.

It's all too easy for all of us to recall the example of a news story or newsreel that saw a tornado destroy a city, or the poor bastard who blew his hand off with fireworks on Independence Day.

Deaths from drowning and asthma are rarely reported.

They don't immediately come to mind, and as a result we underestimate them greatly.

Indeed, this is similar to Sesame Street's "Which one doesn't belong?" game. And you're right in saying it doesn't belong in the swimming pool because the only thing on this slide is the swimming pool and it's actually very dangerous.

More people are likely to die this way than all three of the other ones shown on the slide combined.

Of course, lotteries are a great example and a great test case for people's ability to calculate odds.

And economists -- sorry lottery folks -- economists, at least among their peers, call the lottery a stupid tax. Because the odds of winning money from investing in lottery tickets are about the same as flushing your money straight down the toilet -- you don't have to go to the store and actually buy anything, by the way.

Why would anyone play the lottery?

There are many answers, but one answer for sure is that there are many winners. right? When this couple wins the lottery, or when Ed McMahon shows up at their front door with this giant check, I don't know how they're going to cash something that big.

we watch this on tv We read about it in the newspaper.

When was the last time you saw an extensive interview with all the losers?

In fact, if a television station required each loser to give a 30-second interview every time it interviewed a winner, it would take nine and a half years of concentration just to see 100 million losers say "Me? I lost" in the last lottery. "Me? I lost."

Now, if you watched TV for nine and a half years, didn't sleep, didn't take a bathroom break, lost after losing, and ended with a 30-second "and I won" scene, your chances of winning the lottery are very slim.

See, I can prove this. There is a small lottery ticket here.

This lottery has 10 tickets.

Nine of them were sold to these individuals.

It costs $1 to buy a ticket, but if you win, you get $20. Is this a good bet?

Bernoulli tells us it is.

The expected value of this lottery is $2. This is a lottery where you should invest your money.

And most people say, "Okay, I'll play."

Well, a slightly different version of this lottery. Imagine all nine tickets are owned by one fat man named Leroy.

Leroy has nine tickets. There is one left.

do you want that Most people don't play this lottery.

Now, you can see that the odds of winning haven't changed, but it's now a lot easier to imagine who's going to win.

It's easy to see that Leroy gets the check, right?

You're not as likely to win as Leroy, so you can't say to yourself, "I'm as likely to win as everyone else."

The fact that all these tickets are owned by one man changes the decision to play or not, even though it has no effect on the odds.

Now, estimating odds may seem difficult, but it is easier than estimating value. We try to think about how much something is worth, how much we can enjoy it, how much joy it gives us.

I want to talk about value errors here.

How much is this Big Mac worth? Is it worth $25?

Most people have a gut feeling that it isn't. I wouldn't pay that kind of money for that.

But really, you have to ask just one question to determine if a Big Mac is worth $25. It's like, "What else can you do with $25?"

If you're on a long-haul flight to Australia, and your food isn't there, and you realize that someone in the front row just opened a McDonald's bag and the smell of golden arches wafts into your seat, you'll think you can't do anything else for $25 in 16 hours.

I can't even light a fire - they took my cigarette lighter!

Suddenly, a $25 Big Mac might be a bargain.

On the other hand, if you're visiting a developing country and want to buy a gourmet meal for $25, it's an exorbitant price for a Big Mac.

Why were you all so sure the answer to the question was no before I said anything about the context?

Because most people compared the price of this Big Mac with what they usually pay. Instead of asking, "What else can I do with my money?" compare this investment to other possible investments and compare it to the past.

And this is an organizational mistake people make.

All you knew was that you paid $3 in the past. 25 is outrageous.

This is wrong and can be proven by showing what absurdity it leads to.

For example, of course, this is one of the sweetest tricks in marketing, where something that used to be expensive suddenly looks like a very good deal.

If you ask people about these two different jobs, one that makes 60,000, then 50,000, then 40,000, one that pays less each year, and one that pays more. People prefer the second job to the first one, even though they all say it pays much less. why?

Even if total wages were higher in the decline period, there was a sense that wage declines were worse than wage increases. Here's another good example.

This is a $2,000 Hawaii travel package. Currently on sale for 1,600 yen.

Would you buy this package if you wanted to go to Hawaii?

Most people say they will. Here's a slightly different story. A $2,000 Hawaii vacation package is currently on sale for $700, so I decided to take a look at it for a week.

By the time you get to the ticket agency, the cheapest fare is gone and the package costs 1,500. would you like to buy? Most people say no.

why? It used to be 700 yen, so you can't pay 1,500 yen for something that was 700 yen last week.

This tendency to compare with the past causes people to overlook more lucrative deals. In other words, a good deal that used to be a great deal isn't as good as a bad deal that used to be a terrible deal.

Here's another example of how comparing to the past can confuse decision-making.

Imagine you go to the theater.

You are on your way to the theater.

I have a $20 ticket in my wallet.

There is also a $20 bill.

Arriving at the theater, they discover that they have lost their tickets along the way.

Why don't you use the leftover money for exchange?

Most people answer "no".

Now let's make one change in this scenario.

You're on your way to the theater and you have two $20 bills in your wallet.

When they arrive, they discover that they have lost one of them.

Would you like to spend the remaining $20 on tickets?

Of course, I went to the theater to see the play.

What does it have to do with losing $20 along the way?

Now, in case you don't understand, I'll outline what happened.

(laughs) I dropped something along the way.

In both cases it was a piece of paper.

In one case, the President of the United States was depicted. Other times it was not.

What difference does it make?

The difference is when you lose your ticket, tell yourself, "I'm not going to pay for the same thing twice."

You compare the cost of the current play - $40 - with the cost of the previous play - $20 - and say it's a bad deal.

Compared to the past, it raises many of the problems that behavioral economists and psychologists point to when people try to assign values.

But we still make certain mistakes, even when compared to the possibilities, not the past.

I will introduce one or two of them.

One thing we know about comparisons is that comparing one thing to another changes its value.

So in 1992, for those of us on the liberal side of the political spectrum, George Bush didn't seem all that great.

All of a sudden we are longing for him to come back.

(Laughter) This comparison changes the way we evaluate him.

Of course, retailers have known this long before anyone else and have used this wisdom to help customers and alleviate unfair financial burdens.

A retailer needs to go to a wine shop and buy a bottle of wine, and if you find it for $8, $27, $33, what would you do?

Most people don't want the most expensive, and they don't want the cheapest.

Therefore, they would choose the middle item.

If you are a smart retailer, you will put very expensive items on the shelves that no one will buy. Because suddenly $33 of wine doesn't look that expensive by comparison.

In other words, the comparison changes the value of things.

Here's why this is a problem: The problem is, when you bring that $33 bottle of wine home, it doesn't matter what it once sat next to your shelf.

The comparisons we make when evaluating value, trying to estimate how much we like something, are not the same comparisons we make when consuming it.

This changing comparison problem can undermine our attempts to make rational decisions.

Let's take an example.

I have to show you something from my own lab, so let me sneak this in.

These subjects have come to the experiment to ask the simplest questions. "How much fun will you have eating potato chips a minute from now?"

They are sitting in a room with potato chips in front of them.

Some subjects had a box of Godiva chocolates in the corner of the room, while others had a can of Spam.

In fact, these items placed in the room changed how much participants enjoyed potato chips.

I mean, people watching spam think potato chips would be very tasty. If you've seen Godiva chocolate, you'd think it wouldn't taste so good.

Of course, what would happen if you ate potato chips?

See, you don't need a psychologist to tell you that what's in the corner of your room doesn't really affect your taste experience when you're taking a bite of a delicious greasy, salty, crunchy snack.

Nevertheless, their predictions are distorted by the comparison, and subsequent experiences do not materialize and remain unchanged.

Even if you've never come to our lab to eat potato chips, you've experienced this yourself. So here's the question. I would like to purchase a car stereo.

The dealer near you sells this stereo for $200, but you can get it for $100 if you drive across town.

So would you like to drive your car to save $100 with a 50 percent discount?

Most people say they will.

I can't imagine buying it for twice the price when you can get it for half the price in one trip around the city.

Now imagine, instead, that you wanted to buy a car with a stereo, and it was on sale for 31,000 at the dealership near your house.

But if you want to drive around town, you can buy one for ¥30,900.

Would you like to pick it up by car? At this point, you are saving 0.003 of $100.

Most people say, "No, are you going to hang out across town to save $100 on your car purchase?"

This kind of thinking drives economists crazy, and it should.

Because you can save this $100 -- hello! -- I don't know where it came from.

I don't know what you saved it in.

When I go grocery shopping with this, it doesn't go, the money I saved on my car stereo, or the stupid money I saved on my car. it's money

And if the drive across town is worth $100, it's worth $100 regardless of what you save. People don't think that way.

That's why I don't know if mutual fund managers get 0.1 percent or 0.15 percent of their investment, but they're clipping coupons to save a dollar on toothpaste.

Now, as you can see, this is a comparison shift problem. Because what you're doing is comparing $100 to what you're doing, and you don't do that comparison when you spend that money.

I'm sure you have all experienced something like this.

For example, if you're American, you've probably traveled to France.

And at some point, you may have met a couple from your hometown and thought, "Oh my God, these people are so warm. They're so nice to me."

I mean, compared to people who hate me when I try to speak their language, and hate me even more when I don't, these people are really great. ’ So you tour France with them, come home and invite them to dinner, and what do you find?

Compared to your usual friends, it's boring and boring, isn't it? Because in this new context the comparisons are very different. In fact, you find yourself hating them enough to be eligible for French citizenship.

Well, I have exactly the same problem when buying a stereo.

If you go to a stereo store, there are two sets of speakers. These big, boxy monolithic speakers and these little sleek speakers. And when you play them, you can certainly hear the difference. Bigger speakers sound a little better.

So you end up buying them and taking them home, completely infringing on your home decor.

And the problem, of course, is that this comparison we made in the store is a comparison we'll never do again.

What are the odds, years from now, that you'll turn on your stereo and think, 'That sounds so much better than that little thing' that you don't even remember hearing?

The problem of shifting comparisons becomes even more difficult when these alternatives are sequenced over time.

People have a very hard time making decisions about things that happen at different points in time.

And what psychologists and behavioral economists have found is that people generally use two simple rules.

So let's give them one very easy problem, then one very easy problem, and then a third hard problem.

The first simple problem is: You can have $60 now, or you can have $50 now. Which do you prefer?

This is a so-called one-item IQ test.

I hope we all want more money. The reason is that we believe that more is better than less.

Here comes the second problem. You can get $60 today, or you can get $60 a month later. Which do you prefer?

Again, the decision is easy. Because we all know that now is better than later.

The difficulty in our decision making is when these two rules conflict.

For example, let's say you're offered $50 now, or $60 in a month's time.

This is typical of many situations in life where waiting pays off, but you have to be patient.

what do we know? What do people do in situations like this?

Well, people in general are very impatient.

That means you need hundreds or thousands of percent interest to put off gratification and wait until next month for an extra $10.

That may not be all that remarkable, but what's worth noting is that this impatience can easily be eliminated simply by changing when these currency denominations are delivered.

Imagine you could get $50 in 1 year (i.e. 12 months) or $60 in 13 months.

what do we find now?

People are happy to wait. If you're waiting until 12:00, better wait until 13:00.

What happens with this dynamic mismatch?

Compare. Annoying comparison. let me show off

Here's a graph showing the results I suggested you would show if you gave me time to respond. In other words, people will find subjective value 50 higher than subjective value 60 if they are delivered now or within a month, respectively, i.e. 30 days late, but if they postpone the whole decision to a year later they show the opposite pattern.

Now, why are we getting these results?

These people tell us

Here we see two young men, a firefighter and a fiddler. One is larger than the other.

They're moving away toward the vanishing point on the horizon, but be aware of two things.

A firefighter never looks taller than a fiddler. meaningless.

But the gap between the two seems to be closing.

First 1 inch in sight, then 1/4 inch, then 0.5 inch, and finally off the edge of the earth.

This is the result I just showed you.

This is subjective height. Here's how tall these guys were at different points in time.

And I want you to see that two things are true.

The first is that they appear smaller as they get further away. And two, firefighters are always bigger than fiddlers.

But look what happens when you erase some of them. right.

At very close range, the fiddler appears taller than the firefighter, but from a distance their normal, real relationship is preserved.

As Plato said, space determines size and time determines value.

These are the results of the hard question I gave you: 60 now or 50 in a month?

These are subjective values ​​and as you can see our two rules hold.

People always think that more is better than less. Always think 60 is better than 50 and better now than later. That is, the bar on this side is higher than the bar on this side.

Let's see what happens when we drop some.

Suddenly there was a dynamic contradiction that baffled us.

People tend to choose $50 now rather than wait a month, but not if that decision is far in the future.

Note the interesting implications of this. In other words, people change their minds when they reach the future.

I mean, as the 12th of the month approaches, I'll wait another month to get the $60 and say what I was thinking.

I will receive $50 from now.

Well, the question I want to close is this. If we are so stupid, how did we get to the moon?

Because I could go on and on for two hours or so with evidence that people can't estimate odds or value.

I'm sure the answer to this question is something you've already heard in a few talks, but I dare say you'll hear it again. In other words, our brains have evolved for a world very different from the one we live in.

They evolved for a world where people live in very small groups, rarely meet anyone significantly different from themselves, have few options, life is fairly short, and eating and mating is a top priority today.

Bernoulli's Gift, Bernoulli's Little Formula, enables us to do just that and teaches us how to think in a world where nature never designed us.

This explains why we are bad at using it, but it also explains why it is so important for us to be good and fast at using it.

We are the only species on this planet that has taken our destiny into our own hands.

We have no significant predators. We are masters of our physical environment. The things that normally cause species to go extinct are no longer a threat to us.

The only thing that can destroy us and ruin us is our own decisions.

If we are not here ten thousand years from now, it is because we failed to take advantage of the gift given to us by the young Dutch in 1738 because we underestimated the potential for future suffering and overestimated the value of present pleasures.

thank you.

(Applause) Chris Anderson: It was remarkable.

I have time to ask Dan Gilbert a few questions. One and two.

Bill Lyell: Do you think this mechanism is part of how terrorism actually scares us? Also, is there a way to combat it?

Dan Gilbert: I was recently consulting with the Department of Homeland Security, and they generally believe that America's security spending should be spent on making our borders safer.

I tried to point out to them that terrorism is a name based on people's psychological reactions to events, and that if they are concerned about terrorism, they might ask what causes terrorism and how can we stop people's fear instead of stopping the atrocities that we are all concerned about.

Sure, at least forgive the play the American media is giving, but by the raw numbers these are very minor accidents.

For example, we already know that more people in the United States died as a result of being too scared to fly or driving on the highway than died on 9/11. OK?

If I told you there was an epidemic that would kill 15,000 Americans next year, you might be alarmed if you didn't know it was the flu.

These are minor accidents and we should be wondering if they need to get plays and coverage like this.

Indeed, it overestimates the possibilities of hurting people in many ways, and empowers the very people who want to scare us.

CA: Dan, I'd like to hear more about this. So you're saying that our reaction to terrorism is kind of a mental bug?

Please talk more about it.

DG: That's non-standard. I mean, look.

If Australia were to disappear tomorrow, perhaps terrorism would be the right response.

There are many very nice people. On the other hand, when a bus exploded and killed 30 people, more people in the same country died for not wearing seat belts.

Is terrorism the right response?

CA: What caused the bug? Is it the drama of this event that makes it so spectacular?

The fact that it was a deliberate attack by an outsider?

what is that?

Director: Yes. There are many, but some of them are true.

First, it is a human agent trying to kill us. It's not a tree that fell on us by chance.

Second, they are enemies who may be trying to attack and hurt us again.

People are being killed for no good reason, not for good reason. As if there is a good reason, but sometimes people think there is a good reason.

As such, there are a number of reasons why this looks like a great event, but don't underestimate the fact that newspapers sell when they publish what people want to read. So the media plays a big role here, and they want these things to be as great as they can be.

CA: So, what does it take to persuade people to downplay our culture?

DG: Well, let's go to Israel. Yes, please go to Israel. And then the mall exploded and everyone complained about it. And an hour and a half later, at least when I was there, and I was 40 feet away from the mall when it exploded. I returned to the hotel and the planned wedding was still going on.

And, as an Israeli mother said, "We will not call off the wedding and let them win."

So this is a society that has endured a certain amount of terrorism but has learned to be less upset than those of us who have not been hit by terrorism.

CA: But is there really a rational fear that the reason we fear this is because we think the Big One is coming?

DG: Yes, of course. So, knowing that this is the worst attack yet, there could be more and more 30-passenger buses, and you probably wouldn't be so scared.

I hate to say it, but please. Somewhere you will be quoted saying, "Terrorism is fine, we shouldn't suffer so much."

That's not what I mean.

What I mean is, indeed, rationally, our distress over what happened and threats should be roughly proportional to the magnitude of those threats and those coming.

I don't think that's the case with terrorism.

And do you know how many of the things we heard from the speakers today, how many people stood up and said, "Poverty!" I can't believe what poverty is doing to us.

people wake up in the morning They don't care about poverty.

It's not headline, it's not news, it's not flashy.

No shots were fired.

So, if you had to solve one of these problems, Chris, which would it be? Terrorism or poverty?

(Laughter) (Applause) That's difficult.

CA: No questions.

Poverty is an order of magnitude, an order of magnitude greater. Unless someone can prove that there are nuclear terrorists, there is a good chance they will indeed come.

What I've read, seen, and thought about recently is that it's incredibly difficult for them to do.

If it turns out to be wrong, we'll all look stupid, but when it comes to poverty, it's kind of a problem -- DG: Even if it were true, more people would die from poverty.

CA: We've evolved to get excited about dramatic attacks like this. Is it because, long ago, in the eons of time, we didn't understand the diseases, institutions, etc. that caused poverty and such, so it was pointless as a species to put our energies into worrying about them?

people died. that's OK.

But when attacked, it was something that could be managed.

So we evolved these correspondences.

did that happen?

DG: Well, the people most skeptical of the evolutionary explanation for everything are the evolutionary psychologists themselves.

My guess is that there is nothing more concrete in our evolutionary past. Rather, if you're asking for an evolutionary explanation, you might say that most organisms are neophobic, that is, they're a little scared of the new and different.

And for good reason. Because the old ones won't eat you. right?

Animals you've seen before are less likely to be predators than animals you've never seen before.

So when a school bus blows up and we've never seen it before, our general tendency is towards something new and novel.

I don't think it's as specific a mechanism as the one you alluded to, but I think it's probably a more fundamental mechanism underlying it.

Jay Walker: You know, economists love to talk about the stupidity of people who buy lottery tickets. But I suspect you're making the very same mistake you're blaming those people for: the value mistake.

I've interviewed about 1,000 lottery ticket buyers over the years, so I know that.

It turns out that buying a lottery ticket isn't worth winning.

That's what you think. have understood?

The average lottery ticket purchaser purchases about 150 tickets per year. So the buyer buys 150 tickets a year, knowing full well that he will lose. why is that?

It's not because she's stupid, or because he's stupid.

That's because the anticipation of a possible win releases serotonin in your brain, making you feel good until you actually lose the lottery.

In other words, investing in dollars can feel a lot better than flushing money down the toilet.

Now, economists -- (applause) -- economists tend to see the world through their lens. So this is just a bunch of stupid people.

As a result, many people see economists as stupid people.

Fundamentally, the reason we got to the moon is because we didn't listen to economists. thank you very much.

(Applause) DG: No, that's a great point. It remains to be seen if the joy of anticipation exactly equals the amount of disappointment after the draw. Remember, people who didn't buy tickets won't feel sick the next day, even if they feel sick during the draw.

I disagree with people saying they know they can't win.

I think they consider that unlikely, but they prefer it to flushing because it can actually happen.

But I certainly see your point that buying lottery tickets has some utility besides winning.

Now, I think there are many good reasons not to listen to economists.

For me this is not one of them, but there are many others.

CA: Last question.

Aubrey de Gray: My name is Aubrey de Gray and I'm from Cambridge.

I'm dealing with a problem that kills more people than anything else: the aging problem. And I think everyone will hear tomorrow, but I'm interested in doing something about it.

I very much agree with what you are saying. Because I think the problem with getting people interested in aging is that by the time aging kills people, it looks like cancer, heart disease, etc. Do you have any advice?

(laughter) DG: For you or for them?

AdG: In convincing them.

DG: Oh, it was you who persuaded them.

Well, it's notoriously difficult to get people to have foresight.

But one thing that psychologists have tried that seems to have worked is getting people to imagine the future more vividly.

One of the problems with making decisions about the far and near future is that we imagine the near future far more vividly than the far future.

As long as people can put an even amount of detail into mental representations of the near and far future, people will start making decisions about the two in the same way.

So, asking if you want another $100,000 when you're 65 is very different from asking yourself what you'll look like when you're 65: will you be alive, what will you look like, how much hair will you have, and who will you live with?

Once you grasp all the details of that imaginary scenario, it suddenly feels like it might be important for the person to save some for retirement.

But these are tricks around whitespace.

I think you're generally battling a very basic human tendency to say, "I'm here today, so now is more important than later."

CA: Thank you, Dan. It was a great session, dear audience. thank you.

(applause)

In 1593, in the German town of Nördlingen, an innkeeper named Maria Hell was accused of witchcraft.

She was arrested for questioning but denied the charges.

She continued to claim that she was not a witch through 62 tortures until her accusers finally released her.

Rebecca Lemp, who was accused in the same town a few years ago, faced an even worse fate.

She wrote to her husband from prison, worried that she would be tortured into confessing, even though she was innocent.

She was burned at the stake in front of her family after making a false confession.

Both Hell and Lemp were victims of witch hunts that occurred in the colonies of Europe and America in the late 15th and early 18th centuries.

These witch hunts were not coordinated efforts by a single authority, but rather sporadic occurrences that followed similar patterns each time.

The term "witch" has many meanings, but these hunts refer to someone who has acquired magical powers by following Satan rather than God.

This definition of witchcraft prevailed in Western European churches from the end of the 15th century.

The movement took off in earnest in 1485 after the Pope authorized a monk and professor of theology named Heinrich Kramer to conduct an Inquisition to search for witches.

His first trial in the town of Innsbruck was not well supported by the local authorities, who disapproved of the harsh interrogation of his upstanding citizen and broke off the trial.

Undaunted, he wrote a book called "Malleus Maleficarum" or "The Witch's Hammer".

The document claimed the existence of witches and suggested ruthless tactics for hunting and prosecuting them.

He cited women as vulnerable targets for demons, but men can also become witches.

Kramer's book inspired others to write their own and preach sermons on the dangers of witchcraft.

According to these documents, witches performed rituals such as kissing the demon's anus and poisoning or bewitching the target the demon chose to harm.

Although there was no evidence to support these claims, the belief in witches was widespread.

Witch hunts often began with misfortunes such as failed harvests, sick cows, and stillbirths.

Members of the community condemned witchcraft and accused each other of being witches.

Many of the accused were on the margins of society, such as the elderly, the poor and marginalized, but any member of the community, even children, can be targeted.

While religious authorities encouraged witch-hunting, local secular governments routinely detained and punished suspected witches.

Witchcraft suspects were interrogated and often tortured, and thousands of innocent people under torture confessed to witchcraft, implicating others in turn.

