(laughs) Me: "It's very popular now.

(Laughter) The other day, there were 30 varieties in the supermarket.

You can cut raw carrots and put them on and eat them.

Have you ever done it, Mr. Solomon? ”

(laughs) Seo: "I have to go to sleep now.

(Laughter) (Applause) Good night.

sweet dream"

I'm at a loss for words!

Me: "Bonsoir my gold nugget good night"

(Laughter) Imagine this going on for weeks, but it was the best few weeks of my life.

Even if my friends invite me out for a drink

"I can't do it because I'm waiting for a gold-related email"

this is discontinued

I have to put an impossible punch line

With that in mind, I devised a plan: I said, "Solomon Security is a concern

We have to use encryption when we email each other."

Solomon agrees

(Laughs) Me: "Solomon, I stayed up all night thinking about the code, so that I can use it for all future communications Lawyer: Kuma-san gummy

Bank: Cream Egg

Legal: Cola Gummy Application: Peanut M