These witch hunts occurred sporadically over the centuries and from continent to continent, so the details varied widely.

Punishments for convicted witches ranged from small fines to burning at the stake.

The investigation in which Hell and Lemp were accused lasted nine years, while the others lasted only a few months.

Victims can range from a few to hundreds.

The witch hunters' motives probably varied, but most likely they weren't consciously looking for scapegoats, but genuinely believed in witchcraft and thought they were doing a good thing by eradicating it from their communities.

Authorities have allowed real harm to be done based on these beliefs.

But opposition has always existed. Legal scholars, scholars, and doctors have refuted books like Kramer's The Witch's Hammer with sentences against the brutality of the hunt, the coercion of confessions, and the lack of evidence of witchcraft.

Their claims gained momentum in the late 17th and mid-18th centuries, with stronger central governments and the rise of legal norms such as due process.

Witch hunts gradually declined and eventually disappeared completely.

The emergence and termination of these atrocities happened gradually from seemingly mundane circumstances.

Similar situations still exist in which authorities use their power to mobilize society against false threats, but so does the capacity of rational dissent to combat these false beliefs.

By monitoring blood sugar levels, delivering insulin, and avoiding the need for constant finger sticks and blood tests, insulin pumps have improved the lives of many of the 415 million people with diabetes worldwide.

These small machines contain a pump and a needle that sense blood sugar levels and feed them back to the pump to calculate how much insulin to administer through the needle.

But they have their pitfalls. that it is temporary.

Within a few days, the glucose sensor should be moved and replaced.

And it's not just blood glucose monitors and insulin pumps that have this problem, it's all body implants on various timescales.

A plastic knee prosthesis should be replaced after about 20 years.

Other implants, such as those used for cosmetic purposes, may suffer the same fate in about ten years.

It's not just annoying. It can be expensive and risky.

This inconvenience is caused by our body's immune system.

Honed by hundreds of millions of years of evolution, these defensive fronts are remarkably good at discerning foreign objects.

Our immune system is equipped with great tools to tackle, intercept, and destroy anything that shouldn't be there.

But this constant scrutiny makes our bodies treat useful implants like insulin pumps with the same suspicion as harmful viruses and bacteria.

As soon as an insulin pump is implanted in the skin, its presence triggers a reaction known as a "foreign body reaction." It starts with floating proteins that stick to the surface of the implant.

These proteins contain antibodies, which try to neutralize the new object and send signals to summon other immune cells to the site to enhance their attack.

Early response inflammatory cells, such as neutrophils and macrophages, respond to emergency calls.

Neutrophils release tiny granules packed with enzymes that try to destroy the surface of the insulin pump needle.

Macrophages also secrete enzymes along with nitric oxide radicals that trigger chemical reactions that break down objects over time.

When macrophages can't expel the foreign material quickly, they fuse together to form clumps of cells called "giant cells." At the same time, cells called fibroblasts migrate to the site and begin depositing a dense layer of connective tissue.

They surround the needle that the pump uses to deliver insulin and test blood sugar levels.

Over time this scaffold builds up and forms a scar around the implant.

The scar acts as a nearly impenetrable wall and can begin to block vital interactions between the body and the implant.

For example, a scar around a pacemaker can interrupt electrical transmission that is essential for the pacemaker to function.

As the artificial knee joint wears, it releases particles, and immune cells can become inflamed around the debris.

Sadly, immune system attacks can even be life-threatening.

But researchers are finding ways to trick the immune system into accepting new devices we introduce into our body tissues.

We have found that coating implants with certain chemicals and drugs can dampen the immune response.

These essentially make the implant invisible to the immune system.

We also manufacture more and more implants from natural materials with shapes that directly mimic tissue, making the body less aggressive than it would be if it were to encounter a completely artificial implant.

Some medical procedures include implants designed to regenerate lost or damaged tissue.

In such cases, implants containing specific signaling components can be designed to carefully tune the body's immune response.

In the future, this method of working in tandem with the immune system could aid in the development of complete artificial organs, fully integrated prostheses, and self-healing wound treatments.

These treatments may one day revolutionize medicine and change the bodies we live in forever.

A career I started early in life was searching for exotic life forms in exotic locations. At the time, I was working in the Antarctic and Arctic, and in the high and low deserts.

Up until a dozen years ago, I was obsessed with caves and refocused most of my research in that direction.

So I'm doing a really great job -- I can do some really great things.

I work in some of the harshest cave environments on earth.

Many of them try to kill us from the moment we step inside, yet they are absolutely fascinating and contain incredible biological wonders that are very different from anything we have on Earth.

Apart from the intrinsic values ​​of biology, mineralogy and geomicrobiology that we do there, we also use these as templates for finding ways to go in search of life on other planets.

Especially Mars, but also Europa, the small icy moon around Jupiter.

And perhaps, one day, well beyond our solar system itself.

I am very passionate about the future of humanity, especially the Moon and Mars and other parts of the solar system.

I believe we are now in a time of transitioning civilizations and species towards the solar system.

And all of this makes me wonder if we can and should think about transporting terrestrial life to other planets.

Mars in particular is the first example.

What I never talk about at academic conferences is how we actually got to this point and why we do what we do.

Why can't I get a normal job, a decent job?

And, of course, I blame the USSR.

Because in the mid-1950s, when I was a little kid, they had the audacity to launch a very primitive small satellite called Sputnik, throwing the Western world into hysterical chaos.

And a huge amount of money was put into improving children's science and math skills.

And like many of my colleagues, I am a product of that generation.

It really got us hooked and lit the fire. It would be great to be able to reproduce it again now.

Of course, refusing to be an adult is something I do pretty well with, even if I pretend to be an adult in my day-to-day life, but it's really important to keep the childishness of not caring what other people think about the things I'm interested in.

The next factor is the fact that I have applied a value judgment, and my value judgment is that the presence of life is better than the absence of life.

Therefore life is more valuable than no life.

And I think that sums up a lot of the work that this audience approaches.

Of course, I am very interested in Mars. And it was the product of when a Viking lander landed on Mars when I was a young undergrad.

And it transformed what had been a small celestial object that looked like a dot in the sky into a complete landscape, and the very first primitive pictures flowed onto the screen.

And when it became a landscape, it also became a destination and really changed the course of my life.

In graduate school, I worked with my colleague, mentor, and friend Steve Schneider at the National Center for Atmospheric Research on the issue of global change.

We've written a lot about the role of the Gaia hypothesis, whether we can think of the Earth as a single entity in a meaningful scientific sense. Later, as a derivation, I studied the effects of nuclear warfare on the environment.

Sometimes it's great, sometimes it's terrifying.

But what it has taught me is to see the Earth as a planet with an outside eye, not just as a home.

And it's a great step from the perspective of trying to think about how our planet behaves as a planet and with the life that lives on it.

And it seems to me that all these are important points in history.

We are poised to begin the process of leaving our planet of origin and into the wider solar system and beyond.

Now, back to Mars.

How hard would it be to find life on Mars?

Well, even here on Earth it can be really very difficult for us to find each other.

So finding life on another planet is not an easy task and we spend a lot of time thinking about it.

Whether or not you think it's likely to succeed depends on how you think about the potential for life in the universe.

I myself believe that life is the natural result of matter becoming more and more complex over time.

So starting with the big bang, you get hydrogen, then you get helium, then you get more complex stuff, and planets are formed. From my point of view, life is a general planet-based phenomenon.

Indeed, over the past 15 years, the number of planets outside our solar system has been increasing, and just last month, a few weeks ago, a planet the size of Earth was indeed discovered.

This is very exciting news.

So my first bold prediction is that life is everywhere in the universe.

It will be everywhere we look, wherever there are planetary systems that could potentially support it.

And those planetary systems will become very common.

So what will life be like on Mars?

Well, a decade or so ago, if someone asked me how likely it was that there was life on Mars, I would probably say a few percent.

And even that was considered outrageous at the time.

I was once cynically presented by a former NASA employee as the only person on Earth who believed there was still life on Mars.

Of course, the official is dead now, but I'm not. So there is a certain amount of glory in surviving an adversary.

However, the situation has changed significantly in the last ten years.

And the reason they changed is because new information came in.

The amazing Pathfinder mission in 1997, and the MER rover mission to Mars we are talking about now, and the European Space Agency's Mars Express have taught us many amazing things.

The planet has ice underground.

Therefore, where there is water, life like us is very likely to exist.

There's obviously sedimentary rock all over the place. One of the landers sits in the middle of the ancient seabed. There is an amazing structure called Blueberry. Blueberries are little boulders that we're busy making biologically in my lab right now.

Putting it all together, I think the possibilities in life are much greater than I thought.

I think the odds of life ever forming on Mars are probably 1 in 4 to 1 in 5.

So this is a very bold statement.

I think it's there, and I think we need to go look for it, and I think it's in the basement.

This is the game we play in astrobiology.

How are we going to understand extraterrestrial life?

how are you going to find it?

How do you know it when you find it?

Because if it was big and obvious, we should have found it already. It's already bitten your leg, but it's not yet.

So I know it's probably very puzzling.

Very importantly, if you find it, how do you keep it from polluting it?

And, perhaps more importantly, since this is our home planet, how do we protect ourselves from it while we study it?

So why is it so hard to find?

Well, it's probably microscopic, and it's never easy to study the microscopic, but thanks to the amazing tools we have now, we can study things on a much smaller scale and much more deeply than we ever have before.

But if you isolate the resource from the environment, it makes you palatable, and others can eat or consume you, so it's probably hidden.

And then there is the predator-prey game, which is universal in nature and, in fact, ends up being present in all kinds of biological systems.

Also, their basic properties, i.e. their chemistry and size, can be very different.

When you say small, what does that mean?

virus size? smaller than that?

Is it bigger than the largest bacterium? I do not understand.

And the speed of activity is a problem we face when dealing with subterranean organisms, as they grow very slowly.

If I take a swab from your tooth and put it in a petri dish, you should see growth within about 4-5 hours.

However, the organisms we deal with from the earth's subsurface take months, often years, to see growth.

So they are essentially slower life forms.

But the real problem is that we are guided by our limited experience, and until we can think beyond our own skulls and what we know, we fail to recognize what to look for and how to plan for it.

So perspective is everything, and thanks to the history I just talked about briefly, I've learned to think of Earth as an extraterrestrial planet.

And this has been invaluable in our approach to trying to study these things.

This is my favorite game about airplanes. If you look out the window on an airplane, you can see the horizon.

I always turn my head to the side, and that simple change takes me from seeing this planet as my home to seeing it as a planet.

It's a very easy trick, so I always do it when I'm sitting in the window seat.

Well, this also applies to our work.

This shows one of the most extreme caves we work with.

This is Cueva de Villa Luz in Tabasco, Mexico, but this cave is saturated with sulfuric acid.

The cave is a completely hostile environment for us, with large amounts of hydrogen sulfide flowing into it from volcanic sources and the decomposition of evaporites (the minerals underlying the carbonates from which the cave is formed).

We have to go in protective suits and respirators and 30ppm H2S will kill you.

This is typically a few hundred ppm.

So it's a very dangerous environment with CO and many other gases.

These extreme physical and chemical parameters make the biology that grows in these places very special.

Because life isn't here, as you might think.

This is one of the richest caves we have found on Earth.

I am overflowing with vitality.

Extreme phenomena on Earth are interesting in and of themselves, but one of the reasons we are interested in them is that they actually represent average conditions that we would expect on other planets.

So this is part of our ability to stretch our imaginations in terms of what we might find in the future.

There are many creatures in this cave, and I can't even trace its surface with you.

But one of the most famous of these objects is what we call snottites, for obvious reasons.

This is similar to what comes out of a 2-year-old's nose when he has a cold.

And this is produced by bacteria that actually produce more sulfuric acid and live at a pH just near zero.

So this is like battery acid.

Yet everything in this cave is adapted to that.

In fact, the cave has so much energy available for biology that it is actually home to a huge number of cave fish.

And the local Zoke Indians harvest it twice a year as part of their Easter Week celebrations and Holy Week celebrations.

This is very unusual in caves.

In other great caves we work with, this one is in Lechuguila Caverns, New Mexico, near Carlsbad, and is one of the most famous caves in the world.

It's a 115-mile corridor on the map, pristine and without openings, a huge biological and geomicrobiological laboratory.

The cave is extensively covered with the reddish material seen here, and also has giant crystals of selenite that can be seen hanging.

This substance is biologically produced.

This is the breakdown product of bedrock, and what organisms are busy munching on.

It takes in iron and manganese minerals in the bedrock and oxidizes them.

And every time they do that, they get a tiny little packet of energy.

And that tiny little packet of energy is what they use to carry out life processes.

Interestingly, they also do this with uranium and chromium and various other toxic metals.

Thus, an obvious means of bioremediation can be obtained from such organisms.

We are now bringing these organisms into the lab, where we can see some of them growing on Petri dishes and reproduce the exact biominerals we found in the walls of these caves.

So these are the signals they left on rock records.

Well, even the basalt surfaces of lava tube caves, a byproduct of volcanic activity, often find these walls completely covered in these beautiful shiny silver walls, or shiny pink, shiny red, or shiny gold.

These are also mineral deposits made by bacteria.

You can see scanning electron micrographs of these people in the center image here. These are germ gardens.

One of the interesting things about these particular bacteria is that they belong to the group of actinomycetes and actinomycetes, from which we get most of the antibiotics.

Beneath the earth's surface is a vast biodiversity.

And because these organisms are so far from the surface, they produce a huge number of novel compounds.

Its potential for pharmaceutical and industrial chemical applications is therefore quite untapped, but probably exceeds most of the rest of the biodiversity on earth.

Well, lava tube caves - I talked about the creatures that inhabit this planet.

We know that there are many such structures on Mars and the Moon.

we can see them

On the left you can see a lava tube formed by a recent eruption (Mount Etna in Sicily). This is how these lava tubes are formed.

And when it is hollowed out, it becomes a habitat for living things.

These are all over Mars and we are currently busy cataloging them.

So there exists a very interesting cave estate of at least that type on Mars.

To access these subterranean environments that we are interested in, we are very interested in developing tools to do this.

As you know, entering these caves is not easy.

Accessing these requires crawling, climbing, ropework, technical ropework, and many other complex human movements.

We are faced with the question of how this can be done robotically.

Why would you want to do it robotically?

Well, we will be sending robot missions to Mars long before human missions.

And secondly, going back to the point I made earlier about the preciousness of life that might be found on Mars, we don't want to pollute Mars.

And one of the best ways to research something without polluting it is to hire an intermediary.

And in this case, we envision an intermediate robotic device that can actually do some of the front-end work for us to protect any potential life we ​​find.

I am not going to cover all of these projects here, but we are working with various groups on about 6 robot development projects.

I want to talk specifically about the arrays shown at the top.

These are swarms of jumping microbots.

I'm working on this with my friend Steve Dabowski from the Field Space Robotics Laboratory and MIT. Then he came up with the idea of ​​making a little bean-like robot that jumped around, propelled by artificial muscles. This is EPAM, or artificial muscle, one of the specialties of the Dubowski lab.

And these allow them to hop.

They have correlated swarm behavior modeled on that of insects and can be very numerous.

And as you can see in this top left diagram, 1,000 of them could be sent and could fit in the payload bay used in one of the current MER rovers.

And these little guys, you could lose a lot of them.

If you send 1,000 of them, you'll probably eliminate 90% of them and still have a mission.

So you have the flexibility to navigate even the most challenging terrain and get where you really want to go.

Now, to conclude this, I want to spend a couple of seconds talking about caves and the extraterrestrial expansion of humanity as a natural result of the work they do in caves.

Many years ago, we realized that caves have many properties that humans and other creatures have used as habitats in the past.

And perhaps it's time to start exploring Mars and the Moon in view of future explorations of them.

So we've just completed Phase 2 research at NASA's Advanced Concepts Laboratory, looking at the irreducible set of technologies needed to make lava tubes on the Moon and Mars actually habitable.

It turned out to be a fairly simple and small list, moving in the direction of relatively primitive technology.

So, we're talking about inflatable liners that can conform to the complex terrain inside caves, in-situ foam airlocks to deal with this complex terrain, different ways to obtain breathing gas made from materials unique to these celestial bodies, and so on.

And there is a future where we can take advantage of these lava caverns on Mars.

And now we're in caves, doing science and recreation, but I think in the future we're going to use them for habitat and science for these other celestial bodies.

Now, my take on the current state of potential life on Mars is that it probably exists on Mars, probably a 1 in 2 chance.

The question of whether there is life on Mars in relation to life on Earth is now very vague. Because we know from Martian meteorites that have reached Earth that there is material that can be exchanged between these two planets.

Of course, one compelling question, if we were to go there and find life underground, which I fully expect would be, is it a secondary origin for life?

Did life start here and be carried there?

Did it start there and bring it here?

This will be an interesting mystery for the next half century. And I expect more and more Mars missions to answer these questions.

thank you.

As I was trying to figure out how syncing related to happiness, I realized that for some reason, we enjoy syncing.

We like to dance together, we like to sing together.

So, if you'll put up with this, I'd like to ask you to help me with my first experiment today. The experiment was -- by the way, when you applauded, I realized you did it in a typical North American way. I mean, you were loud and incoherent.

you were unorganized. It never occurred to me to applaud in unison.

do you think you can? I would like to see if this audience, which I have not practiced as far as I know, can come together and clap their hands.

(Applause.) Oh! Now, that's what we call emergent behavior.

(Laughter) So I wasn't expecting that, but I was expecting it to sync.

It never occurred to me to increase the frequency.

That's interesting.

(Laughter.) What then? First of all, we know you guys are great.

This is a room where intelligent and sensitive people gather.

Some are trained musicians.

Were you able to sync it?

So let's take the question a little more seriously and ask ourselves what we just did: what are the minimum requirements for spontaneous synchronization?

For example, do you need to be as smart as you are?

Do we need brains just to synchronize?

do i have to be alive? I mean, it's a creepy thought, right?

Inanimate objects that may spontaneously synchronize.

It's real. In fact, what I'm going to explain today is that syncing is probably one of the most, if not the most pervasive drives in nature.

It extends from the subatomic scale to the ends of the universe.

This is a deep tendency to order in nature that goes against what we have all been taught about entropy.

So I'm not saying that the law of entropy is wrong.

But there is an opposing force in the universe, a tendency toward spontaneous order. That's our theme.

Now, to get to the point, let's start with something that might immediately come to mind when you hear that we're talking about synchrony in nature. It is a shining example of flocking birds and fish swimming in organized schools.

They are therefore not particularly intelligent creatures, but nevertheless, as we shall see, they perform a beautiful ballet.

This is from the BBC show 'Predators' and here we are looking at an example of sync related to defense.

Like starlings and fish, when their bodies are small and weak, they are useful in flocking to avoid or confuse predators.

Please shut up for a second, because this is so wonderful.

For a long time, biologists were baffled by this behavior and wondered how it was possible.

We are used to choreography that creates synchrony.

These creatures are not choreographed.

They choreograph themselves.

Introducing a computer model of how a herd works, created by Oxford University researcher Ian Cousin.

There are only 3 simple rules.

First, all individuals perceive only their nearest neighbors.

Second, all people tend to line up.

And third, they're all attracted to each other, but they try to keep a little distance.

Once you've incorporated these three rules, you'll automatically start seeing flocks that look a lot like schools of fish or flocks of birds.

Now, fish like to stay close to each other, about a body length apart.

Birds try to stay about three to four body lengths apart.

But apart from that difference, the rules are the same for both.

Now, everything changes when a predator invades the scene.

The fourth rule is to stay out of the way when a predator approaches.

In this model, we see a predator attacking.

The prey moves in random directions and then comes back together again by the law of attraction, thus constantly splitting and reforming.

And it is also found in nature.

Note that while each individual appears to act to cooperate, what is really happening is a kind of selfish Darwinian behavior.

Each one scatters randomly to protect its scales and wings.

That is, out of a desire to save themselves, each creature obeys these rules, which leads to what is safe for all creatures.

Even though it looks like they are thinking as a group, they are not.

You may be wondering what exactly the advantages of being in a herd are, but there are a few possibilities.

As I said earlier, when you're in a crowd, you're less likely to find yourself in an unlucky position than in a small group.

There are many eyes that can detect danger.

And in the example of starlings and birds, we see that when this peregrine falcon is about to attack them, it can actually propagate a wave of panic and send a message over long distances.

As you can see, it probably comes last, but maybe not.

This mechanism allows information to be transmitted over half a kilometer in a very short time.

Yes it's happening here.

See if you can see the waves propagating through the flock.

beautiful. Birds have some idea of ​​what is going on from their computer models.

Like I said, it's just these three simple rules and the rule to watch out for predators.

There seems to be nothing mystical about this.

But on a mathematical level it doesn't really make sense.

i am a mathematician I would like to deepen my understanding.

I mean, I showed you a computer model, but the computer doesn't understand.

In some ways, computers are just experiments.

We want to gain more insight into how this works and understand exactly where this organization came from.

How do rules create patterns?

There is one case that we have come to understand better. That is the case of fireflies.

If you look at fireflies in North America, like many types of fireflies in North America, fireflies are often independent operators. they ignore each other.

They each do their own thing and blink without paying attention to their neighbors.

However, in Southeast Asia such as Thailand, Malaysia and Borneo, beautiful cooperative behavior is seen between male fireflies.

You can see it every night on the river bank.

The mangrove trees are full of fireflies that communicate with the light.

Specifically, the male fireflies flash in unison, perfectly timed and in perfect synchronization, reinforcing their message to the females.

And the message, you guessed it, is, "Come over here, hang out with me."

(music) I'll show you the slow motion of one firefly in a moment to get a feel for it. This is a single frame.

Then it turns on, then turns off. 1/30th of a second.

And watch this whole riverbank and see how accurate the synchronization is.

On, then on, then off.

The combined light from these beetles (although they are actually tiny beetles) is so bright that fishermen out at sea can use these beetles as navigational beacons to find their way back to their home rivers. It is wonderful.

When the first Western travelers like Sir Francis Drake went to Thailand and returned with tales of this incredible sight, it was hard to believe for a long time.

no one believed them.

You don't see anything like this in Europe or the West.

And long after it was documented, it was thought to be some kind of optical illusion.

A scientific paper has been published that says eyelid twitching explains it, or that there's a human tendency to see patterns in nothing.

But after watching the video tonight, I think you can see that they were really well in sync.

Now the question is, do we have to be alive to see this kind of spontaneous order, and we have already suggested that the answer is no.

Well, it doesn't have to be a perfect creature.

You can even be just a single cell.

For example, consider the pacemaker cells in your heart right now.

they keep you alive.

Every beat of the heart depends on this vital area, the sinoatrial node. The sinoatrial node has about 10,000 independent cells, each of which beeps and has an electrical rhythm, a voltage that goes up and down, and sends signals that pump the ventricles.

Well, a pacemaker is not a single cell.

This democracy requires 10,000 cells to fire in unison for the pacemaker to function properly.

I'm not trying to convey the idea that syncing is always a good idea.

If you have epilepsy, there are instances where billions, or at least millions, of brain cells discharge in pathological concordance.

So this tendency towards order is not necessarily a good thing.

It doesn't have to be alive. It doesn't have to be a single cell.

For example, if you look at how lasers work, it would be a case of atomic synchrony.

In lasers, what makes laser light very different from overhead light is that this light is incoherent. It has different colors and different frequencies, similar to how you first clapped. But if you were Lazer, it would be rhythmic applause.

It causes all atoms to pulsate in unison, emitting light of one color and one frequency.

Now, the very dangerous part of my story is demonstrating that inanimate objects can be synchronized.

hold your breath for me

What I have here are two empty water bottles.

This is not Keith Barry doing magic tricks.

This is a junk just playing with a water bottle.

Here are some metronomes.

Can you hear me?

Ok, so I have a metronome and it's the world's smallest metronome, it shouldn't be advertised.

Anyway, this is the world's smallest metronome.

I set it to the fastest setting and now I'm going to use another one set to the same setting.

Let's try this first. If you put them together in a table, there's no reason to sync them, and they probably won't.

Maybe we should listen to them. I will stand here

What I would expect is that their frequencies aren't exactly the same, so they might simply drift apart.

right? they did

They were in sync for a while, but then drifted apart.

And the reason is because we can't communicate.

How can a metronome communicate?

That's right, they can communicate via mechanical forces.

So I will give them a chance to do so.

Place it on a movable table. This is the Cornell University Graduate Study Guide. have understood? So here it is.

Let's see if this works.

My wife pointed out to me that wearing both at the same time would turn the whole thing upside down, so it works.

have understood. Let's go. let's see. OK, I'm not trying to cheat. Let's start without syncing. No, that's too difficult.

(Applause.) Okay. So put them out there before someone gets out of sync.

(Laughter) Now, it may seem a little whimsical, but this prevalence of this tendency toward spontaneous order can sometimes have unintended consequences.

A clear example of this is what happened in London in 2000.

The Millennium Bridge was supposed to be the pride of London. A beautiful new footbridge over the River Thames, the first river crossing in London in over 100 years.

There was a big competition over the design of the bridge, and the winning proposal was submitted by an unusual team of architects, perhaps Britain's greatest architect, Sir Norman Foster, who collaborated with artist and sculptor Sir Anthony Caro and engineering firm Ove Arup - really in the spirit of TED.

Together they submitted a design based on Lord Foster's vision. It reminded him of when he used to read Flash Gordon comic books as a kid and said that when Flash Gordon fell into the abyss, he would shoot what would be a kind of lightsaber today.

He shot his lightsaber into the abyss, created a blade of light, and ran over this blade of light.

"That's the vision I want to give to London," he said.

I want a blade of light across the Thames. ”

So they made a blade of light, and it's a very thin ribbon of steel, probably the flattest and thinnest suspension bridge in the world, with cables coming out the sides.

You are used to suspension bridges with large hanging cables at the top.

These cables flank the bridge and hold it up like a rubber band stretched across the Thames.

Well everyone was very excited to try it.

Thousands of Londoners gathered on opening day and something happened.

And within two days the bridge was closed to the public.

So, first, I would like to introduce some interviews with people who were on the bridge on the opening day. They explain what happened.

Man: It started to move sideways and up and down a bit, as if you were in a boat.

W: Well, I remember feeling unsettled, very windy, and lots of flags up and down the sides.

Interviewer: Isn't it up and down? Boy: No.

Interviewer: Not before or after? Boy: No.

Interviewer: Just to the side. How far do you think it moved?

BOY: It's about -- Interviewer: So that much or this much?

Boy: About the second.

Interviewer: How much? Boy: Right.

Interviewer: Well, at least this much? Man: Oh, yes.

Woman: I remember wanting to get off.

Interviewer: Oh, did you? Woman: Right. It felt strange.

Interviewer: So was it enough to scare you? Woman: Yes, but I thought it was just me.

Interviewer: Oh! Now tell me why did I have to do this?

BOY: I had to do that to keep my balance. Because if you can't keep your balance, you'll fall to the left or right, about 45 degrees.

Interviewer: Then, please show me how you usually walk. right.

Then show me what it looks like when the bridge starts to move. right.

This meant that I had to deliberately push my foot out to the side and walk in short steps.

Man: That's right. And it was clear to me that it was probably due to the number of participants.

Interviewer: Were they walking in step on purpose or something like that?

Man: No, it would have been better if we had followed the movement of the bridge.

Steven Strogatz: Okay. You already have a hint of what happened with this.

Think of the bridge like this platform.

Think of people like a metronome.

Now, you may not be used to thinking of yourself as a metronome, but after all, we walk the same way, vibrating back and forth while walking.

And especially if we start walking like them, right?

They all exhibited a strange kind of skating gait that they adopted once the bridge started to move.

Now let me show you a video of the bridge.

But also, after seeing the bridge on opening day, you can also see an interesting clip of the work done by a Cambridge bridge engineer named Alan McBee. He worked out what happened on the bridge and built a bridge simulator to explain exactly what the problem was.

It was a sort of unintentional positive feedback loop between how people walked and how the bridge started to move, something the engineers didn't know.

In fact, I think the first thing you see is the young engineer who was put in charge of this project. have understood.

(Video) Interviewer: Anyone injured? Engineer: No.

Interviewer: Right. I mean, it was pretty small -- Engineer: Yes. Interviewer: -- But really?

Engineer: Of course. Interviewer: I thought, "Oh, that's a hassle."

Engineer: I felt sorry about that.

We spent a lot of time designing this bridge, analyzing it, checking the code, stressing it heavier than the code, and here the bridge was doing something we didn't know about.

Interviewer: You didn't expect that. Engineer: That's right.

Narrator: The most dramatic and shocking footage shows an entire portion of the crowd, hundreds of people, apparently swaying from side to side in unison. They are swaying with the bridge, not with each other.

This synchronized movement seemed to move the bridge.

But how can the crowd tune in?

Was there something special about the Millennium Bridge that caused this effect?

This was to be the focus of the investigation.

Interviewer: Well, the mock bridge is finally complete. You can wobble.

Now, Alan, this is all your fault, right? Alan McCroby: Yes.

Interviewer: This, yes, you designed this mock bridge, do you think it mimics the behavior of a real bridge?

AM: Yes, it captures a lot of physics.

Interviewer: Right. Then you should be able to wobble if you ride, right?

Alan McLovie, a bridge engineer in Cambridge, wrote me that the bridge simulator should swing like a real bridge, as long as you hang it on a pendulum of exactly the right length.

AM: It's only a few tons, so it's pretty easy to get started.

just by walking. Interviewer: Well, it's certainly progressing now.

AM: It doesn't have to be real hanging. just walk. it starts.

Interviewer: Actually walking is quite difficult.

If you put your feet in the wrong place, your feet will be scooped, so be careful.

AM: It certainly affects how you walk. You cannot walk on it normally.

Interviewer: No. If you try to put one foot in front of the other, your foot will come off the bottom. AM: Yes.

Interviewer: You mean you need to put your foot out to the side?

So already the simulator makes me walk exactly as our witnesses walked on the real bridge.

AM: ...how to walk on ice skates. It is rare to walk like a snake like this.

Interviewer: I wanted my own first day audience, the sound check team, to do a more convincing experiment.

Their instructions are "just walk normally".

It's really interesting because no one is trying to drive.

They all have some difficulty walking.

And the only way to walk comfortably is to keep pace.

But, of course, everyone drives on bridges.

It can't be helped. In practice, the movement of the bridge forces you to keep pace, thus requiring you to move the bridge further.

SS: Okay, well, maybe that's the end of the story from the Stupid Ministry of Strolling. I know you've gone.

But I hope you go out and see the world in a new way and see all the amazing synchrony around us. thank you.

(applause)

Deep in our solar system, a new era of space exploration is unfolding.

Astrobiologists continue to search for extraterrestrial life under the thick ice of Europa, in the steam plumes of Enceladus, and in Titan's methane lakes.

We focused on these three moons because each is an "ocean world," an environment containing liquid oceans, which can support the formation of life.

Organisms must, among other things, be able to grow, reproduce and feed themselves.

All of these functions require the formation of complex molecules from more basic components.

With a liquid such as water, the compound stays in suspension rather than sinking due to gravity.

This allows them to interact frequently in three-dimensional space and, under the right conditions, undergo chemical reactions that lead to the formation of biological matter.

That's not enough. The small but complex biomolecules we know so well are temperature sensitive and will not mix if they are too hot or too cold.

Liquid water has the added advantage of being relatively stable in temperature. This means that molecules can be insulated against large heat changes.

On Earth, these and other conditions in the aquatic environment may have supported the emergence of life billions of years ago.

Interestingly, the same may be true elsewhere in the solar system, such as these three icy moons.

Jupiter's moon Europa is perhaps the most interesting ocean world.

Beneath the ice surface, which is thicker than Everest, lies a liquid ocean that is 100 kilometers deep.

Astrobiologists believe this hidden ocean could harbor life.

Thanks to the Galileo spacecraft, we can speculate that its potential salinity is similar to that of some lakes on Earth.

However, most of its characteristics remain a mystery until further investigation.

Like Jupiter, Saturn also has moons that may have suitable conditions for life.

For example, Enceladus is a tiny ball of ice small enough to fit on the surface of the Gulf of Mexico.

Like Europa, there may be oceans under the ice.

But Enceladus also has geysers, which frequently release water vapor and tiny ice grains into space.

Astrobiologists are interested in whether these geysers are connected to the ocean below.

They want to send a probe to test whether the geyser's steam eruptions contain life-enabling material from its hidden ocean.

Water is best known as the substance that sustains life, but it is not necessarily the only medium that can sustain life.

Saturn's largest moon, Titan, has a thick nitrogen atmosphere containing methane and many other organic molecules.

The clouds condense and rain on Titan's surface, keeping lakes and oceans filled with liquid methane.

The special chemistry of this compound means that it is not as supportive a medium as water.

But when combined with large amounts of organic matter that also rains down from the sky, these liquid methane blobs could feed unknown life forms.

So what would indicate the existence of life on these or other worlds?

Astrobiologists speculate that if it did exist on Earth, it would be microscopically comparable to the bacteria that exist on Earth.

This makes it difficult to observe directly from a distance, so astrobiologists look for clues called biosignatures.

They can be cellular, fossil, or mineral traces left by living things.

And finding biosignatures will be difficult for many reasons.

One of the biggest concerns is thorough sterilization of the probe.

Otherwise, you could accidentally pollute the ocean world with Earth's own bacteria and destroy extraterrestrial life.

Titan, Enceladus and Europa are just three of the many possible ocean worlds we can explore.

We already know several other candidates within the solar system, such as Jupiter's moons Callisto and Ganymede, Neptune's Triton, and even Pluto.

If there is so much potential for life in our tiny solar system, what unimaginable secrets does the rest of the universe hide?

Hello, I'm Andrea Gibson. This is my poem "Nutritionist".

A nutritionist said I should eat root vegetables. I said that if I could harvest 13 turnips in a day, I would be grounded and rooted.

My head said it wouldn't be able to keep flying to where the darkness dwells.

The psychic said my heart was too heavy She told me if I had $20 she would tell me what to do When I gave her $20 she said, "Don't worry, darling, you'll find a good man in no time."

I tried it once, and I couldn't help but think how gay it was sitting in my closet.

A yogi told me to stretch everything but the truth, focus on the exhaled breath, that if I could care more about what I could give than what I could get, everyone would find happiness.

The pharmacist said Klonopin, Lamictil, Lithium, Xanax.

The doctor said antipsychotics might help me forget what Trauma said Trauma told me not to write this poem.

Nobody wants to hear you cry about the grief in your bones, but my bones said, "Tyler Clementi jumped into the Hudson River convinced he was completely alone." My bones said, "Write a poem." in lamp light.

To the fateful chandelier hanging on the thread.

Every day when you can't get out of bed.

For those who have ever wanted to die on the wrist.

It's sometimes said that the most healing thing we can do is tell ourselves over and over Others feel the same way Tomorrows come and go And it doesn't get better When you're about to write your mother a letter "I swear to God I tried" I know there are days when the whole world seems to be dancing in the streets Looted buildings You're not alone Wondering who's going to be convicted of the crime of claiming you keep loading your sorrows into the chamber of shame Just because your heart is so heavy doesn't mean you're weak I've never met a heavy heart other than a red-cloaked phone booth Hands always hold fast to the precipices of believing This is how life can be rich Soil creates food for decay Turns wounds into highways Pick me up in a truck with a bumper sticker saying "Well fitting into a sick society is not the measure of health" Never trusted a man who arched his spine like he believed those with untied throats Four nights screaming for a heartbeat and jumping off the George Washington Bridge for a heartbeat Four nights before Tyler Clementi jumped off the George Washington Bridge I was sitting in a hotel room in my own town Calculated exactly what I'd have to swallow to keep my bottle of sleeping pills down All I know about living is that the pain is never just ours Every time I hurt I know that hurt is an echo When it came into view, I saw a dandelion faint in the wind, and when it did, it scattered a thousand seeds.

So this time when I say how easy it is to get out, don't try to put me back in, here we are together by the window in pain to make everything better but I know the worst days can still come and our hearts may have just skinned our knees so let me just say this for the record, even if I keep stepping on my holy feet was it?

you stay here with me

Biting into the bitter darkness Your bright longing Your bright fists of loss Friends, if the only thing we can get here is each other, my God, that's enough My God, that's enough My God, so much light to give to each other's backs

It's amazing to meet a head of state and say, "What is your most precious natural resource?" --They don't say children at first.

And say children, and they will readily agree.

(Video): Today we are traveling with the Minister of Defense of Colombia, the Chief of the Armed Forces and the Chief of Police. We will deliver 650 laptops to children living in communities cut off from the world for the past 40 years without televisions or phones.

The importance of getting laptops to this region is connecting children who were otherwise unconnected because of the FARC (guerrillas that started as a political movement 40 years ago and then became a drug movement).

There are 1 billion children in the world, 50% of whom have no electricity at home or at school.

In some countries, like Afghanistan, 75 percent of girls are out of school.

And it doesn't mean they drop out of school in third or fourth grade. they don't go to school.

So, in the three years since I spoke at TED and showed off the prototype, it went from an idea to an actual laptop.

Half a million laptops are now in the hands of children.

We are in the process of shipping about 250,000 to these and other children, with another 250,000 on order at this time.

So, at a rough count, there are 1 million laptops.

This is less than I expected, 3-10 million, but still a very large number.

Colombia has about 3,000 laptops.

We are working with the Minister of Defense, not the Minister of Education. Because this is seen as a strategic defense issue in the sense of liberating these zones that were completely blockaded. It was, as it were, inhabited by people who have caused 40 years of bombings, kidnappings and assassinations.

And suddenly the kids plugged in their laptops.

they took a leap.

This change is truly monumental. Because it doesn't just open it up, it opens it up to the rest of the world.

Yes, they will build roads, they will install telephones, they will have televisions.

But since children aged 6 to 12 surf the internet in Spanish and local languages, they grow up with access to information and a window into the world.

Previously closed.

Interestingly, in other countries it is the finance minister who is seen as the engine of economic growth.

And that engine will pay off in 20 years.

It won't happen within a year, but this is an important and profound economic and cultural change that happens through our children.

A total of 31 countries are participating, and in the case of Uruguay, half of the children already own a laptop, and by mid-2009 every Uruguayan child will have a laptop – the little green laptop.

So what are the consequences?

Results common to all countries included teachers who said they never liked teaching more, and a spike in reading comprehension as measured by a third party, not by us.

Perhaps the most important thing we see is what children teach their parents.

they own a laptop they take them home.

So when I met three children from school who had traveled all day to come to Bogotá, one of the three children brought his mother.

And the reason she brought her mother is because this 6-year-old was teaching her to read and write.

Her mother did not go to elementary school.

This is a true reversal and a great example of how children are agents of change.

Now, finally, you will be asked why a laptop.

A laptop is a luxury item. It's like giving them an iPod. no.

The reason we need laptops is because the word is education, not laptops.

This is an educational project, not a laptop project.

They have to learn to learn. And think about it. They may have, say, 100 books.

A village has 100 laptops, each with 100 different books, so suddenly there are 10,000 books in the village.

When you and I were in elementary school, we didn't have ten thousand books.

In some cases schools are under trees, and in many cases teachers are only educated through fifth grade. So we need not only more schools and more teachers to train, but also collaborative learning models. It has to be done anyway.

So we're doing "Give One, Get One" again.

Last year, we ran our "Give One, Get One" program and were able to generate over 100,000 laptops and give them away for free.

And being a $0 laptop takes you to countries where you can't buy one at all.

And that's what we did. I have been to Haiti, Rwanda, Afghanistan, Ethiopia and Mongolia.

Seed principles such as saturation, connectivity, and underage in non-market places.

And you'll be able to actually deploy massive amounts of data.

So think of it like this: Consider this an inoculation to children against ignorance.

And think of your laptop as a vaccine.

A small number of children are not vaccinated.

You vaccinate all children in your community.

There are more Chinese restaurants in the country than McDonald's, Burger King, Kentucky Fried Chicken and Wendy's combined, 40,000 in fact.

In fact, Chinese restaurants have played an important role in American history.

The Cuban Missile Crisis was solved at a Chinese restaurant called Yanjing Palace in Washington, DC, which unfortunately is now closed and is being remodeled into Walgreens.

And the house where John Wilkes Booth planned the assassination of Abraham Lincoln is now a Chinese restaurant called Wok and Roll on H Street in Washington.

(Laughter) And it's not completely free. Because it's "wok" and "roll" i.e. Chinese and Japanese food, so it works to some extent.

And Americans love Chinese food so much that they actually brought it into space.

For example, NASA offers heat-stabilized sweet and sour pork on its shuttle menu for astronauts.

So let me ask you a question. If apple pie is your measure of Americanness, you need to ask yourself: How often do you eat apple pie? On the other hand, how often do you eat Chinese food?

(Laughter) And when you think about it, many of the foods that we or Americans think of as Chinese food are almost unrecognizable to Chinese people.

Examples: Beef and Broccoli, Egg Rolls, General Tso's Chicken, Fortune Cookies, Chop Sui, Takeout Boxes.

For example, I took a ton of fortune cookies back to China and gave them to Chinese people to see how they would react.

[What is this?] [Would you like to try it?] [Try it!] [What is this called?] [It's a fortune cookie. [Laughter] [There's paper inside!] [Laughter] [What's this?] [I won a prize!] [What's this?] [It's a fortune slip!] [Delicious!]

Simply put, they actually came from Japan.

And in the suburbs of Kyoto, there are still small family-run bakeries that make fortune cookies, just as they were 30 years before they were introduced to the United States, more than 100 years ago.

If you look side by side, there are yellow and brown.

It's actually flavored with miso and sesame paste, so it's not as sweet as our version.

So how did they end up in the US?

Well, to put it simply, Japanese immigrants came and many bakers introduced them. There's at least one in Los Angeles, and here in San Francisco, including a bakery called The Faithful Church on the corner of Sutter and Buchanan.

At the time, I was making fortune cookies using an iron very similar to the one I saw in Kyoto.

An interesting question is how to change the fortune cookie from Japanese to Chinese.

Well, during World War II we locked up all the Japanese, including the people who made the fortune cookies.

So the Chinese came in and saw the market opportunity and took over.

(Laughter) Now fortune cookies: invented by the Japanese, popularized by the Chinese, and eventually consumed by the Americans.

They are, first and foremost, Americans.

Another favorite dish of mine is General Tso's chicken. By the way, at the United States Naval Academy, it's called Admiral Tso's Chicken.

(laughs) I love this dish.

The original name of my book was "General Tso's Long March".

And he actually marched very far, because he's sweet, he's fried, he's chicken, and he's everything Americans love.

(Laughter.) In fact, he's marched so far that the chef who invented the dish in the first place doesn't even realize it. he's a little scared

Video: (in Chinese) Audience: (laughter) He's in Taiwan now.

He is retired, deaf and often plays mahjong.

When I showed him this, he got up and said "mòmíngqímiào" (meaning "this is all nonsense") and went back to play mahjong in the afternoon.

Another dish is one of my favourites. Beef and broccoli.

Broccoli is not a Chinese vegetable. Actually, it's originally an Italian vegetable.

Introduced to the United States in the 1800s, it became popular in the 1920s and 1930s.

China has its own broccoli called Chinese broccoli, but now they have discovered American broccoli and imported it as a sort of exotic delicacy.

I assure you, General Tso has never seen a broccoli stalk in his life.

It was General Tso's photo.

I went to his hometown.

This is a sign that says "Welcome to General Tso's Birthplace".

Then I went looking for chicken.

Finally I found a cow, and I also found a chicken.

Believe it or not, they were actually crossing the road.

(laughter) And I found many of General Tso's relatives still in town.

This man is now five generations away from Generals. This person is about 7 years old.

When I showed him a picture of General Tsochkin, he said, "I don't know this dish. Is this Chinese food?"

Because it doesn't look like Chinese food to them.

But they were not surprised that I had traveled all over the world to visit them, because in their eyes he was, after all, a famous military hero of the Qing dynasty.

He played a key role in the Taiping Rebellion, a war started by a man who believed himself to be the Son of God and the younger brother of Jesus Christ.

He started a war that killed 20 million people – the deadliest civil war in the world to this day.

So I realized when I was there, General Tso is a lot like Colonel Sanders in America in that he's known for his chicken, not his war.

But in China, this man is actually known for war, not chicken.

But the grandfather of all Chinese-American cuisine we should probably talk about is chop suey, introduced around the early 20th century.

According to the New York Times in 1904, Chinese restaurants were all the rage in town, and "...the town went 'chop suey' crazy."

So it took about 30 years for Americans to realize that chop suey is actually unknown in China and, as this article points out, "the average person in any city in China knows nothing about chop suey."

Back then, it was a way to show that you were sophisticated and international. A man who wants to impress a girl may take her on a quick date.

I would like to say that chop sui is the greatest culinary joke one culture has played on another because 'chop sui' when translated into Chinese means 'jaap sui' and vice versa means 'odd and ending'.

I mean, these people are going all over China looking for choppy, and it's like a Japanese person coming here and saying, "I heard that your country has a very popular dish called leftovers."

(Laughter) And that's not all. "This dish is especially popular after the holiday called 'Thanksgiving.'" (Laughter) So why and where did chop suey come from?

Travel back to the mid-1800s when the Chinese first came to America.

At that time, Americans didn't want to eat Chinese food.

In fact, they saw these peoples who landed on their shores as alien.

These people weren't eating dogs, they were eating cats.

If they're not eating cats, they're eating mice.

In fact, my respected employer, The New York Times, published an article in 1883 asking, "Do the Chinese Eat Mice?"

It's not the most PC-related question asked today, but it's not that outlandish when you look at the images that were popular at the time.

This is actually a genuine advertisement for rat poison from the late 1800s.

And under the word "clears," written very small, "They must leave." This refers not only to the rats, but to the Chinese who were among them. Because the way we perceive food was that these people eating different food than us must be different from us.

Another way to find out about antipathy to the Chinese is through documents like this.

This is in the Library of Congress.

A pamphlet published by Samuel Gompers, a hero of the American labor movement.

Its title is "Some Reason for Chinese Exclusion: Meat vs. Rice: American Masculinity Against Asian Coolies: Which Will Survive?".

And it basically developed the argument that Chinese men who eat rice would inevitably lower the living standards of American men who eat meat.

And in fact, this is one of the reasons why we have to remove them from this country.

It was against this backdrop that the Chinese Exclusion Act was passed between 1882 and 1902. This is the only time in American history that a group has been explicitly excluded because of their nationality or ethnicity.

So, in a way, the Chinese were attacked, so Chopsui was created as a defense mechanism.

Who came up with the idea of ​​chop suey?

There are many different mysteries and legends, but the most interesting I have found is this article from 1904.

A Chinese man named Lem Seng showed up in New York City's Chinatown and said, "I want you guys to stop making choppy because I'm the original creator of choppy and a sole proprietorship."

And he told me that a famous Chinese diplomat came and told him to cook a dish that was so popular that he could "pass" as Chinese.

And as he said, we would never print this today, but basically, American men have become very wealthy.

Lem Sen: "I could have made this money too, but I spent so much time looking for the American guy who stole my recipe.

Now that I have found him, I want my recipe back and I want you guys to stop making chop suey or pay me for the right to do the same.

So this was an early intellectual property exercise.

In fact, this idea of ​​Chinese-American food doesn't just exist in America.

In fact, Chinese food is the most popular food on the planet and is served on all seven continents, including Antarctica. Because Monday night is Chinese food night at McMurdo Station, Antarctica's premier science base.

You can see various kinds of Chinese food.

For example, in French-Chinese cuisine, frog legs are served with salt and pepper.

They also have Italian Chinese, but they don't have fortune cookies so they serve fried gelato.

My neighbor Alessandra was shocked when I told her that fried gelato is not made in China.

She said, "No, but all Chinese restaurants in Italy serve it."

(Laughter) The British have their own version too.

This is a dish called "Crispy Shredded Beef", which is more crunchy, more shredded, and less beef.

There is West Indian Chinese, Jamaican Chinese, Middle Eastern Chinese and Mauritian Chinese.

This is a dish I discovered called "Magic Bowl".

They have Indo-Chinese, Korean-Chinese, and Japanese-Chinese, with pizza versions of bao or small buns.

(Laughs) And then they pull out a Chinese noodle dish completely at random and just ramenify it.

This is the Chinese version without the juice.

So there is Peruvian Chinese food, but it should not be mixed with Mexican Chinese food. Basically, take something in and make it look like fajitas.

(laughs) There are also things like risotto chop suey.

My personal favorite of all the restaurants I've come across around the world is a restaurant in Brazil called "Kung Food".

(Laughter.) So let's take a step back and try to understand what is valued in America.

McDonald's has earned a lot of attention and respect for essentially standardizing menus, decor and dining experiences in post-World War II America.

But do you know?

They did so through a centralized headquarters in Illinois.

Chinese restaurants, I would argue, have done much the same, from menus and decor to restaurant names, but without a centralized headquarters.

So this actually became very clear to me in the March 30, 2005 Powerball draw. There, based on ticket sales, there were expected to be 3 or 4 second place winners from matching 5 or 6 Powerball numbers.

Instead, they got 110 and they were completely shocked.

They researched across the country and found that this could not be a scam because it happened in different states and on different computer systems.

Whatever it was, it caused people to act in a collectively aligned manner.

Well, it might have something to do with paper patterns like diamonds and diagonals.

It wasn't, so they were like, "Okay, let's watch TV."

So they looked up the "Lost" episode.

Now I don't have a TV, so I'm weird, but I'm very productive -- (Laughter) And on the "Lost" episode, this guy has a lucky number, it's not a lucky number, that's why he's on the island, but they looked it up and the numbers didn't match.

They saw "The Young and the Restless." Nor was it.

It didn't last until the next day when the first guy showed up and asked, "Where did you get your phone number?"

"I got it from a fortune cookie," he said.

This is a slip that one of the winners had, and a Tennessee lottery security officer said, "No, that's not true."

Basically, out of those 110 people, about 104 got their number from the fortune cookie.

(Laughter) Right. So I went and started looking.

I walked around the country looking for restaurants where these guys got fortune cookies.

There are many restaurants, including Leeds China in Omaha, some of which are actually run by Koreans, but that's another point, many of which are labeled "China Buffet."

What's interesting is that their stories are similar, but different.

It was lunch, it was takeout, it was sit down, it was buffet, it was three weeks ago, it was three months ago.

But at some point, all of these people got together at a fortune cookie and a Chinese restaurant and had a very similar experience.

And all of these restaurants served fortune cookies, but of course not even Chinese food at all.

This is part of a phenomenon I have called “spontaneous self-organization” where, like ant colonies, small decisions made at the micro level actually have a large impact at the macro level.

A good contrast is chicken mac nuggets.

McDonald's actually spent a decade developing a chicken-like product.

They made Chicken Pot Pie, Fried Chicken and finally introduced Chicken McNuggets.

And the great innovation of the Chicken McNuggets wasn't to bother them, it's kind of a simple concept.

The trick was that I was able to remove the chicken off the bone in a cost effective way. That's why it took people so long to imitate it. Within a decade, and then a few months, it had become a huge hit and had been introduced throughout the McDonald's system in the country.

By contrast, General Tso's Chicken actually started in New York City in the early 1970s. I also started getting involved in this world in New York City in the early 1970s.

(laughs) And this logo!

So me, General Tuo's chicken and this logo are all related.

However, it took about ten years for the dish to spread from New York City restaurants across the United States.

Someone says, "It's sweet, it's fried, it's chicken. Americans will love it."

My point here is that here in the Bay Area of ​​Silicon Valley, we think of McDonald's as Microsoft is to the dining experience.

A Chinese restaurant can probably be considered a Linux, open source thing, right?

(Laughter) If one person's idea is copied and propagated through the system, there can be specialized versions of Chinese food depending on the region.

New Orleans, for example, has Cajun Chinese food, with Sichuan alligators and sweet and sour crayfish.

And Philadelphia has the Philadelphia Cheesesteak Roll, which is like an egg roll on the outside and a cheesesteak on the inside.

I was surprised that it was in Atlanta as well as Philadelphia.

What happened was a Chinese family moved from Philadelphia to Atlanta and brought it with them.

So, because we tend to love stories, our historical lore is filled with a huge cast of characters: Howard Schultz from Starbucks, Ray Kroc from McDonald's, Asa Candler from Coca-Cola.

But small print is easy to miss.

For example, Mr. Lem Sen who introduced Chop Sui, Pen Chef who introduced General Tso Chicken, and the Japanese bakers who introduced Fortune Cookies.

So the point of my presentation is to make you think again. People whose names are forgotten in history may have had just as much, if not more, impact on what we eat today.

thank you very much.

When I was a kid, I used to leave my mom and stepfather's house every other Friday. Indian, British, atheist, Buddhist, agnostic, vegetarian, occasionally New Age, Democrat family.

And I was going to go 2.3 miles to my father and stepmother's house and join a white, evangelical Christian, conservative, republican, twice a week church going, meat eating family.

I don't need to shrink to describe how I got into the field of conflict resolution.

(Laughter) Whether I was facilitating dialogue in Charlottesville, Istanbul or Ahmedabad, the challenges were always the same. Despite all the challenges, honestly, how do we get people to make meaningful connections, take risks, and be changed by their experiences?

And I got to witness very beautiful electricity in those rooms.

And I will leave those rooms and attend the same daily gatherings, weddings, conferences, back-to-school picnics, etc. that many of you will fail to do.

There was a semantic gap between these intense conflict groups and my daily gatherings.

Now, sure, some might say someone's birthday party doesn't live up to the racial dialogue, but that's not what I was answering.

As a facilitator, you are taught to strip everything down and focus on interactions between people, whereas everyday hosts focus on getting things in order—food, flowers, fish knives—and leave interactions between people mostly to chance.

So I started thinking about how we could transform our daily gatherings to focus on creating meaning through human connection rather than obsessing over canapés.

And I interviewed dozens of brave and quirky organizers, including Olympic hockey coaches, Cirque du Soleil choreographers, rabbis, and camp counselors, to better understand what creates meaningful, even transformative gatherings.

And today I would like to share with you some of the things I learned about the new rules of gathering.

That's why most people start with a ready-made format when planning a get-together.

birthday party? cake and candles.

board of directors?

One brown table and 12 white men.

(Laughter) We cannot skip and form too quickly, assuming the purpose is clear.

Not only does this lead to tedious and repetitive gatherings, it misses out on deeper opportunities to actually serve our needs.

The first step to creating more meaningful daily gatherings is to embrace a specific, controversial purpose.

Pregnant women I know were terrified of baby showers.

The idea of ​​a "pin the diaper on the baby" game or opening presents felt strange and irrelevant.

So she stopped and asked. "What is the purpose of a baby shower?"

What do I need at this moment?

And she realized it was to deal with her fears and her husband's - remember that man? -- transition to parent.

So she asked two of her friends to organize a meeting based on it.

And on a sunny afternoon, six women gathered.

And first, she was scared to deal with her fear of giving birth. They told the story of her life to remind her of the traits she already possessed: courage, wonder, faith and surrender, which they believed would carry her and also help her to give birth.

And as they talked, they could tie each quality bead into a necklace and hang it around her neck in the delivery room.

Then her husband came and wrote new vows, family vows, and said them aloud. First, we made a commitment to keep our marriage at the center of our parenthood, but we also made future commitments to our future sons about what we wanted to keep from each family line and what we wanted to end with this generation.

Later, more friends, including men, came to the dinner party.

And instead of gifts, they each brought their own favorite childhood memories to share at the table.

Now, this might sound pretentious, or a little quirky, or a little intimate for a baby shower.

good.

it is specific.

It is debatable.

Just as your gathering should be unique to you, it is unique to them.

The next step in creating more meaningful daily gatherings is creating good debates.

Like me, you may have learned to never talk about sex, politics, or religion at the dinner table.

That's a good rule in terms of keeping harmony, or that's the intent.

But it strips away the core elements of meaning, the things that burn heat and relevance.

The best gatherings learn to foster good controversy by creating the conditions for human ties to be threatened by unhealthy peace as well as unhealthy conflict.

I used to work with an architecture firm and they were at a crossroads.

They had to decide whether to remain an architecture firm and focus on constructing buildings, or pivot and become a new design firm with a focus beyond constructing spaces.

And there was a real disagreement in that room, but you didn't know because no one was actually speaking out publicly.

So we hosted a good debate.

After the lunch break all the architects came back and held a cage match.

They came in and we took an architect and put it in one corner to represent the architecture and the other to represent the design.

We draped white towels around their necks and stole them out of the bathroom -- sorry, played Rocky music on their iPads and let managers like Don King hype up their opinions and prepare counterarguments, basically arguing the best possible arguments for each vision of the future.

Codes of politeness hampered their progress.

We then had everyone else physically choose between sides in front of their colleagues.

And they broke the deadlock because they were able to really show where they stand.

architecture won.

that's the job.

What about a tense Thanksgiving dinner?

who?

(Laughs) First of all, please tell us your purpose.

What does this family need this year?

If cultivating good heat is part of that, try spending an evening banning opinions and listening instead.

Choose a theme related to the underlying conflict.

But instead of opinions, ask everyone around the table to share stories of their own lives and experiences, differences and belongings that no one around the table has ever heard, or stories of when I changed my mind, so people can come and go to each other without burning down their homes.

Finally, to create more meaningful daily gatherings, use pop-up rules to create temporary alternate worlds.

A few years ago, I started noticing that invitations have a set of rules.

Feeling bored or controlling?

error.

In this multicultural and intersecting society, where many of us gather and are raised with etiquette that differs from our own, and unspoken norms of not sharing etiquette are problematic, pop-up rules allow us to connect meaningfully.

These are one-off constitutions for specific purposes.

I mean team dinners where different generations come together and don't share the same assumptions about phone etiquette. The first person to see the phone will pay the bill.

(Laughter) Try it.

(Applause.) In entrepreneurial advice circles made up entirely of strangers, organizers don't just want everyone listening to the one venture capitalist in the room.

In the case of a mother's party dinner where women who happen to be mothers gather and want to overturn the common sense, you need to be proactive when talking about your children.

(Laughter) It's a real dinner.

Rules are powerful because they can temporarily change and harmonize our behavior.

And in a diverse society, pop-up rules have special power.

They allow us to come together across differences, connect and make meaning together without having to be the same.

As a child, I became a chameleon and traveled between two worlds.

If someone sneezes at my mother's house, I say, "Take care of yourself," and at my father's house, "God bless you."

Like many of us, I went into hiding to protect myself.

And it wasn't until I grew up and through conflict work that I started to stop hiding.

And for me, gatherings, at their best, made me realize that we can be among others and be seen and seen for who we are.

How we collect matters because how we collect affects how we live.

thank you.

(applause)

"The New Colossus" by Emma Lazarus Not like the brazen-skinned giants that made their name in Greece, they straddle from land to land with their conquered limbs. Here at the Gates of Sunset washed by the sea, a mighty woman with a torch will stand. Its flames are trapped lightning, and its name is Mother of Exiles. A worldwide welcome shines from her lighthouse. Her placid eyes gaze out over the sky bridge harbor that surrounds the twin cities.

"Keep your famous pomp, O ancient land!" she cries with silent lips. "Give me the weary, the poor, the crowd longing to breathe free, the wretched garbage of the overflowing shore.

Send me the homeless, the storm-stricken. I will hold the lamp by the golden door. ”

My name is Saphia Eljillo. This poem is about "making use of water."

Dilute Forget the Arabic word for economy Forget the English عسل Forget the Arabic word for incense and incense English مسكين Arabic sandwich English صيدلية &amp; It's swirling My new mouth can be called glaucoma But Arabic still translates to swimming in white water I want to go home Break up I want to go home half drowning Half can't reach, can't even cross, you'll be ungrateful You'll be homesick in your safe home Blue American passport Do you even understand what's been lost to bring you here

My mom always reminded me that I have the same proportions as a Lego human.

(Laughter) And she actually has a point.

Lego is a company that has managed to make everyone believe that Lego is from their home country.

But no, it comes from my home country.

So you can imagine my excitement when the Lego family called me and asked me to design a brick house together.

This is an architectural model. Naturally, we built it out of Lego.

This is the final result.

And what we set out to do was design a building that was as interactive, engaging and playful as Lego itself, with an interconnected playground like this on the roof.

You can enter the ground-level square where Billund citizens can roam freely without a ticket.

And it's probably one of the only museums in the world where you're allowed to touch all artifacts.

But the Danish word for design is 'formgivning', which literally means giving form to something that has not yet been formed.

In other words, shaping the future.

And what I love about Lego is that Lego is not a toy.

It is a tool that allows children to build their own world, live in it through play, and invite friends to co-live and co-create that world.

And that's exactly what "shaping" is all about.

We humans have the power to shape the future.

Inspired by Lego, we built a public housing project in Copenhagen with wooden blocks stacked side by side.

Between them is left space with extra ceiling height and balconies.

And by gently wiggling the blocks, you can actually create curves and organic shapes that adapt to any urban situation.

Because adaptability is perhaps one of architecture's most powerful drivers.

Another example is here in Vancouver.

We were asked to see where the Granville Bridge trifurcates as it meets downtown.

And started mapping various constraints.

It's set back about 100 feet from the bridge because the city doesn't want anyone looking into the traffic on the bridge.

There are parks that cannot cast shadows.

In the end, you're left with a small triangular footprint, almost too small to build.

But then we wondered what if the 100 foot minimum distance was really close to the minimum distance. Once you reach 100 feet in the air, you can put the building back up.

And we did.

As you drive across the bridge, it's like someone is pulling back the curtains and welcoming you to Vancouver.

Or like weeds that grow through cracks in the pavement and bloom with light and air.

Under the bridge, we worked with Rodney Graham and a handful of Vancouver artists to create what we call the Sistine Chapel of street art, an upside-down art gallery, trying to turn the bridge's negative impact into a positive one.

So even though it looks like this kind of surreal architecture, it is very adaptable to its surroundings.

In other words, if bridges become museums, museums can also play the role of bridges.

Norway is building a museum across the river that allows people to travel through the exhibits from one side of the sculpture park to the other.

Architecture adapted to the landscape.

I built the headquarters of an energy company in China and designed its facade to look like Issey Miyake fabric.

It's wavy, so if you're facing the main direction of the sun, it's all opaque. It faces away from the sun, so it's all glass.

On average, it's like going from solid to transparent.

And without any moving parts or technology, this very simple idea reduces energy consumption by 30% when cooling, purely thanks to the shape of the façade.

In other words, what makes a building look elegant is also what makes its performance elegant.

The architecture is adapted to the climate.

You can also adapt one culture to another, like Manhattan. We incorporated a social space in a Copenhagen courtyard building where people can hang out in this kind of oasis in the middle of the city. And we combined that with the density and verticality of American skyscrapers to create what we call "courthouse skyscrapers."

From New York to Copenhagen.

We are now completing this waste-to-energy plant on the Copenhagen waterfront.

It will be the world's cleanest waste-to-energy power plant, with no toxins coming out of its chimney.

A totally invisible engineering marvel.

So we wondered how we could express this.

Copenhagen, as you can see, has snow but no mountains at all.

To go to Sweden for alpine skiing you have to go by bus for 6 hours.

So we decided to install an alpine ski slope on the roof of the power plant.

So this is the first test run I did a few months ago.

And what I love about this piece is that it also shows the power of shaping to change the world.

I have a 5-month-old son who will grow up never knowing that there was a time when he couldn't ski on the roof of a power plant.

(Laughter) (Applause) So for him and his generation, imagine that's their baseline.

Imagine how far they could go, and what crazy ideas they could propose for the future.

In front of it we are building the smallest project.

It's basically nine containers that were piled up at a Polish shipyard, crossed the Baltic Sea and docked at the port of Copenhagen, where 12 students currently live.

Each student has a view of the water and can jump out of the window into Copenhagen's beautiful harbor and back again.

All heat comes from the thermal mass of the ocean and all power comes from the sun.

This is the first 12 in Copenhagen, 60 more are in the works, and another 200 are on their way to Gothenburg, where they are in talks with the Paris Olympics to set up a small floating village on the Seine.

Just this kind of almost nomadic, impermanent architecture.

And our urban waterfronts are undergoing major changes.

Economic change, industrial change, climate change.

This is Manhattan before Hurricane Sandy, and this is Manhattan after Sandy.

We were asked by New York City to see if we could provide Manhattan with the flood protection it needs without building a seawall that isolates city life from the surrounding waters.

And we were inspired by the Highline.

You probably know the Highline. It's this great new park in New York.

Essentially an abandoned railroad track, it is now one of the city's most popular promenades.

So we wondered if we could design the necessary flood protection for Manhattan so we didn't have to wait until it closed before it got better.

So we spoke with citizens living along New York's waterfront and worked with them to design the flood protection needed to make the waterfront more accessible and enjoyable.

Underneath the FDR we set up something like a pavilion with a pocket wall that can be slid out to protect it from water.

We are creating a small stepped terrace that not only makes the underside more enjoyable, but also protects it from flooding.

Further north, East River Park creates hills that protect the park from highway noise, but also provide much-needed flood protection that can stop waves when storm surges hit.

In a way, this project, which we call the Dryline, is essentially the Highline -- (Laughter) the Highline that keeps Manhattan dry.

(Applause.) We plan to break ground on the first section of the East River later this year.

But it was essentially co-designed with the residents of Lower Manhattan to incorporate all the necessary infrastructure for resilience and give it positive social and environmental side effects.

So New York isn't the only city facing this situation.

In fact, by 2050, 90% of the world's major cities will have to deal with rising sea levels.

In Hamburg, they created an entire district designed so that the bottom floor can withstand the inevitable flooding.

In Sweden, we designed cities where all parks are wet gardens that deal with rainwater and wastewater.

So we thought it might be possible. In fact, today there are already three million people permanently living at sea.

So we wondered, could we really imagine a floating city designed to incorporate all of the United Nations Sustainable Development Goals into an entirely new man-made ecosystem?

And, of course, it must be designed to harness the thermal mass of the ocean, the power of the tides, the power of the currents, the power of the waves, the power of the wind, heat, and the energy of the sun to generate its own power.

In addition, we will collect all the rainwater that falls on this artificial archipelago, process it organically and mechanically, store it and purify it.

With no space or resources to eat dairy, we have to grow all our food locally and it has to be fish and plant based.

And finally, we intend to process all waste locally through composting, recycling and converting waste into energy.

So, imagine where a traditional urban master plan would typically depict a street grid on which cars can drive and building lots on which a few buildings can be erected.

In this master plan, we talked with a few scientists and basically started with all renewable and available natural resources and then started directing the flow of resources through this kind of anthropogenic ecosystems and this kind of urban metabolism.

Therefore, it will be modular, buoyant and designed to withstand tropical storms.

Large prefabs can be created, towed and docked with other vehicles to form small communities.

We design this kind of coastal addition so that each island is unique with its own coastal landscape, even if it is modular and rational.

The architecture should be kept relatively low to keep the center of gravity buoyant.

We plan to take all the farming and also use it to create social spaces so that you can actually enjoy the permaculture garden.

We design for the tropics, so all roofs are optimized to collect solar power and block the sun.

All materials, such as bamboo and wood, will be light and renewable, which will create this inviting and warm environment.

And any architecture should be able to fit this platform.

With all the storage under the pontoon, it's like a mega version of the student dormitory we've been working on.

We do all of the storage of energy that is generated, the storage and restoration of water.

It's like we're dealing with all waste and composting.

We also carry out back-up farming using aeroponics and hydroponics.

So imagine something like this vertical section of the landscape from above, where we have a vertical farm. Below you will find aeroponics and aquaponics.

Further down is a marine farm, where biorock is used to create new coral reefs and regenerate habitat where they tie the island to the ground.

So let's consider this small island with a population of 300 people.

They can then be grouped together to form clusters or neighborhoods, which in turn can be grouped together to form entire cities of 10,000 people.

And imagine if this floating city thrived, it could grow like a culture in a petri dish.

Therefore, one of the first locations we are considering for the installation, or anchoring, of this floating city is the Pearl River Delta region.

So imagine having a solar canopy like this on this archipelago in the ocean.

As we sail towards the island, we see marine inhabitants using alternative water transportation to get around.

Enter this kind of community port.

You can roam a permaculture garden that is not only a productive landscape, but also a social one.

The greenhouse also becomes an orange grove for the cultural life of the city, while under the sea life abounds in agricultural, scientific and social spaces.

So, in a way, you can imagine this community harbor as a place where people gather day and night.

And even though the first was designed for the tropics, I imagine its architecture can adapt to any culture. Imagine, for example, a floating city in the Middle East, a floating city in Southeast Asia, or someday in Scandinavia.

So, perhaps just to conclude.

70% of the human body is water.

And our earth's surface is 70% water.

And it's rising.

And even if the whole world wakes up tomorrow and becomes carbon neutral overnight, there will still be island nations doomed to sinking into the sea unless we develop alternative forms of floating human settlements.

And the only constant in the universe is change.

Our world is constantly changing, and now so is the climate.

No matter how serious the crisis is and however real it is, it is also our collective superpower.

We have the power to adapt to change, and the power to shape the future.

(applause)

"The Second Coming" by William Butler Yates. Things fall apart. The center cannot be held. Mere anarchy is unleashed upon the world, blood-dimmer tides are unleashed, drowning in rites of innocence everywhere. The best are utterly devoid of belief, but the worst are full of passionate intensity.

Certainly some revelation is on the horizon. The Second Coming is certainly near.

Second Coming! Few words come out when the vast images emanating from Spiritus Mundi haunt my vision: a figure with a lion's body and a human head somewhere in the desert sands, a stare as hollow and pitiless as the sun, its slow thighs moving while the shadows of angry desert birds roll around it.

Darkness descends again. But now I know Twenty centuries of stony slumber were plagued by nightmares in the cradle And what kind of wild beast, when the time finally comes Bend over to Bethlehem and be born?

"All the World's a Stage" from William Shakespeare's As You Like It All the world is a stage, and all men and women are just players. They have exits and entrances. And one man at that time played many roles and his acting was seven years old.

At first, the infant was crying and vomiting in the nurse's arms. And a whining schoolboy with a bag on his back and a bright morning face crept up like a snail and went to school reluctantly.

And the lover, sighing like a furnace, sang a pathetic ballad between her brows.

Then the soldier, full of strange oaths, bearded like a pard, jealous of honor, suddenly and quarrelsome, seeking a bubble reputation even in the mouth of a cannon.

And Justice, with a finely rounded belly and a fine hat, with stern eyes and a formal cut beard, is full of wise saws and contemporary examples. And he does his part.

At 6, she transitions to slim, slippery pantaloons, glasses on her nose, and pouches on her sides. His youthful hoses were well known and there was a world too wide for his shrunken shins. And his big manly voice veers again into childish high notes, pipes and whistles in his sound.

Above all, the final scene, it is the second childishness and mere oblivion that puts an end to this strange and turbulent history. No teeth, no eyes, no taste, no all.

Let's start the story of the 17th century.

I hope no one finds it offensive.

After inventing PCR, I needed some kind of change.

Then I moved to La Jolla and learned how to surf.

And I began to live on the beach there for a long time.

And when surfers are outside waiting for a wave, those who have never been outside will wonder what they are doing.

10, 15 minute breakouts can occur while waiting for a wave to arrive.

They usually talk about the 17th century.

As you know, they have a really bad reputation all over the world.

People think of themselves as vulgar.

One day someone suggested that I read this book.

It was called "Air Pump", or something like "Leviathan and Air Pump".

It was a really strange book about the 17th century.

And I realized that the roots of my way of thinking are the only natural way of thinking about things.

Well, I was born that way, and I've always been a little scientist.

And when I was trying to find out something, I used the scientific method. I wasn't too surprised when they first showed me how science should be done. Because I was already doing science as a hobby or something.

But it wasn't. It never occurred to me that it had to be invented and that it was invented only 350 years ago.

You know, it kind of happened in England, Germany and Italy at the same time.

And I thought the story was really engaging.

So let's talk a little bit about that. Scientists talk about what exactly should be done.

It's kind of - you know, Charles I was beheaded somewhere in the early 17th century.

And the British established Cromwell and a bunch of Republicans or something, but not Republicans like us.

They changed the government, but it didn't work.

And his son Charles II was finally restored to the English throne.

He was really nervous because his father had been beheaded because he was the King of England.

They had no TV screens, no football games to watch.

And they got really pissed off, and all of a sudden people started pouring into the streets arguing over issues like whether it was okay for Robert Boyle to build a device called a vacuum pump.

Well, Boyle was a friend of Charles II.

He was a Christian on weekends and a scientist on weekdays.

(Laughter) It was -- at the time it was kind of like, look, look, if you made this -- he made this little device that reverses a bicycle pump and sucks out all the air -- do you know what a bell jar is? One of them has a sticker on it when you pick it up and you can see what's going on inside it.

But what he was trying to do was pump all the air out of it and see what would happen there.

So I think the first experiment was to put the birds in there.

People in the 17th century didn't understand it the same way we do. This substance is a bunch of different kinds of molecules, and we didn't understand that we could inhale it for a purpose.

In other words, fish don't know much about water, and humans don't know much about air.

But both started exploring it.

One time he put a bird in it and blew all the air out, and the bird died. So he said, hmm...

He said he called what he did "make," but didn't call it a vacuum pump at the time.

Now we call it a vacuum pump. he called it a vacuum.

right? And soon, he got into trouble with a local clergyman, who said he couldn't make a vacuum.

Oh, oh -- (laughter) Aristotle said nature loathes man.

Perhaps it was a bad translation, but people relied on authority that way.

And Boyle says, well, shit.

I make it all the time.

So whatever kills the birds, I call it a vacuum.

And the religious people said if God wants you to decide, God is everywhere, that's one of their rules, God is everywhere.

And the vacuum -- there is nothing in the vacuum, so God cannot be there.

That's why I said the church can't be a vacuum.

Boyle said it was bullshit.

I mean, you want to call it godless, you call it godless.

But that's not my job. i'm not interested in that.

I do it on weekends. And what I'm trying to do is figure out what happens when I suck everything out of the compartment.

And he did all these cute experiments.

Just like he did, it had a small fan-like wheel that was loosely attached so it could spin on its own.

He had another fan against him, and it was kind of like he would -- I mean, the way I do this would be like a rubber band, you know, around the fan like a toy.

I know exactly how he did it. I've seen the drawings.

It had two fans, one could be turned from the outside after establishing a vacuum. And I found that if I blew all the air out of the fans, one fan wouldn't spin the other.

I was missing something. I mean, these are kind of weird to think someone had to do an experiment to show that, but that's what happened back then.

And there was also a big discussion about it at gin houses, coffee shops, etc.

And Charles started not to like it.

Charles II was saying, look, we should protect it, let's create a place where people can do this where they don't understand, look, we don't want that, we don't want to offend people again. And because when they started talking about religion, science, etc., that was when he got his father into some kind of trouble.

So Charles said, ``I will pay for the building.

And that was fine with Boyle.

He said, "Okay, let's start the meeting."

Anyone who wants to do science does. That's when Isaac Newton started producing a lot of really interesting stuff.

And all sorts of people came together, called the Royal Society. I had to be pretty dressed up.

It was nothing like the TED conference.

It was the only criteria, that you looked like a gentleman and that they could come by anyone.

I didn't need to be a member then.

So they will come along and you will too - at the time anyone trying to show an experiment like a new word had to do it on a stage where everyone could see it in order to demonstrate some principle.

I mean, they were. The really important part of this issue is that you shouldn't talk about the end cause, for example.

And God didn't exist.

The nature of reality did not matter.

Do not talk about the absolute nature of anything.

We shouldn't talk about things we can't prove.

If someone could see it, they could say, "This is how machines work, we do this, and what happens."

And it was fine to see what happens and generalize and say, I'm sure this will happen whenever I create one of these.

Then you can start making some rules.

You said that whenever you go into a vacuum, you find that one wheel does not turn the other if the only connection between them is the one that existed before the vacuum. Such that.

Candles don't burn in a vacuum, so sparklers probably won't.

It's not clear; in fact, sparklers do, but they didn't know it.

They didn't have sparklers. But they can -- (laughter) -- make rules, but they should only be related to what you've been able to demonstrate.

And most of the demonstrations were visual.

For example, if you're doing an experiment on stage and no one can see it, they just hear it, they'll probably think you're weird.

In other words, reality is what you see.

It wasn't an explicit rule at the conference, but I think it was certainly part of it. If people hear a voice but can't associate it with someone, that person probably isn't there.

But there is a common belief that you can only really talk about things in that place if you have some kind of experimental basis.

It didn't matter what the local philosopher, Thomas Hobbes, said about it. I didn't mean to talk about the final cause.

What was happening here in the mid-seventeenth century was that the science that had become my specialty, the experimental science, naturally moved away. It was in the physical sense. Because we do it right here in this room. But it was also an amazing event.

Science was all tied up with theology, philosophy, and—and—mathematics, but it wasn't really science.

But experimental science was tied to all of them.

And the mathematics part and the experimental science part moved away from philosophy.

And -- things -- we never looked back.

It's been so cool ever since.

So it just unraveled the problems that really held back the development of the technology.

And I mean, folks in this room, it was about 350 years ago now.

Remember, it's a short time.

It was probably 300,000 years ago when most of us, most of our ancestors in this room, came out of Africa and turned left.

Well, there are some right-facing ones in the Japanese translation as well.

But that was a long time ago compared to 350 years ago.

But in its 350 years, the place has undergone many changes.

In fact, everyone in this room, especially if you picked up the bag, I'm sure some of you didn't pick it up, but if you picked up the bag, everyone in this room would have either put it in their pocket or gone back to the room. This is what the kings of 350 years ago had to go to war and get.

I mean, just think about how important it is. Having a GPS system without satellites is of little use. But, like, but if someone had a GPS system in the 17th century, some king would have gathered an army and gone for it. If he -- AUDIENCE: What about teddy bears? Teddy bears?

Kary Mullis: Maybe it was for the teddy bears, yes.

But we all own things.

In other words, an individual owns what a king would have certainly gotten by going to war.

And this is only 350 years.

Not many people do this.

You know, important people. You can almost read about all the really important people who have made progress in their lives.

And I mean, this kind of thing, you know, all this stuff came from this little separation of things that we do -- now I was born as a boy with the idea that if you want to know something -- you know, maybe it's because my old man died so often and my mother didn't know much science, but I thought if you wanted to know something about things, you should do it -- do an experiment.

I had a natural feeling for science and experimental settings. I thought that's what everyone always thinks.

I thought anyone with a brain would do that.

that's not true. I mean, there are a lot of scientists who got into trouble at dinner the other day because of postmodernism.

I didn't mean to say that, you know, where's that woman?

Audience: Here.

(laughs) KM: So I didn't really think of it as a discussion, just a lively discussion.

I didn't take it personally, but I just thought it was, until this surfing experience took me back to the 17th century, naively thinking that's how people think, that's what everyone does, that they perceive reality by what they see, touch, feel and hear.

Anyway, when I was a boy, I had this for example -- I got this little book from Fort Sill, Oklahoma -- this was around the time George Dyson's father started blowing up nukes -- thinking about blowing up nuclear rockets and all that.

I was thinking of building my own little rocket.

And I knew that frogs, little frogs, have the same aspirations as humans for space travel. And I -- (Laughter) I -- was looking for a propulsion system that would lift a rocket that's about four feet tall up to several miles.

So that was my goal.

I erased it from sight and hoped this little parachute would come back with a frog on it.

And I, I got this book from Fort Sill, Oklahoma, where the missile base is.

They sent it out to amateur rocket developers and it said never to heat the mixture of potassium perchlorate and sugar.

(Laughter) You know, that's called a lead.

(Laughter.) You kind of said, let's get some potassium chlorate and sugar, perchlorate and sugar and see if we can heat it up. It will be interesting to see what they don't want me to do and what it does and how it works.

And we didn't have my mother tending the backyard through a second-floor window and ironing things there.

And she was usually just on the lookout, and when the smoke billowed up, she leaned over and advised all of us not to blow our eyes off. It was her -- you know, it was the worst thing that could have happened to us.

That's why I thought, as long as I don't miss it...

The fact that heating this solution is prohibited may not bother you.

I will do it carefully, but I will do it.

It's just like any other prohibited thing, it's done in the back of the garage.

(Laughter) So I went to the drugstore and tried to buy some potassium perchlorate, but back then it wasn't unreasonable for a kid to go into a drugstore and buy chemicals.

Not anymore, ma'am, check your shoes. And it was like -- (Laughter) But then it wasn't -- they didn't have anything, but the guy did -- I said, what kind of potassium salt do you have?

And he had potassium nitrate.

And I said, whatever it is, might do the same.

It must have something to do with rockets or it wouldn't be in the manual.

So I -- did some experiments.

As you know, I added readily available potassium nitrate and sugar little by little, mixed in various proportions, and lit.

I tried to see what would happen if I mixed them.

And it was—they burned.

Burning was a bit slow, but compared to other rocket fuels I've tried, it smelled nice due to the sulfur content.

And it smelled like burnt candy.

So when I started a melting business, it melted.

Then it melted into a brown, syrupy liquid.

And it cooled into a solid substance like a brick, and when it was ignited it vanished like a bat.

So when you light a small chilled bowl, it starts dancing in the garden.

And I said there is a way to get the frog where you want it to go.

(Laughter) So I started developing -- you know, George's dad had a lot of help. My brother was just there.

But it took me about 6 months before I finally figured out all the little things.

Even after you have fuel, there are many little things involved in making a rocket that actually make it work.

But you do it - as I say it now - by experimenting and occasionally writing it down or observing it.

And slowly build up a theory of how this works.

And it was - I was following all the rules.

I didn't know what the rules were. I think I'm a born scientist. Or maybe it's kind of a throwback to the 17th century.

But either way, we finally have a device that can reproducibly erase frogs from sight and bring them back to life.

And we weren't afraid of it. I mean, we weren't scared by it.

A lot of smoke, a lot of noise, and powerful, so we should have.

And sometimes it exploded.

But, by the way, I wasn't worried about the explosion that would cause the destruction of the Earth.

I hadn't heard of 10 Ways We Should Fear. By the way, I could have thought that I shouldn't do this because I was told not to do it.

And it is better to get permission from the government.

If I had waited for it, it would never have died, the frog would have died.

Anyway, it's a good story, so when I brought it up, he said, "Tell me something personal." You see, it's personal. I was going to tell you about the first night I met my wife, but that's too personal, isn't it?

So I have something that is not personal.

But that... process is what I think of as science, you know, starting with some idea and then, for example, instead of looking up every authority you've ever heard of, later on when you're going to write a paper, sometimes you want to look up who else is working on that paper.

But the actual process gives you an idea. For example, one night I had the idea that I could amplify DNA with two oligonucleotides and make many copies of a small piece of DNA. The thought of it was about 20 minutes while driving. Then I didn't go and went back and told people about it, but had I heard what all my molecular biologist friends had told me, I would have abandoned the idea.

If I had gone back to find someone authoritative to tell me if it would work, he would have said, "No, it probably won't work."

Because the results are so impressive that, if successful, they will change the way we approach molecular biology.

No one wants to have a chemist come in and mess with their stuff like that and change things.

But going to authority doesn't always get you the right answer if you don't always do it.

But I knew, you would go into the lab and try to run it yourself. And you're an authority and you can say, I know it works because right there in that tube is where it happened and here on this gel there's a little band and I know it's DNA and that's the DNA I wanted to amplify, so there it is! So it works.

That's the way science works.

And you say, so how can it work better?

And we keep finding better ways to do it.

But you always work from the facts that you get from experimenting, the facts that you can do on stage.

And there's no tricky shit behind things. So to be really successful, you have to be very honest about what you're doing.

In other words, you can't make up a result and then run another experiment based on that result.

So you have to be honest.

And I'm basically honest.

I have a pretty bad memory and always get into trouble if I'm dishonest. That's why I'm naturally honest and naturally curious, and that's what leads me to that kind of science.

Well, let's see...

You have five minutes left, right?

OK. Not all scientists do.

You know -- and there's a lot -- (Laughter) there's a lot -- a lot has happened since Isaac Newton and all that stuff happened.

One of the things that happened right around the same time as World War II, the same time before that, and certainly after that, governments realized that scientists weren't weirdos hiding in ivory towers and doing silly things with test tubes.

World War II as we know it was largely made possible by scientists.

They made a faster one.

They made bigger guns to shoot down.

As you know, they made a drug to administer if the pilot broke up midway through.

They made all kinds of bombs and ended it all with one giant bomb, right?

And everyone took a step back and said, look, we should invest in this shit. Because whoever gathers the most people to work there will have a dominant position, at least militarily, and probably in every kind of economy.

And they got involved in it, and the establishment of science and industry was born, and from that came many scientists who joined there for money, because it suddenly became available.

And they weren't curious boys who liked to raise frogs into the sky.

They were the ones who later went on to medical school. Because I had the money. I mean, after that, they all started doing businesses, I mean, there was that wave, but when you got into high school, that person said, 'I want to be rich, I want to be a scientist.' I can't do it anymore.

You want to be rich, you want to be a businessman.

But many got into it for money, power and travel.

It was a time when travel was easy.

And those people don't think they don't always tell the truth, they don't think so.

In fact, there is nothing in their contract that always favors them.

And I'm talking about likes. They say they are members of a committee called the Intergovernmental Panel on Climate Change, for example.

And they're trying to figure out how to hold massive conferences and continually prove that the earth is warming when in fact it goes against most people's senses.

So if you actually measure the temperature over a period of time, the temperature has been measured pretty carefully for about 50, 60 years. Longer than that, but measured in a very good and precise way, records have been kept for 50 or 60 years, and in fact the temperature was not really rising.

The nighttime temperature at the weather station is slightly higher, so it feels like the average temperature is slightly higher.

But there is a good explanation for this.

And that is, the weather stations are all built outside the town, where the airport used to be, and now the town has moved there and is surrounded by concrete, they call it the skyline effect.

And most responsible people who measure temperature recognize the need to protect their measuring devices from temperature.

Still, the building gets warmer during the day and a little warmer at night.

So, the temperature has risen little by little.

It should have been. But not so much. No, the first man, the first man to come up with the idea of ​​embarrassing themselves here, as a matter of fact, he didn't think of it that way.

His name was Sven Arrhenius. He's Swedish, and he calculated that doubling the concentration of carbon dioxide in the atmosphere, which was in 1900, should raise the temperature by about 5.5 degrees.

He thought of the earth as something completely insulated and empty, really just energy pouring in and energy leaving.

So he came up with this theory, and he said, in Sweden you have a longer growing season, so this is cool, surfers liked it, surfers thought it was a cool idea, because the ocean was pretty cold at times, and -- but then a lot of other people started thinking it wasn't good.

But no one has actually proven it, right?

That is, the measured air temperature. You can find this on our great internet. Go find all the NASA records, all the weather station records, and look it up yourself, and you'll see that temperatures have risen. Nighttime temperatures measured at the Earth's surface have risen only slightly.

So, averaging this with daytime temperatures, it rose about 0.7 degrees over the course of this century.

But in fact it was just getting closer - it was night. The daytime temperature did not rise.

I mean, Arrhenius' theory and all of the global warming theorists would say yes, the greenhouse effect should raise temperatures during the day as well.

Well, people like things that have names like that and can imagine it, right? I mean, but people don't like this sort of thing, so most people aren't very excited about things like the actual evidence for tropical circulation strengthening in the 1990s.

This is a paper published in February that most of you have probably never heard of.

"Evidence for large decadal variations in the tropical mean radiative energy budget"

excuse me. These papers were published by scientists at NASA, Columbia University, Viliki, and many at Princeton University.

And these two papers were published in the February 1st issue of Science Magazine. And the conclusions of both of these papers, and the Science editor's explanation of these papers, simply put is that our theory about global warming is completely wrong. I mean, what they were doing and what this is, the NASA guys have been saying this for a long time.

They say that if you measure the temperature of the atmosphere, it's not rising, not rising at all. We've been doing this very carefully from satellites for 20 years and it's not increasing.

In this paper, they show something even more surprising. It was they did something called radiation. I won't go into details. In fact, it is quite complicated, but not as complicated as the language used in the paper suggests. Ultimately, the sun gives off a certain amount of energy, we know that amount, it rains down on the earth, and the earth gives back a certain amount.

The warmer it is, the more red energy is produced. In other words, it's the same as warm things, like infrared rays, giving off infrared rays.

The whole problem of global warming is actually that too much carbon dioxide in the atmosphere will not allow the heat to escape. But most of the heat from the sun is down there, at something like 350 nanometers at its center, and passes directly through the CO2.

So heat is still generated, but not dissipated.

Well, they measured them all.

I mean, you can talk about things like that, you can write these big reports, you can get government funding to do it, but these are the results that they've actually measured, that's why I said "decade" in the last decade, and it turns out that the energy, the level of what they call the "imbalance" was way above expectations.

The degree of imbalance, that is, heat coming in and not going out like you get from doubling the carbon dioxide, but we're nowhere near that, by the way.

But if CO2 were to double what it was in 1900 by 2025 or so, they say, the energy budget would increase roughly. In other words, more 1 Watt per square centimeter flows in than it leaves.

Therefore, the earth should become warmer.

Well, in this study, two studies by two different teams, we found that 5.5 watts per square meter of power flowed in from 1998 to 1999, and the place didn't get warm.

This theory is meaningless. it's nothing.

These papers should have been called "The End of the Global Warming Debacle".

They are concerned and you can see they draw very cautious conclusions in these papers. Because they are talking about large labs funded by huge amounts of money and people who are frightened.

What do you know if they say so?

We can do that because the global warming problem no longer exists. You know, they're funding it.

And if you start a grant application with such content and say that global warming was clearly not happening...

If they, if they, if they actually said so, I'm out.

(Laughter) I stand up, too, and -- (Laughter) (Applause) They have to say that.

They had to be very careful.

But I mean, you'd be happy to, because both the non-dummy Science editor and this fairly professional, really professional team really came to the same conclusion, and that's what they have to say at the conclusion of the paper. What this means is that what we have been thinking about is the Earth Circulation Model, which predicts that the Earth will overheat, and it was all wrong. It is wrong by a large factor.

It's no small thing. They just misunderstand the fact that there is a mechanism going on on Earth that no one clearly knows about. Because the heat is coming in, but it's not getting warm.

I mean, this planet is pretty amazing, big and scary, and big and wonderful, but it's doing all sorts of things that we don't know anything about.

So the reason I put these things together is this is how science should be done. Some science is done for other reasons or just curiosity.

There are a lot of scientific public problems, such as global warming and the ozone hole. If you're interested, you'll need to dig into the details and read the paper "Large Decadal Variations".

You have to understand what all these words mean.

And if you only listen to people who hype those issues up and make a lot of money at it, you'll be misinformed and worry about the wrong things.

Remember 10 things that get you. The -- one of them -- (Laughter) And I really agree there is an asteroid.

In other words, you have to be careful with asteroids. OK, thanks for being here.

(applause)

It may seem that we are standing on solid earth now, but we are not.

The rocks and soil below us are crisscrossed by tiny cracks and empty spaces.

And these empty spaces are filled with such astronomical amounts of microbes.

The deepest part of the Earth where we have ever found microbes is 5 kilometers below the surface.

For example, if you start running towards the ground with yourself on the ground, you can keep running for the entire 5km race and the entire path will be lined with microbes.

So, while you may not have thought about these microbes that live deep within the earth's crust, you've probably thought about the microbes that live within our gut.

The combined gut microbiota of all people and all animals on Earth weighs about 100,000 tons.

This is a huge biome that we carry in our stomachs every day.

We should all be proud.

(Laughter) But that's nothing compared to the number of micro-organisms that cover the entire surface of the earth, like soil, rivers, and oceans.

Together, they weigh about 2 billion tons.

However, it turns out that most of the microbes on Earth are not even in the oceans, intestines, or sewage treatment plants.

Most of them are actually inside the crust.

So all together they weigh 40 billion tons.

It's one of the largest biomes on Earth, but we didn't even know it existed until a few decades ago.

So the possibilities for what life is like there, or what it might bring to humans, are endless.

Here's a map showing, with red dots, all the locations where modern microbiological techniques yielded reasonably good deep subsurface samples. You might be impressed that we have pretty good global coverage, but actually things look a little worse when you remember that these are the only places we're getting samples from.

If we were all on an alien spacecraft and tried to reconstruct a map of the Earth from these samples alone, it would never be possible.

So people sometimes say to me, "Well, there are a lot of microbes underground, but...

Aren't they just sleeping? ”

This is a good point.

Compared to fig plants or measles or my kid's guinea pigs, these microbes are probably doing very little.

I know I have to slow down because there are so many.

If they all started dividing at the rate of E. coli, overnight the total weight of the Earth, including rocks, would double.

In fact, many of them probably haven't even undergone cell division since ancient Egyptian times.

It's just crazy.

For example, how do you think about something that lives this long?

But I came up with an analogy that I really like, and it's weird and complicated.

So I hope you can go there with us.

ok, let's try it.

It's like trying to understand the lifecycle of a tree...

If I only lived for one day

In other words, if a human lives for only one day and lived in the winter, he would go through his whole life without ever seeing a tree with leaves.

And with so many human generations gone by in a single winter, we may not even have access to history books that state anything other than the fact that trees have always been lifeless sticks and do nothing.

Of course this is funny.

We know that the trees wait until summer to become active again.

But if human life spans are significantly shorter than tree life spans, we might be unaware of this utterly mundane fact.

So when we say these deep subterranean microbes are just sleeping, are we like someone who dies a day later trying to figure out how trees work?

What if these deep subterranean creatures are just waiting for summer to come and our lives are too short to see it?

When E. coli is sealed in a test tube and left without food or nutrients for months or years, most of the cells die, of course, because they are starving.

However, some cells survive.

Let these old surviving cells compete with new, fast-growing E. coli cultures, also under conditions of starvation, and the grizzly, brawny old men beat the squeaky-clean upstarts every time.

So this is evidence that there really is a payoff for evolution to be very slow.

So it's possible that slowness shouldn't be equated with unimportance.

Maybe these invisible, out-of-conscious microbes can actually help humanity.

Well, as far as we know, there are two ways to live underground.

The first is to wait for food to drip from the surface world, like trying to eat leftovers from a picnic that happened 1,000 years ago.

It's a crazy way of life, but surprisingly, it seems to work for many microbes on Earth.

Another possibility is that the microbes just say "no, we don't need the terrestrial world."

Microbes that follow this route must obtain everything they need to survive from within the earth.

In fact, some are more readily available to them.

They are more abundant in the interior of the earth, like water, nutrients such as nitrogen, iron, phosphorus, or where they live.

These are the things we literally kill each other to get hold of the surface world.

But underground, finding enough energy becomes a problem.

At the surface of the earth, plants can chemically weave together carbon dioxide molecules to make delicious sugar as fast as the sun's photons hit their leaves.

But underground, of course, there is no sunlight. So this ecosystem needs to solve the question of who makes food for other people.

Underground you need something like plants, but you breathe rocks.

Fortunately, such things exist and they are called chemoautotrophs.

(Laughter) These are microbes that use chemicals - 'chemos', out of rocks - 'lithos', to make food - autotrophs.

And they can do this with lots of different elements.

They can do this with sulfur, iron, manganese, nitrogen, carbon, and some can use pure electrons directly.

For example, if you cut off the end of an electrical cord, you can breathe like a snorkel.

(Laughter) These chemoautotrophic organisms, like plants, use the energy they get from these processes to make food.

But we know that plants don't just make food.

They also produce oxygen, a waste product on which we are 100 percent dependent.

However, the waste products produced by these chemoautotrophs are often in the form of minerals such as rust, pyrite, fool's gold, or limestone-like carminiite.

So we have really slow microbes, like rocks, getting energy from rocks and making other rocks as waste.

So am I talking about biology or geology?

This really blurs the lines.

(Laughter) So, if I'm going to do this, and I'm going to be a biologist who studies microbes that work like rocks, I should probably start studying geology.

What's the coolest part of geology?

volcano.

(Laughter) This is a look inside the crater of Poas Volcano in Costa Rica.

Many volcanoes on Earth occur because oceanic tectonic plates collide with continental plates.

As this oceanic plate subducts or shifts beneath the continental plate, water, carbon dioxide, and other matter are squeezed out of it like a wet washcloth.

Subduction zones are thus like portals to the deep Earth, where materials are exchanged between the surface and the underground world.

So I was recently invited by some of my colleagues in Costa Rica to work with them on some of the volcanoes.

And of course I said yes. Because Costa Rica is beautiful, but also because it sits on one of these subduction zones.

We wanted to ask a very specific question. Why does the carbon dioxide coming out of this deeply buried oceanic plate come only from volcanoes?

Why is it not seen distributed throughout the subduction zone?

Do microbes have anything to do with it?

Here is a photo I took with my colleague Donato Giovannielli inside the Poas volcano.

That lake we're standing next to is made of pure battery acid.

I know this because I was measuring pH when this picture was taken.

And at one point while working inside the crater, I said to my Costa Rican colleague Carlos Ramírez: "Okay, if this starts erupting now, what would be our exit strategy?"

And he said, "Oh yeah, that's a great question, it's very simple.

Turn around and enjoy the scenery. ”

(Laughter) “Because it will be the last time.”

(Laughter.) And he may sound too dramatic, but 54 days after I stood next to that lake, this happened.

Audience: Oh!

It's scary, isn't it?

(Laughter) This was the biggest eruption this volcano has had in over 60 years. And shortly after this video ended, the camera that was filming the video was destroyed, completely evaporating the entire lake we were sampling.

But at the same time, I want to be clear that Costa Rica, through the OVSICORI Institute, is very closely monitoring the volcano, and the scientists from that institute were with us that day, so we were confident that this would not happen on the day we were actually at the volcano.

But the fact that it erupted perfectly shows that if you want to find where the carbon dioxide gas is coming from this oceanic plate, look no further than the volcano itself.

But if you go to Costa Rica, you might find that in addition to these volcanoes, there are many cozy little hot springs everywhere.

Some of the water in these hot springs actually springs from this deeply buried oceanic plate.

And our hypothesis was that the carbon dioxide must be bubbling with it, but something deep underground is filtering it out.

So we spent two weeks driving around Costa Rica and trying every hot spring we could find. Let me tell you, it was terrible.

We then spent the next two years measuring and analyzing the data.

And if you're not a scientist, let me tell you that big discoveries don't actually happen in beautiful hot springs or public places. They happen when you're hunched over a cluttered computer, troubleshooting a difficult piece of equipment, or Skype with a colleague when you're completely confused about your data.

Scientific discoveries, like deep subterranean microbes, can take a very long time.

But for us, this was the only time it really worked.

We have found that literally tons of carbon dioxide are coming out of this deeply buried oceanic plate.

And what kept them underground and prevented them from being released into the atmosphere was chemoautotrophs deep underground in Costa Rica's adorable sloths and toucans.

These microbes and the chemical processes taking place around them converted this carbon dioxide into carbonate minerals and trapped them underground.

I have a question here. If these underground processes are so good at sucking up all the carbon dioxide that comes from below, could they also help with the smaller carbon problems at the surface?

Humans are releasing enough carbon dioxide into the atmosphere to reduce the Earth's ability to sustain life as we know it.

And scientists, engineers, and entrepreneurs are working on ways to extract carbon dioxide from these point sources so that it doesn't get released into the atmosphere.

And you have to put it somewhere.

For this reason, we need to continue to study where this carbon might be stored, possibly underground, and find out what happens to it when we go there.

Could these deep subterranean microbes be a problem because they're too slow to actually keep anything there?

Or is it useful because it helps transform this substance into a solid carbonate mineral?

If only one study we did in Costa Rica can make such a big breakthrough, imagine what else is waiting to be discovered there.

Geobiochemistry, or deep subterranean biology, or whatever you want to call it, will have a major impact not only on mitigating climate change, but perhaps on our understanding of how life and the Earth have co-evolved, and on discovering new products that will benefit industrial and medical applications.

Maybe we can predict earthquakes or discover extraterrestrial life forms.

It may also help us understand the origin of life itself.

Luckily, you don't have to do this yourself.

I have wonderful colleagues around the world unraveling the mysteries of this deep underworld.

And life buried deep within the earth's crust may seem so far removed from our everyday experience that it is, in some ways, irrelevant.

But in fact, this strange slow life may hold answers to some of life's greatest mysteries on Earth.

thank you.

(applause)

Oh, oceans of the earth.

They are beautiful, inspiring and life sustaining.

Also, as you well know, they are more or less messed up.

For example, in the Seychelles, corals are bleaching due to human activity and climate change.

Fish stocks have plummeted due to overfishing.

Biodiversity is in danger.

So what can we do?

Well, apparently some form of protection.

Nature is very resilient.

Whole ecosystems can recover when marine areas are strategically protected.

But creating a marine reserve is not easy.

First, there is the problem of figuring out where to protect.

This reef overlaps that international fishing route and intersects with this fish hatchery.

Everything is interconnected.

And marine conservation plans need to consider how one area affects another.

Then there's the issue of getting everyone on board.

Coastal economies often depend on fishing and tourism.

If people think they can't do their job, they have no chance of getting the local buy-in they need to succeed.

Marine reserves should also be enforced.

That means the government itself must be heavily invested in the program.

Token support is not a solution.

And finally, saving requires money.

Governments in island and coastal countries may want to protect their waters, but in many cases these countries are so heavily indebted that they cannot afford to prioritize conservation.

If we rely solely on philanthropic funds to fund marine conservation, we could have a small marine reserve here and a small marine reserve there.

But more marine reserves need to grow more quickly to have a lasting impact.

So what does smart ocean conservation look like?

How do you get funding, government support, and careful planning that considers both local economies and complex ecosystems?

I would like to share with you some bold ideas from The Nature Conservancy.

Trying to address all of these at once.

They realized that the debt of island and coastal states is what allows them to meet their conservation goals.

The TNC's idea is to rebuild this debt and generate the money and political will to protect coral reefs, mangroves and fisheries.

For example, if you refinance your home to take advantage of better interest rates, you might use the savings to insulate your attic.

That's what Blue Bonds for Conservation is doing across the coastal nations.

Refinance debt and use the savings to create marine reserves.

Of course, sovereign debt restructuring is more complicated than that, but you get the basic idea.

Investors investing $40 million now could raise $1.6 billion for ocean protection.

And this is how it works.

Step 1: Negotiate the deal.

Coastal States commit to protect at least 30 percent of their sea areas.

In return, conservation groups bring investors, public funders and international development agencies to the negotiating table to restructure some of the country's debt, leading to lower interest rates and longer repayment terms.

Step 2: Create a marine plan.

Together, The Nature Conservancy works with marine scientists, government leaders and local stakeholders to develop detailed conservation plans that integrate the needs of the oceans and people.

Step 3: Activate to extend life.

The TNC will establish an independently operated Conservation Trust Fund.

Savings from the debt restructuring will be used to support new marine protected areas.

This trust then holds the government accountable for its commitments and ensures that the blue bonds fund actual conservation efforts.

Will this plan work?

It's already happening.

In 2016, TNC helped develop a National Conservation Plan in the Seychelles.

TNC has restructured $22 million in government debt.

And in exchange, the government agreed to protect 30 percent of the ocean.

Currently, the Seychelles have plans to protect 400,000 square kilometers of ocean.

Its area is about the same size as Germany.

The Seychelles are protecting coral reefs, replenishing fisheries and becoming more resilient to climate change.

At the same time, the economy is also strengthening.

This success has attracted the attention of other governments.

Many people want to participate in this.

There is an opportunity to scale this up dramatically.

The TNC has identified another 20 countries where such plans would be possible.

But it needs seed capital to run.

We then set up a local team that can develop a conservation plan and work with all parties to structure the deal.

With the help we need over the next five years, we have the potential to protect 4 million square kilometers of our oceans.

That's ten fraternity.

This would increase the area of ​​all marine protected areas in the world by as much as 15%.

This will replenish vast coral reef sites around the world and provide safe habitats for countless species.

This is really unbelievable.

And that's really just the beginning.

Because there are not 20 countries in the world where this kind of debt conversion works.

There are almost 100 of them.

With this approach, everyone wins.

Governments, locals, funders and most importantly our oceans.

So, in reality, we all win.

Oh, oceans of the earth.

[Bold project]

Actually, I got a little tired of talking about simplicity, so I decided to make my life more complicated for serious play.

So, to give you an idea of ​​how I got here, I'd like to take a look at some slides from long ago.

So basically it all started with the whole idea of ​​a computer.

Who has a computer? Yeah.

Yes everyone has a computer.

Even a mobile phone is a computer.

And -- who remembers this "Instant activity for Your Apple" workbook -- each book comes with a free poster.

This is the beginning of computing.

Please do not forget. A computer appeared. there was no software.

You buy it, take it home, turn it on, and absolutely nothing happens.

So I had to program it, but there was some great programming, tutorials like this one.

I mean, this was great.

It's, you know, Harvey the Apple II.

This is a great method. So they should make a Java book like this and we should have no problem learning to program.

But this is the wonderful and grand age of computers, and what is a computer just raw, raw? kind of era.

And this era coincided with my own childhood.

I grew up in a tofu factory in Seattle.

Who grew up in a family business and was tortured?

Torture was good. Wasn't it good torture?

It was truly life-changing. So in my life, you know, I was in tofu. It was family run.

My mother was also a kind of designer.

She built something like a wall of tofu dishes, which confused customers because everyone thought it was a restaurant.

Bad kind of branding or something.

But anyway, this little tofu factory in Seattle was like this where I grew up. I grew up in a small room. I look big in that picture.

that's my dad My father was like MacGyver, inventing ways to make things heavier.

There is concrete block technology here, and you need a concrete block to press the tofu. Tofu is actually like a liquid, so you need something heavy to push the liquid out and make it stiff.

Tofu comes out in large quantities, so my father used to cut it by hand.

I can't tell you -- the story of the family business: you know -- my father was the most loyal man possible.

He once entered a safeway on a rainy day, slipped and broke his arm, and rushed out. I didn't want to bother Safeway.

So instead it was when my dad broke his arm and was in the store for two weeks and that week, now for those two weeks my brother and I had to do everything.

And it was torture, real torture.

Because we watched my dad take out a big chunk of tofu, put a knife in it, and cut it into crunchy pieces. We thought 'wow'.

So the first time I did it, I thought, "Wow!" like this.

bad block. Anyway, tofu for me is basically like my origin.

I loved going to school because working in a store was so hard. It was like heaven.

And I did very well in school.

So when I got into MIT, like most creative people, my parents all told me not to be creative, right?

So, in the same way, I was good at art and math, and my dad says he-John was good at math.

I went to MIT to study mathematics, and computers were just becoming visual, so this was a great opportunity.

Apple -- The Macintosh just came out. When I went to MIT, I had a Mac.

And it was a time, in a way, where there was a man who could cross both sides, it was a good time.

So I remember my first major piece of software was on a direct copy of Aldus PageMaker back then.

A long time ago I created a desktop publishing system. That was the first step in figuring out what to do. Ah, it's fun to combine these two aspects.

And the problem with being young is that students tend to have very big heads.

When I was making icons, I thought I was an icon master and oh, I'm really good at this.

And luckily, I had the good fortune to go to something called a library, and there I came across this very book.

I found this book. It's a book called Thoughts on Design by a guy named Paul Rand.

A little slim volume. I don't know if you've seen this before.

It's a very nice little book. This is the story of Paul Rand, one of the great graphic designers and great writers.

And when I saw this guy's work, I realized how bad I was at designing, or what they called it at the time, and suddenly I had some kind of career goal, some kind of intense pursuit.

So I sort of switched. I ended up going to MIT.

I got my master's degree and then went to art school.

I started designing chopstick wrappers, napkins, menus, whatever I could. It was kind of like fumbling around trying to get promoted in the design world.

And don't you think the moment when you publish your design is a magical moment?

Remember when you published your design?

Remember that moment? It felt great.

So I got published, I mean, wow, my design is in the book, you see?

After that, something went wrong and I started thinking about computers. Because I've always been curious about computers.

I didn't quite understand. And Paul Rand was kind of a surly designer. You see, I was a brusque designer. Like delicious French bread?

In his book he writes: "A Yale student said, 'I'm here to learn design, not to learn how to use a computer.' Design schools take note."

It was the 80's, a time when computers and non-computers were at war.

It's actually a very difficult time.

And this was an important message from Rand for me.

So at that time I started messing around with computers.

This is my first play and my own full-fledged play.

I built a working version of something that looks like Adobe Illustrator.

It looks like illustrator. You can also draw.

It was really difficult to make this.

It took me a month to make this part.

So I wondered what would happen if we added this feature. That means you can fly like a bird in this regard. Like, you're free.

That means you can change the type of stability with a little control on the dial and watch it flip.

And this was in 1993.

And my professors were very angry with me when they saw this.

They said, "Why are you moving?"

They said, "Stop it!"

Well, I said, well, that's the point, it works.

And he said, "So when are you going to stop?"

And I said "never".

And he said, "worse." Now Stop it.

I started studying the whole idea of ​​what this computer is. It's a strange medium.

It is different from printed matter. Not like a video.

It lasts forever. It's a very strange medium.

So I gave up on this and started looking for more things.

So I started experimenting with people in Japan.

This is actually bad, human experimentation.

I had the students become pens and use pens such as blue pens, red pens, green pens, and black pens.

And someone sits down and paints.

They're laughing because he told them to draw from middle to right to middle, and he kind of screwed up.

You see, humans don't know how to take orders. Computers are very good at it.

This guy figured out how to get the computer to draw with two pens at once. So you, pen, do this, and you, pen, do this.

And I started using multiple pens on the page, which was also difficult to do by hand.

And someone discovered this "wow moment" when you can use a coordinate system.

We thought, oh, it's going to happen now.

Finally he painted the house. It was the most boring.

It's become like a computer. We came to think of the X, Y system as a computational thing, and it was a revelation of sorts.

And then I wanted to make a computer out of humans, called a human-powered computer.

So this happened in 1993.

Please be quiet.

It is a computer whose parts are humans.

Behind this wall are disk drives, CPUs, graphics cards, and memory systems.

They are picking up a giant floppy disk made out of cardboard.

I have it in my computer.

And that little program is in that cardboard disc.

So she puts in a disk, reads the data from the disk's sectors, and the computer boots. It's really like booting.

And it's kind of a working computer. When I built this computer, I thought for a second, what is it called?

This computer seems fast. She works pretty hard and people run around. And we think it's happening really fast.

And this computer is programmed to do only one thing. That is, moving the mouse changes the mouse on the screen.

Moving the mouse on the computer moves the arrows.

On this computer, when I move the mouse, it takes 30 minutes for the mouse cursor to change.

To give you a sense of speed and scale, computers are amazingly fast, okay?

So, after that, I started experimenting with different companies.

This is what I did for Sony in 1996.

Three Sony "H" devices responded to the sound.

So if you speak into the mic, you will hear the music through your headphones. The video will play when you speak on the phone.

So I started experimenting with the industry in different ways, combining these kinds of skills.

I made this ad. I don't believe in this kind of alcohol, but I drink it from time to time.

and Chanel. So I started doing different projects.

Also, I realized that I love making things.

we like to make things Making things is fun.

Because of that, I never developed the ability to hire staff.

I have no staff. It's all made by hand - like a broken hand.

And this hand was influenced by Naomi Inami.

This person was like my mentor.

He was Tokyo's first digital media producer.

He was the one who discovered me and introduced me to digital media.

He was such an inspirational person.

I remember, we were in his studio at 2am and then he would emerge from a client meeting.

He would come over and say, "As long as I'm here, everything will be fine."

Then you will feel much better.

And I will never forget, but I will never forget when he suddenly got into a situation, he had an aneurysm.

He slipped into a coma.

So he's been out for three years and all he could do was blink, and at this moment I realized, wow, this thing we're wearing, this body and mind that we're wearing, how fragile it is, so I thought, how can I try harder?

How will you spend the time you have left, chasing?

So Naomi was extremely important in that regard.

So I started thinking more carefully about computers.

This was the moment I was thinking. So you have a computer program. It reacts to movement (X and Y). Then I realized that each computer program contains all these images within the program.

So, if you look here, that show you're watching in the corner, you can unfold it and you'll see all of this at once.

It is true simultaneity. It's not what we're used to dealing with.

We are used to working with one vector.

All this is done at the same time.

Computers exist in so many dimensions.

At the same time, I was annoyed. Because I went to art and design schools all over the place. There is such a thing as a "computer lab", this was in the late 90's, a great graphic design school in Basel.

And here is a dirty, shabby, dark computer room.

And I started to wonder if this was the goal.

This is what we want, right?

Also, I started to take an interest in machines such as copiers. And this is actually in Basel.

I've noticed how much time is spent creating interactive features (which are like touch screens). I also noticed that there are only 5 touchable locations. So, "why are we wasting so much interactivity all over the place?"

This is the question. And so is the sound. I discovered that you can make your ThinkPad look like a phone.

Do you understand? no? OK.

And also, at Logan Airport, I found this calling out to me.

do you hear that? It looks like a cow. This is 4am in Logan.

So I wondered, what is this computer thing in front of me?

It didn't make sense.

So I started making things again. This is also a series of objects made with an old computer in the basement of my home.

I brought an old Macintosh from Tokyo and used it to make various things.

I started to lose interest in the computer itself, so I started drawing with my PalmPilots.

I made this series of works.

These are paintings I made with a palm pilot in the center as a display of sorts. This is a kind of thinking, I am abstract art. what am i I am abstract

And it keeps thinking aloud about its own abstraction.

I started to get fascinated with plastic, so as a form of stress relief, I spent four months making eight plastic blocks completely optically transparent.

As a result, I became interested in blue tape and held an exhibition of blue tape at C.C. in San Francisco.

I made the whole installation out of blue tape, the blue painter's tape.

And at this point, my wife started to worry about me, so I quit the blue tape and started wondering what else there was in life.

And computers, you know, in addition to these big computers, there are now smaller computers.

They are small computers, so one-chip computers, I programmed one-chip computers and started making objects out of my PC. Board, LED.

I started making LED sculptures that fit inside a small MDF box.

A series of light boxes made for the show in Italy.

A very simple box: a single button press causes LED interaction.

This is a lamp series that I made. This is a bento box lamp. It's like a plastic rice lamp. Very friendly.

I did an iPod-made show in London last year. I used an iPod as a material.

So I took 16 iPod Nanos and basically built something like a Nano fish.

Recently it's Reebok.

As a kind of apparel hobby, I have also worked on Reebok shoes.

Anyway, there are many things you can do, but what I like most is to experience and taste the world.

The world is so delicious.

We are going to go to the museum. It has all the flavors.

No, they are all there.

So this is in front of the Eiffel Tower, actually around the Louvre.

This is the place I found, nature painted for me.

This is essentially a perfect 90 degree angle.

In this strange moment when these things appear.

We are all creative human beings.

We have this genetic defect in our hearts.

You have to stop, right? This feeling is wonderful.

It's a museum that's always open in perpetuity.

This is what the cape looked like last year.

I found myself having to find an art and design equation known as circles, triangles and squares.

Found it everywhere on the beach.

I started collecting all instances of circles, triangles and squares.

By the way, they are all back.

And I also found a way to do it.

Some rocks are twins who were separated at birth.

This is also out in the world.

How did this happen?

I am happy to gather you all again.

So, three years ago, I discovered that the letters M-I-T exist in simplicity and complexity.

My alma mater, MIT, and I had a sort of M. Night Shayamaran moment. So I thought: I have to do this.

And I followed it with passion.

But recently this RISD opportunity arose--go to RISD--but the letter said MIT forever, so I couldn't come to terms with this easily.

But I noticed the French word raison d'être.

I was like, oh wait a minute.

And then RISD appeared.

Then I realized it was fine. Take out.

So I'm actually going to RISD.

Who are the RISD alumni?

Who are RISD alumni? Yes, RISD. Come on, RISD. Wow, RISD.

I'm sorry, I'm sorry, Art Center -- The Art Center is nice too.

RISD is kind of my new kind of passion, and I'll talk a little bit about it.

So, what is RISD -- I was outside of RISD, and I thought that a student had written this on a block somewhere and, wow, RISD wanted to know what it was.

I have no idea what a RISD really should be or what a RISD wants, but one thing I have to say is that I'm an engineer, but I don't really like technology.

It's kind of a damn thing or something.

People say, "Are you going to introduce RISD in the future?"

And I say, I'm going to turn the future back into RISD.

There's my point of view. Because really, the question is not how to technologize the world.

How to make it human again.

And, if anything, I think RISD has some weird DNA.

It's a strange frenzy about materials and the world, and I think it's a charm that the world desperately needs right now.

Thank you very much, everyone.

I'm Clint Smith. It's "the only black kid hymn in the class."

You seem to be the manifestation of several lifetime struggles.

Brown versus raw board.

Most days, the classroom feels like an antechamber.

You are considered an expert in all things Morrison, King, Malcolm and Rosa.

Wait, weren't you sitting on that bus too?

You are everyone's best friend until you are no longer.

hip hop lyricist.

presumed athlete.

Free & Free Sideshow Shrink.

Exceptions and caricatures.

Too black and too white at once.

If you're successful, it's because of affirmative action.

If you fail, it's because you were destined.

You won't see until the lights come on Friday night.

Here you are the star before being asteroided.

Before they can see you, you will be reduced to dust.

Sixty-five million years ago, a very important and devastating event changed the course of life on land.

And I know that the land animals I'm going to talk about are just the remnants of the earth on land, little bits of land floating around, but they matter to us. Because they are like millimeters to meters on the scale of our experience.

And these animals disappeared, and in their place another life, mammals, appeared radially. So we know this in great detail. So this is the core from near Bermuda. We know that tsunamis, earthquakes, and what we have experienced throughout the entire record of human history, disasters like the one this has brought to the planet cannot be completely avoided.

Thus, even before its effects were known, even before ordinary scientists came to a consensus on the theory of evolution, scientists and naturalists of all kinds actually divided the history of life on Earth into two episodes: the Mesozoic, Mesozoic and Cenozoic, and recent life.

And as it turns out, it actually fits very well with geological history.

So we have the Mesozoic, the age of fragmentation, and the Cenozoic, the age of reunification from South America to North America and from India to Asia.

So, my research really is trying to understand the characteristics of Mesozoic radiation compared to Cenozoic radiation, and to see what mysteries we can learn from dinosaurs and other animals about what life on drifting continents actually tells us about evolution.

This work immediately raises the question: "Why didn't they go into the sea?"

That is, certainly mammals were. This is an example.

You can also go outside -- see many other examples.

Within 5-10 million years of the fireball impact, animals of all kinds were entering the water. why didn't they?

Why didn't you hang out in a moderately sized tree, why didn't you dig a hole?

Why didn't they do all these things, and if they didn't do all these things, what kinds of animals were there in that space?

And if there were no animals in that space, what would that tell us about how evolution would have happened on land?

These are really interesting questions. I think it has a lot to do with body size.

In fact, I think most of it has to do with body size, which is how you take over the ecospace that has been vacated by any natural disaster.

Observing dinosaur evolution, studying it, digging it up for years, and finally looking at radiation in mammals. Much like technology, everything seems to be advancing by orders of magnitude very quickly.

Dinosaur evolution proceeded at an imposing pace, but by any measure it was an order of magnitude slower.

Want to measure in diversity?

Want to measure how long it takes to reach maximum body size?

Yes, they do get bigger, but many are smaller, but we're interested in how long it took them to reach that size.

It takes 50 million years to reach this maximum body size.

And that's ten times the time it took mammals to reach their maximum body size and invade all habitats.

So there are lessons to be learned, and lessons to be learned from exceptions. Exceptions are well known today from discoveries made by us and by many other scholars around the world.

This slide has been shown before. This is the famous Jurassic bird Archeopteryx.

We now know that this migration was the only time that dinosaurs actually fell below their length -- we'll see where they started in a moment -- and the only time that they rapidly encroached on all the habitats we just talked about where they weren't.

They became Marines. We can now know them from the ice cap.

There are birds that dig holes.

They live in trees of all body sizes and of course on land.

We were therefore the first to actually name the birds in the famous series that later exploded on the pages of science and nature.

We named this bird Sinornis. It's a little more advanced than Archeopteryx, and if you go through the various layers, you'll find those less advanced than Archeopteryx, and all the grades in between. So when we find something today, we usually part the hair, or more appropriately the feathers, to determine if it is indeed non-avian or avian.

In fact, moving from one habitat to another on land is without exception the greatest transition we experience to understand how bony, rather heavy, kilograms or kilograms of animals can make such transitions.

It's just one of our biggest, our biggest evolutionary streams.

Well, my work started from scratch.

I figured if we wanted to understand dinosaur evolution, we'd have to go back to the bed they picked up the debris from and go back to when and where the earliest dinosaurs existed.

I would like to invite this small video clip to give you some idea of ​​what we are facing. We are often asked, "How do you find fossils in areas like this?"

Once you've rolled out your first video clip.

This is a lovely helicopter experience over an early bed located in northeastern Argentina.

And we're coming over a cliff, and at the top of that cliff, dinosaurs basically occupied.

At the bottom of the cliff, you'll find something as rare as a chicken's tooth.

Where the origin of dinosaurs can be found is at the bottom of a cliff.

When you go to an area like this, you get geological maps, topographic maps, and the best, most inspired teams you can bring to the area.

And the rest is up to you. Fossils must be found.

Getting it out usually requires digging a hole much larger than that. You have to climb a cliff and find everything that actually exists, not just dinosaurs, but the whole story. With any luck, if you dig a spot like that, you'll actually find an ash layer to dig into it, and we did.

228 million years ago, we discovered the most primitive of dinosaurs, the Ur dinosaur.

3.5 foot object, beautiful skull, predator, carnivore, bipedal animal.

That means every other dinosaur you or your child knows has at least four legs.

It's like looking at a skull, and it's about 5-6 inches long and absolutely stunning.

It looks so much like a bird.

It is hollow and shaped like a bird.

is a predator. Probably 25 pounds, or 10 kilograms.

That's how dinosaurs started. After that, the radiation started.

This is ten times the radiation of a four-legged mammal.

We are very dinosaur-like and unusual in that we approach life on two legs.

Well, if you want to understand what happened when the continents split and the land-dwelling dinosaurs drifted away. Some puzzle pieces are missing.

Most of the missing puzzle pieces are the southern continent. Because those continents are the least explored.

If I were to add to this painting and sketch around the world, I would have to force myself to the four corners of the globe - Africa, India, Antarctica, Australia - and start assembling some of these works.

I've been to some of these continents, but Africa, in the words of Stephen Pinker, was mostly a blank slate.

But if you manage to survive the expedition, it's the one with a giant chalkboard in the middle and lots of little areas of dinosaur rock.

There is no road into the Sahara Desert. It's a great place.

To excavate and retrieve an 80-ton dinosaur from the Sahara desert, you need to assemble an expedition team capable of handling the situation.

Some of them are political. Many of them are physical.

Some of them, most importantly, are spiritual.

And you have to be able to actually withstand the situation. I have to drive to the desert. Often, as we have discovered, you will see landscapes that no one has seen before.

And what kind of teams will they bring?

Yes, they are made up of people who understand science as a purposeful adventure.

They are usually students who have never seen a desert.

Some of them are more experienced.

Your job as a leader -- this is definitely a team sport -- your job as a leader is to inspire them to do more work than they've ever done in their entire lives under circumstances they can't imagine.

So 125 degrees is normal.

Ground level is 150 -- typical.

Therefore, regular metal tools cannot be left unattended as the occasional grab can result in first-degree burns.

So you too are in an amazing cultural environment.

You really stand shoulder to shoulder with the world's last great nomads.

They are a nomadic Tuareg tribe who have lived similar lives for centuries.

Your job is to uncover these frontiers and put them in the pages of history.

To do that, they would have to actually be transported thousands of miles out of the desert.

We are talking about Ethiopia, but let's talk about Niger in the north of Nigeria, or Niger in English. That's where this photo was taken.

Basically, what you're talking about is a country that didn't have container shipping when we started working.

If you wanted to pick bones out of the middle of the Sahara, you took a boat to the shores of Africa yourself.

That's a 2,000 mile trip.

After extensive excavations and a great deal of labor, from some of the dinosaur herds we've seen buried there—20 tons of material—we assembled Jobaria, a sauropod dinosaur like nothing you've seen on any other continent.

It's really a bit out of place in time.

It looks nothing like what you'd find if you dug a modern bed in North America.

Here is the animal that was causing the problem.

And, you know, the whole zoo goes on and on. When you pick up something like this, and some of you have had the chance to touch it, it's part of history. You are touching something 110 million years ago.

This is a thumb nail. It was there shortly after it was discovered.

It's a great way to look at life, and it really started when we started to understand the depths of time.

It has been with us for less than a century. In the meantime, radiometric dating has been around for less than a century, but being able to actually tell how old some of these objects really are is perhaps the most profound change. Because it dramatically changes the way we see ourselves and the world.

I think having a piece of history like that can change kids who might be interested in science.

This is the animal from which the thumb nail is derived, Suchomimus.

There are several others.

This is a giant animal found in Morocco.

The animal's brain was CAT scanned to create a prototype.

The forebrain was found to be 1/15th the size of a human.

This made the cover of Science magazine because they thought humans were more intelligent than these animals, but it is seen by some in the administration that some attitudes remain the same, even though they are vastly superior in brain volume. Any small bird of prey.

All the little Jurassic Park animals you know come from the northern continent.

This is the first skeleton from the Southern Continent, but what will it be? You start preparing it.

The hind feet do not have large claws. It doesn't look like a Velociraptor.

It's actually a completely different radiation.

So what we're trying to piece together here is the story.

This includes this pterosaur-like flying reptile restored from Africa.

An alligator, of course, and it's a nasty one we haven't named yet.

And a huge one - I mean, this is the lower jaw of this giant crocodile lying in the desert.

Alligators are technically called Sarcosuchus.

It is an adult Orinoco crocodile with a jaw.

I had to rebuild this.

To understand how alligators scale, I had to see a modern crocodile in action.

Can I have a second small video clip please?

Now, this field is just an adventure, and of course science in general is just an adventure.

We had to find and measure the largest alligator in existence today.

Narrator: ...as long as they have their boat.

Man: Look at that chopper set! Yes, he's a big man.

Narrator: If landed, this crocodile will provide useful data and aid Paul in his quest to understand Sarcosuchus.

Man: Okay, give me some more here. Man 2: Okay.

Narrator: Paul wanted to cover his eyes.

Man: Watch out! take care! No, no, no, no. You have to stand on your hind legs.

Man: Hind legs are here.

Man 2: Do you have hind legs? No, you have front legs, my friend.

i have it I got hind legs.

Someone please bring me a front leg.

Paul Sereno: Let's put this tape measure on him. put it there

oh.

65. oh.

That's a big skull.

Narrator: Large, but less than half the size of a Super Crocodile skull.

Man: Great. PS: You... have a 14 foot alligator.

Man: I knew it was big.

PS: Please don't get off. You can't get off, but don't worry about me.

Narrator: Paul had the data, so he decided to put the animals back in the river.

PS: Don't get off! don't get off! don't get off!

Narrator: Paul has never seen fossils do that.

PS: Ok, if I say 3, move.

1 2 3！

Wow!

So -- there was -- (Applause) Well, you know -- the fossil record is truly amazing. Because you get to see live animals in a new way.

These measurements proved that alligators scale isometrically.

However, it does depend on the shape of the skull, so I had to actually get measurements to confirm that the super alligator was actually a 40-foot-long crocodile, possibly male, and reconstructed to prove to the scientific community.

Anyway, I'll find others too.

I will lead an expedition to the Sahara Desert to excavate the largest Neolithic site in Africa.

We found this out last year.

200 skeletons, tools and gems.

This is a ritual disc.

An astonishing record of the 5,000-year-old colonization of the Sahara lies there waiting for us to return. Very exciting.

And then the work that followed would take us to Tibet.

Well, we usually think of Tibet as highlands.

It's just an island continent.

It was a herald to India, an emissary from Gondwana, a lost paradise for dinosaurs that had been isolated for millions of years.

No one was found. We know where they are and will go get them next year.

Elevation is between 13 and 14,000 feet, but it's fine if you go during the warmer months of the year.

Now, I've pieced together the evolutionary history of dinosaurs so that you can understand the basic patterns of evolution.

I've talked about some of them. we need to take it further.

To understand where the changes are happening and what they mean, we need to delve into this mass of anatomy we've been compiling.

We can't necessarily predict what will happen in the process of evolution, but we can learn some of the rules of the game. That's what we're actually trying to do.

When it comes to biogeographic issues, the planet is splitting.

These are all terrestrial animals. You have several options.

You split, and continental splits correspond to branching points in the evolutionary tree. Or you can be cunning and run from one side to the other and erase the division. Or maybe both sides live in peace and one side just goes extinct while the other side survives and makes a difference.

And four, you actually did one of those three things, and the paleontologists couldn't find you.

And when we take these four examples, we see a complex problem.

So, in addition to excavations, I think we can get some answers from dinosaur records. These dinosaurs traveled around the world over a few land bridges, I think we call it dispersal.

They did it within two or three degrees of the poles to maintain similarities between continents.

But when they split, they did, and we certainly see the continent carving out differences between the dinosaurs.

But there is one more important thing than that. I think it's extinct.

Downgraded this element.

It marks the history of life and, towards the end, gives us the difference we see in the world of dinosaurs just before the fireball impact.

The best way to test this is to actually create a model.

So, to put it back together, this is a typical 2D tree of life.

I want to teach you about three dimensions.

You can see the tree of life, but now I added the dimension of area.

Therefore, the tree of life usually branches over time.

Now we have created the 3rd dimension of the area, albeit with some divergence over time.

This is a computer program with three knobs.

We can control the things that worry us, such as extinction, sampling, diffusion, movement from one region to another.

And finally, you can control the branching to mimic what the continents might have been like, and run it thousands of times, so you can estimate the parameters to answer the question of whether you're on target or at least know the barriers to the problem. Now let's talk a little bit about science.

Today, I'm going to spend the last few minutes here talking about other things I do in Chicago. This has to do with the fact that I never have. And in fact, when I talk to a lot of TEDsters, there are a lot of you. I don't know if you'll answer honestly if I ask you to raise your hand, but there are many people who started their careers in science, technology, and entertainment as failures of society's standards and schools.

I was one of them. I fell in school, I fell in school.

Who is pointing?

Some teachers nearly killed me.

I found myself in art.

I was a total dropout in school and had no intention of finishing high school.

And I went on - that's my first painting on canvas.

I read a dictionary. I entered university.

I became an artist. OK, I started drawing.

It has become abstract.

I built my portfolio and headed to New York.

If there was a corpse there, bones could be seen.

Something was happening in the background. I went to the studio in New York.

A detour to the American Museum never recovered.

But really, it's the same discipline, they're the same kind of discipline.

I mean, what about discovering this dinosaur bone from the tiny pieces there, or seeing the distortions that we're going to see as evolutionary distortions from one animal to another, and not visualizing the unseen?

This is a very wacky visual.

I give you a human face because you are an expert in the field.

It would take years to figure out how to do that with dinosaurs.

They are really similar fields.

But what we're trying to create in Chicago is a way to attract and attract the most underrepresented students in science and technology.

We know that we lack the capacity to produce enough scientists, engineers, and technicians, and some hints have been made about it.

we've known it for a long time. We've gone through the Sputnik phase and now it's becoming more noticeable as you can see the pace of what we're doing is picking up. Where the hell do these people come from?

And a more general question for our society is what happens to the rest who are left behind.

What about kids like me who were in school, kids who were in school but never got the chance to participate in science and technology, and never will?

That's the question I ask. And talking about Ethiopia, it's very important.

Niger is equally important and I am trying very hard to do something in Niger.

They have an AIDS problem. I asked -- the US State Department recently asked the government, "What do you want to do?" And they gave them two problems.

Dinosaurs were one of them.

If you give us a dinosaur museum, we will attract tourists, our second industry.

And I hope the US government, me, TED, or someone can help with that. Because that would be incredible for their country.

But when we look back at our country, we look back at our cities. The city where most of you are from, and of course my city, has a lot of kids like this.

And the question, which we have been grappling with for centuries, is how do we get these kids involved in science?

We started a non-profit organization called Project Exploration in Chicago.

These are the two children of Project Exploration.

We met them in the early stages of high school. They were poor students who had fallen behind, but now—one at the University of Chicago, the other at the University of Illinois.

Harvard also has students. We are 6 years old.

and made an achievement.

Because when you go out into the field as a scholar and try to find such longitudinal studies and achievements, there are essentially very few, if not none.

That's why we've built an incredible track record of 100 percent graduating, 90 percent going to college, and many first-generation, 90 percent choosing science as a career.

This is a great achievement, and looking back, we didn't exactly solve this theoretically in the first place, but looking back, there was a theoretical movement in science education.

It went through science as research, which was a big breakthrough, and Dewey returned to Chicago. You learn by doing.

So you learn by envisioning yourself as a scientist, and then you learn to envision yourself as a scientist.

The next step is to learn the abilities to become a scientist.

Such steps are necessary. If you have -- it's easy to get kids interested in science.

It's hard to get them to imagine themselves as scientists, but this requires standing in front of people like we do at this symposium, presenting something as someone with knowledge, and then putting yourself in the role of a scientist and giving yourself the tools to pursue it.

So that's what we're trying to do. We are making plans to settle in Chicago.

We have a lot of ideas, but I can assure you -- and I've spoken to some here at TED -- that it's going to be unlike anything you've seen before.

It will be part school, part museum hall, part greenhouse, part zoo and part of the answer to the question of how to get children interested in science.

thank you very much.

My name is Kristin O'Keeffe Aptowitz. This is "Three Months After".

Wanting to disappear is not the same as wanting to die.

Disappear, you don't have to explain to anyone, you can talk to anyone.

To move to a place where no one knows who you are, where you don't have to see a single smiling face.

Who elopes with this grief may be this grief who is not your enemy, perhaps your best friend now.

This sorrow is your husband, the one in whose arms you curl up every night and go to sleep.

Who gets up early and makes me a cold, thankless breakfast.

To go to that place where every side becomes a blade.

Something other than this, something sharp to hang your poor flesh to feel.

My name is Araceris Gilmay. This is "To Estefani, a 3rd grader who made me a card."

An elephant is drawn on the orange line under the yellow circle representing the sun.

6 vertical green lines, colored from above, signifying flowers.

For the first time, peel off five squares of scotch tape and unfold the curved folds of the art class paper.

i'm in the living room It's June.

Inside the card is one long word followed by Estefanie's name. Lois Foelivari Estefanie Royce Foelivari?

Royce Foelivari: Latin scientific representation of hibiscus.

Lower Forlivari: A direction like going north? South? east? West? Royce Foelival?

I read the word out loud many times.

Lois Foelivali.

Lois Foelivali.

LoiSFOE thriving.

Lois Foelivali.

what is this word? I imagine using it in a sentence like, "Hey, I have to go home, I forgot my Lois Foelival." Or "There's nothing better than rain, hot rain, open windows with music, and a tall glass of Royce Foelivale." Or "How do I get to Pittsburgh?" "I've been living with this word for four minutes without knowing what it means.

It's the end of the year. I am thinking of writing the following letter to my student Estefanie. "To the excellent Estefanie!"

Hi Quelida, I hope you are well.

I just opened the card you made and it's so beautiful.

I really liked how the sky was filled with birds.

I think you are chula, churita and superfly!

Yes, the cards are beautiful.

I have only one question.

What does the term "Royce Foelivali" mean?

I'll try that word again. Lois Foelivali.

Lois Foelivali. Lois Foelivali.

I will try the word in Spanish.

Lois foelibari Lo-ees-fo-eh-dee-bah-dee Lo-ees-fo-eh-dee-bah-dee And then slowly, Lo is fo eh-dee-bah-dee And then slowly, Lo is fo e ri bari Lo is fo eribari Love is for everyone Love is for everyone Love is for everyone Love is for everyone Love is for everyone Love is for everyone Love is for everything Love is love for everything love for all love for all love for all love for all love for all love for all love for all.

Many of you may be wondering why flying cars, or more precisely, drivable aircraft, are possible at this point.

Years ago, Mr. Ford predicted that some form of flying car would become available.

Now, 60 years later, I would like to tell you why it is possible.

When I was about five years old, not quite yet, but about a year after Mr. Ford made his prophecy, I was living in rural Canada, on the side of a mountain in a very remote area.

In fact, for a child who is quite short for his age, going to school during the Canadian winter was not a pleasant experience.

It was challenging and scary for a young child.

At the end of my first year at school, that summer, I found several hummingbirds trapped in a shed near my house.

They were exhausted and banging against the windows, but hey, they were easy to catch.

I took them outside and when I let them go, at that moment they were very tired, but the moment I let them go they hovered for a moment and then flew away.

I thought what a great way to go to school.

(Laughter) For a kid that age, this was like fading away at endless speed, and I was so inspired by it.

And then, believe it or not, over the next 60 years, we've built a bunch of aircraft with the goal of creating something that gives you and me the flexibility to do what the hummingbird does.

I generally call this vehicle the Volunteer, after the Latin word Volant, which means to fly light and agile.

Volunteer helicopter.

The FAA, the governing body above all else, calls it a "powered lift aircraft."

And they actually issued a pilot's license for this type of aircraft - a power lift pilot's license.

It's closer than you think. This is somewhat surprising given the lack of operational powered lift aircraft.

So perhaps this time, the government is ahead of the curve.

The media refers to a particular volunteer of mine as a "skycar."

It's a slightly older version, hence the X designation, but it doesn't need an airfield because it's a four-seat aircraft that can take off vertically like a helicopter.

It is powered by electricity on the ground.

It is actually classified as a motorcycle because it has three wheels. This is a huge advantage because in theory it can be used on highways in most states, practically every city.

If you have to deal with car crash protection issues, forget it. Because you never fly a car.

(Laughter) Helicopters do pretty much the same thing as hummingbirds, and you could say they move around in pretty much the same way. That's true, but helicopters are very complex devices.

It's expensive - so expensive that few people can afford to own or use it.

Due to its fragile nature and complexity, it is often described as having many parts flying in formation.

(Laughter) Another difference, which I have to explain because it's very personal, is that another big difference between helicopters and Volunteers (in my case Skycar Volunteers) is my experience flying both.

Riding in a helicopter feels like being hoisted from above by an oscillating crane. This is still an amazing feeling.

Once you get into the Skycar – and I should tell you, only one other person has ever ridden one, and he had the same feeling – there is absolutely no vibration, it really feels like you are being lifted up by a magic carpet. The feeling is incredible.

And it was a great motivation.

I can only drive this vehicle if I convince my shareholders to let me do it, but it's still one of those great experiences that's worth all the time.

What we really need is an alternative to the automobile for trips of 50+ miles.

Few people realize that trips of 50 miles or more account for 85% of American travel miles.

If you could get rid of it, highways would serve you well, in contrast to what is happening in many parts of the world today.

This next slide is an interesting history of what we've actually seen in infrastructure. Because even if I give you the perfect Skycar or the perfect vehicle, it's of little value to you if you don't have a system to use it.

I'm sure some of you have asked the question, "Oh, isn't there something wonderful out there? What are you going to do up there?"

It's bad enough on the highway, but what does it feel like in the air?

The world you speak of tomorrow will be fully integrated. You don't become a pilot, you become a passenger.

And it's the infrastructure that determines whether this process goes forward.

Let me tell you, technically you can build a skycar. Oh my God, we went to the moon!

The technology there was much more difficult than what I'm dealing with here.

But we have to make these changes in priority and have the infrastructure to accommodate this.

Historically, canals propelled us about 200 years ago, but were replaced by railroads when that system disappeared.

As it disappeared, highways appeared.

But if you look at that top corner, the highway network, you can see where we are today. Highways are no longer being built, and that's a fact. No more highways will be built in the next decade.

However, similar to the last decade, traffic is expected to grow by 30 percent over the next decade.

And where will it lead you?

So the question, which I've often asked, is when will that happen?

When will these vehicles be available?

And of course, if you ask me, I'll give you a very optimistic view.

After all, I've spent 60 years here believing it will happen tomorrow.

So I'm not going to quote myself on this one.

I would like to quote others who have testified with me before Congress and who, in their capacity as NASA Administrator, have put forward a particular vision for the future of this type of aircraft.

Now, in view of the fact that we are only averaging about 30 miles per hour on the highways today, I would argue that on average, according to the DOT, skycars go over 300 miles per hour, up to 25,000 feet.

So, in practice, when it comes to speed, you'll probably see a 10x improvement in your ability to move.

Many people don't know, but the sky highway I'm talking about here has been under construction for 10 years.

It uses GPS. You may be familiar with GPS in cars, but you may not be aware of the fact that there is a US GPS, a Russian GPS, and a new GPS system being rolled out to Europe called Galileo.

With these three systems you always get what you need. That is, a level of redundancy that ensures that if one system fails, there is a way to ensure control.

Because when you are in this world where computers control your actions, it becomes very important that something does not go wrong for you.

How does Skycar travel work?

Well, it's too loud right now to leave the house.

This means that you have to be very quiet when you leave your home.

But it's still pretty quiet.

Motorized to Bertiport, blocks or even miles away.

As I said earlier, this is clearly a drivable aircraft and you won't spend a lot of time driving it.

After all, if you can fly like that, why should you drive around the highway?

Go to your local Bertiport, enter your destination and it will be delivered just like a passenger.

You can play computer games, sleep, or read a book on the way.

This is the world. You as a pilot do not exist. And I know the pilots in the audience won't like it. And we've gotten a lot of bad feedback from people who want to be there, fly around, and experience it.

And of course, I think we can still do that, just like recreational parks.

But the vehicle itself makes for a very, very controlled environment.

Otherwise, it would be useless as someone who might use such a system.

It wasn't until 1965 that we flew our first vehicle for the international press that I started to really get into it.

I was a professor at the University of California. Joining the Davis System, I was so excited about this that I was able to fund the start of the program at the time.

And over the years we have invented different vehicles.

In fact, the key point was in 1989, when we demonstrated the stability of this vehicle. It has proven to be completely stable under all conditions. Of course, this is very important.

It's not yet practical in this context, but we believe we are moving in the right direction.

Finally, in early, actually mid-2002, we flew a 400, a four-seat M400.

In this case, the first is flying remotely, as we always do.

And at that time there were very small power plants.

We are currently installing a larger power plant that will allow me to return to the ship.

Vertical take-off aircraft are not the safest vehicles during test flight programs.

There's an old adage that held true from the 1950s to the 1970s, when every airline was working on vertical take-off aircraft.

A vertical take-off aircraft requires an artificial stabilization system, which is essential.

At least when it comes to hovering and slow flight.

If the single stability system, the brain that steers the plane fails, or the engine fails, the vehicle crashes. there is no choice for that.

And the adage I was referring to at the time was that nothing falls faster than an upside-down VTOL aircraft.

(Laughter) We lost a lot of pilots, so that's a creepy comment.

In fact, airline companies have more or less given up on developing vertical take-off aircraft for years.

And the only aircraft in actual service in the world today is the Hawker Harrier Jump Jet, a vertical take-off aircraft unlike a helicopter.

A vertical take-off aircraft like a hummingbird has a very high metabolism and thus requires a lot of energy.

Getting that energy is very difficult. It all comes down to power plants, how to get a lot of power in a small package.

Fortunately, Dr. Felix Wankel invented the rotary engine.

A very unique engine. Round, small, no vibration.

It fits exactly where it needs to be mounted, in the center of the hub of the duct in your system. This is very important. In fact, as anyone interested in cars knows, this engine has recently been used in Mazda's RX8.

And the sports car won Sports Car of the Year.

great engine.

This application produces 1 horsepower per pound. That's twice as much as a car engine today, but only half of what you need.

My company spent 35 years and millions of dollars developing the rotary engine, which was invented in the late 1950's, to the point where it could deliver more than 2 horsepower per pound of reliable, significant power.

One cubic foot actually gives you 175 horsepower.

This vehicle has eight engines.

We have four computers in our house. There are two parachutes.

The key here is redundancy.

If you want to stay alive, you need a backup.

And we actually flew this vehicle, but it lost the engine and kept hovering.

Computers back up each other. If you have a voting system and one computer disagrees with the other three, it will be kicked out of the system.

And then three. You still have triple redundancy.

If one of them fails, you still have a second chance.

If you stay here, good luck will come your way.

You won't get a third chance.

The parachute is there. Hopefully, it's more of a psychological reason than a real one, but when the time comes, the parachute is the ultimate backup.

(Laughter) In the next animation, I'd like to show you one element of how Skycar is used, an animation that shows how Skycar can be used.

You can take it personally in your own words and think about how you would use it.

Video: Skycar is activated, launching a rescue vehicle to San Francisco.

Paul Moorer: As Dr. Goldin says, I believe that personal transportation in things like skycars, perhaps in other forms of volunteering, will become an important part of our lives within the next decade.

And it's going to change demographics very drastically.

If you live 75 miles from San Francisco and get there in 15 minutes, you'll sell your apartment for $700,000, buy a luxury home on the side of a mountain, buy a skycar that I think was probably worth $100,000 at the time, put your money in the bank...

That's a very important motivation for escaping San Francisco.

But property values ​​are going to hell, so you better get out of town first.

(Laughter) Skycar was really hard to develop.

Obviously, I am financially and technically dependent on many people who believe in what I am doing.

And it finds you in a situation where you are very accepting of what you are doing, but you are rejecting a lot of the same kind of things.

As explained, I have characterized this emerging technology in aphorisms, but this really speaks to what I have experienced, and I am sure others have experienced with emerging technologies.

There is an interesting poll recently published on the NAS (I think it's MSNBC). The question was "Are you in the market for volunteers?"

23% said yes, as soon as possible.

47% said yes, the price could drop as soon as possible.

Twenty-three percent said they would "as soon as safety is proven."

Only 7% said they wouldn't consider buying a skycar.

I am encouraged by it. At least I feel like it's becoming somewhat self-evident.

In order for highways to be usable in today's world, there must be an alternative to the automobile for travel of at least 50 miles.

thank you.

So our population is about 7.5 billion.

According to the World Health Organization, depression affects 300 million of us and kills about 800,000 people each year.

A few of them choose a very nihilistic way to die in the act of killing as many people as possible.

These are recent famous examples.

And I'll show you the lesser-known ones. That happened about nine weeks ago.

Even if you don't remember it, it's because there's been a lot of stuff like this going on.

According to Wikipedia, there were 323 mass shootings in my home country, the United States, last year alone.

Not all the shooters were suicidal, not all suicidal, not maximizing the death toll, but a lot of people did.

The key question is, "What limits do these people have?"

Let's play Las Vegas shooting games.

He slaughtered 58 people.

Did you stop there because you got tired of it?

No, and we know this because he shot and wounded 422 more people he definitely wanted to kill.

There is no reason to think he was stuck at 4,200.

In fact, for someone this nihilistic, he could have happily killed us all.

I do not understand.

What we do know is that when suicidal killers go all-out, technology doubles their power.

Here is an example.

A few years ago, guns were so hard to come by in China that there were 10 school attacks with knives, hammers and kitchen knives.

By a strange coincidence, this last attack occurred hours before the massacre in Newtown, Connecticut.

But that one attack by the United States killed almost as many victims as ten Chinese attacks combined.

Therefore, we can say that the knife: terrible. Guns: Worse.

And the plane was even worse, as pilot Andreas Lubitz showed when he forced 149 people to commit suicide and crashed the plane into the French Alps.

There are other examples of this.

And I suspect that in our near future there will be far more deadly weapons than non-metal planes.

Consider, then, the apocalyptic dynamics that occur when suicidal mass murder is added to a rapidly advancing field that holds limitless potential for most societies.

Somewhere in the world there are a few people who, however incompetent, would try to kill us all if they knew how.

The Las Vegas shooter may or may not have been one of them, but we have 7.5 billion people, so we're not zero.

There are many suicidal nihilists out there.

we've already seen it.

Some people have severe mood disorders that are out of their control.

Some suffer from unusual trauma.

As for the corollary group, its size was forever zero until the Cold War began, when suddenly the leaders of two global alliances acquired the ability to blow up the world.

Since then, the number of people with actual doomsday buttons has remained fairly steady.

But I'm afraid there will be more, not just three.

This is crazy.

So it becomes like a business plan for technology.

(Laughter) The reason is that we are in an age of exponential technology. This technology takes the eternal impossibility on a daily basis, makes it the actual superpower of one or two living geniuses, and - and this is the important part - spreads that power to everyone, to a greater or lesser extent.

Now, here's a benign example.

If you wanted to play checkers on a computer in 1952, you had to literally be that person, own one of the 19 copies of that computer in the world, and teach checkers with a brain that resembled a Nobel Prize winner.

It was the bar.

Nowadays, computing is such a quantum leap in technology that knowing someone who owns a phone is enough.

Synthetic biology (referred to here as "symbio") is similar.

And in 2011, a few researchers did something as original and unprecedented as the checkers trick against the H5N1 flu.

It's the strain that kills up to 60 percent of those infected, more than Ebola.

But it is highly contagious and has killed less than 50 people since 2015.

So researchers edited the genome of H5N1 to make it not just lethal in every way, but highly contagious.

The news department of one of the world's top two scientific journals said it would likely trigger a pandemic, possibly with millions of deaths, if it came out.

And Dr. Paul Keim said he couldn't think of a more terrifying creature, which is the last thing I personally want to hear from the chairman of the National Scientific Advisory Board on Biosecurity.

By the way, Dr. Keim also said -- ["I don't think anthrax is as scary as this."] And he's one of them.

[Anthrax expert] (laughter) Well, the good news about the 2011 biohack is that the people who did it didn't mean to harm us.

They are virologists.

They believed they were advancing science.

The bad news is that the technology isn't going to be fixed in place, and their feats will become easier in the coming decades.

In fact, it has already become much easier. Because, as we learned yesterday morning, just two years after doing their research, the CRISPR system was being used for genome editing.

This was a fundamental advance that greatly facilitated gene editing. It was so easy that CRISPR is now taught in high schools.

And this thing is moving faster than computing.

Those slow, stubby white tracks over there?

That's Moore's Law.

This shows how rapidly computing is getting cheaper.

This steep, crazy, fun green line shows how fast gene sequencing is getting cheaper.

Now, gene editing and synthesis and sequencing, these are different fields, but they are closely related.

And they're all moving at an amazing rate.

And the keys to the kingdom are these tiny little data files.

It is an excerpt of the genome of H5N1.

The whole thing fits on just a few pages.

Yes, don't worry. Google it as soon as you get home.

It's all over the internet, right?

And the part that makes it contagious fits well on a single post-it.

And once a genius creates a data file, any fool can copy it and distribute it around the world or print it.

And I don't mean just print to this, I mean print to this immediately.

So let's imagine a scenario.

Let's say you pick any year and say it's 2026. Suppose a brilliant virologist, wishing to advance science and better understand the pandemic, designs a new bug.

As contagious as chickenpox and as deadly as Ebola, it lurks for months before causing an outbreak, potentially infecting the entire world before the first signs of a problem appear.

Then her university gets hacked.

And of course this is not science fiction.

In fact, just one recent US indictment documented the hacking of more than 300 universities.

As such, files containing bug genomes spread to the dark corners of the Internet.

And once a file is leaked, it can never come back. Ask anyone who runs a movie studio or music label.

So maybe in 2026 it will take a true genius like a virologist to create a living creature, but 15 years from now it may be possible with just a DNA printer in any high school.

If not?

Let's take decades.

As an aside, do you remember this slide?

Notice those two words.

If someone tried this and was only 0.1 percent effective, 8 million people would die.

This is equivalent to 2,500 times on 9/11.

Civilization will survive, but it will be permanently damaged.

This means that you have to worry not only about the geniuses, but also about the players who scored a few shots on goal.

So today there are only a handful of geniuses who can create doomsday bugs that are probably 0.1% effective, or a little more.

They do not belong to this group as they tend to be stable and successful.

So, I think I'm kind of okay with that.

But what happens after technology advances and becomes pervasive, making thousands of life science graduate students competent?

Will they all be perfectly stable?

Or what if, years later, all stressed Primeds are in full effect?

At some point in that timeframe, these circles will intersect. Because we are now talking about hundreds of thousands of people around the world.

And most recently, it included that guy who dressed like the Joker and shot 12 people at the Batman premiere.

It was an NIH-funded neuroscience doctoral student.

OK, plot twist: I think you can actually get past this problem if you start focusing on it now.

And I say this because I've spent countless hours interviewing the world leaders of SymBio and researching their work in the science podcasts I produce.

I've grown to fear their work, in case I haven't put it out there yet—(laughter) but more than that, to respect the potential.

This substance will cure cancer, heal our environment, and stop our cruel treatment of other living beings.

So how can you get all this without destroying yourself?

First off, like it or not, symbio is here, so embrace the technology.

If you ban technology, you're just handing the handle to the bad guys.

Unlike nuclear programs, biology can be practiced invisibly.

As with all illicit drug laboratories around the world, the massive Soviet misconduct against the Biological Weapons Convention made that clear.

Then, ask an expert to help you.

Sign up to make more.

For every million bioengineers we have, at least one million will be on our side.

So Al Capone will be on our side in this movie.

The bar to being a good person is very low.

And a huge numerical advantage is important, even if one bad guy could do significant harm. Because, above all, they allow us to exploit the hell out of this situation: we take years, preferably decades, to prepare and prevent.

The first to try something terrible, and surely someone will appear, may not even be born yet.

Secondly, this needs to be a whole-of-society effort and you all need to be a part of it. Because we cannot blame a small group of experts for the containment and misuse of synthetic biology. Because we are already trying it with the financial system. And our administrators became massively corrupt while figuring out how to cut corners, put us at enormous risk, privatize the profits, and got terribly wealthy while they shoved us a $22 trillion bill.

And most recently -- (applause) are you the ones who got the thank you letter?

I'm still waiting for mine

I thought they were too busy to thank me.

More recently, online privacy started to emerge as a big issue, so we basically outsourced it.

And again, privatized gains and socialized losses.

Anyone sick of this pattern?

(Applause.) So we need a more comprehensive way to protect our prosperity, our privacy, and our lives in the near future.

So how do we do all this?

Well, when the body fights pathogens, it uses a very complex, multi-layered and ingenious immune system.

Why not build one of these for the entire ecosystem?

There will likely be a year-long TED talk on this important first layer.

These are just a few of the many great ideas out there.

Some R&D department could put the very primitive pathogen sensors we have today on a very steep price-performance curve, and soon they would be ingenious, networked, and gradually as pervasive as smoke detectors and smartphones.

On a very related note, vaccines have all sorts of problems with manufacturing and distribution, and once manufactured, they become incapable of adapting to new threats and mutations.

We need an agile biomanufacturing platform that spans every pharmacy and even our homes.

Printer technology for vaccines and medicines is within reach if it is a priority.

Next is mental health.

Many of those who commit suicide mass murder suffer from severe treatment-resistant depression or PTSD.

We need noble researchers like Rick Doblin to tackle this problem, but we also need more selfish idiots who recognize the fact that severe suffering will soon endanger not only those who suffer, but all of us.

Then those bastards will join us and Al Capone in fighting this situation.

Third, each of us can and should be the white blood cells of this immune system.

Sure, suicidal mass murderers may be despicable, but they are also deeply hurt and sad people. And we humans don't have to do all we can to keep nobody from falling out of love.

(Applause.) Next, we need to make fighting these hazards a core part of the field of synthetic biology.

At the very least, there are companies that claim to let engineers spend 20% of their time doing what they want.

What if those who hired and became bioengineers spend 20% of their time building defenses for the public good?

Not a bad idea, right?

(Applause.) So in the end, this wouldn't be fun.

But we have to set our minds on some very dark places. Thank you for taking me there tonight.

We survived the Cold War because we all understood and respected its dangers, and in part because we spent decades telling ourselves terrifying ghost stories with names like "Doctor Strangelove" and "War Games."

Now is not the time to be calm.

This is one of those rare times when it's incredibly productive to make a fuss -- (laughter) come up with a few ghost stories and use fear as fuel to fight this danger.

Because all these horrifying scenarios that I have drawn are not destinies.

they are optional.

The danger is still far away.

And that means it will befall us only if we allow it.

let's not

Thank you for your attention.

(applause)

My day starts just like yours.

(Laughs) When I wake up in the morning, I check my phone and then I drink coffee.

But that's where my day really begins.

I live my life as a work of art, so it may not be yours.

Imagine yourself inside a giant jewelry box filled with all the beautiful things you've seen in your life.

Now imagine your body as a canvas.

And on that canvas, you are on a mission to create a masterpiece using the contents of a giant jewelry box.

Once you've created your masterpiece, you might think, "Wow, this is what I made."

This is me today. ”

Then you'll pick up your house keys, walk out the door into the real world, and perhaps take public transport to the center of town...

Sometimes I walk down the street or go shopping.

That's my daily routine.

These pieces are who I am when I walk out the door.

I am an art

I have lived as an art all my life as an adult.

Living as art has made me who I am.

I grew up in the small village of Fillongley in England, and it was last mentioned in the 'Doomsday Book', so that's the spirit.

(Laughs) I was raised by my grandparents, who were antique dealers, so I was surrounded by history and beauty.

I had a very nice dress up box.

As you can imagine, it started then.

At the age of 17 she moved to London to become a model.

Then I went to study photography.

I wasn't very happy with myself at the time, so I was always escaping.

I studied the work of David LaChapelle and Stephen Arnold. They are the photographers who have curated and created a world that strikes me.

So I decided to move from the superficial world of fashion to the superficial world of art someday.

(Laughter) I decided to live my life as a work of art.

I spend hours, sometimes months, building something.

My go-to tool is a safety pin like this -- (lol) it's never big enough.

(Laughs) And since I use fabrics over and over again, I recycle everything I use.

When I dress, I am guided by colors, textures and shapes.

There is rarely a theme.

I find beautiful objects from all over the world and handpick them to create a 3D tapestry over a base layer that covers my entire body shape.

Because I am not very happy with my body.

(Laughter) I ask myself, "Should I take something off or put something on?"

Is it about 100 pieces? ”

And sometimes I do too.

I promise it won't be too offensive -- well, just a little bit -- (Laughter) I feel a little sick because I might get safety pins from time to time talking to you -- (Laughter).

It's true - sometimes.

So this is my version of T-shirt and jeans.

(laughs) When I wear clothes, I build my body like an architect.

I put things down carefully until I feel it's mine.

Then I get a lot of ideas from lucid dreams.

In fact, I told myself I had to go to bed to think of an idea and wake up to write it down.

We wear it until it falls apart and breathe new life into it.

For example, the gold costume is the one I wore to the Houses of Parliament in London.

It was made of armor, sequins, and broken gems, and I was the first person in parliament to wear armor since Oliver Cromwell banned armor in the 17th century.

Beautiful things don't always have to be expensive.

Try making costumes out of trash cans or trash you find on the street.

Maybe they will be on the pages of Vogue.

My collection includes over 6,000 pieces, ranging from 2,000-year-old Roman rings to ancient Buddhist artifacts.

I believe in sharing what I do and what I have with others, so I decided to hold an art exhibition, which is currently touring museums around the world.

It contains my army - there are life size sculptures here as you can see behind me - they are really my life.

They are like 3D tapestries that express my existence as living art.

They include diamonds, beer cans and plastic crystals mixed with royal silk all at once.

I like the fact that the viewer can never guess what is real and what is fake.

I feel it is important to explore and share culture through my work.

I use clothing as a means of researching and evaluating people around the world.

Sometimes people think I'm a performer or a drag queen.

it's not.

My life looks like a performance, but it's not.

Very real.

People react to me in the same way they would to any other kind of work of art.

Many people are fascinated and obsessed.

Some people are shy at first and walk around me staring at me.

Then they come to me and say they love or absolutely hate what I do.

Sometimes I respond, sometimes I let the art speak for itself.

The most annoying thing in the world is when people try to touch your work.

But I get it.

However, as with much contemporary art, many people are negative.

Some people are critical, some people are cursing.

I think it comes from the fear of something different, the unknown.

With so many reactions to my actions, I have learned not to take them personally.

I have never lived as the person Daniel Lismore.

I have lived as Daniel Lismore, a work of art.

And as a work of art, I have faced every challenge.

It can be difficult...

Especially if your wardrobe takes up 40 foot containers, 3 IKEA storage units, 30 boxes -- (lol), it can be very difficult to get into the car, and sometimes -- well, I couldn't get through the bathroom door this morning, so that was the problem.

(laughs) What does it mean to be yourself?

It's often said, but what does it really mean and why is it important?

How would your life change if you chose to be unapologetic and be yourself?

I have had to face struggles and triumphs while living my life as an artist.

I have flown around the world in private jets.

My work is exhibited in a famous museum and I was blessed with the opportunity. By the way, my grandparents raised me. And there I am. (Laughter) (Applause.) I was put on a private jet and flown around the world, and it still wasn't that easy. Because at times I have been homeless, spat on, abused, abused day after day, bullied all my life, rejected by countless people. I got stabbed.

But what hurt most was being put on the "worst dressed" list.

(Laughter) Being yourself can be difficult, but I've found that it's the best way to go.

There is such a thing as "the worst dressed man".

(Laughter) As the saying goes, "Everyone else has already been taken."

I realized that confidence is a concept that you can choose for yourself.

I realized that authenticity is necessary and that is powerful.

I have tried to spend my time like everyone else.

It didn't work.

It's very hard not to be yourself.

I have a few questions for you guys.

who are you?

how many versions do you have?

I have a final question. Are you making good use of them all?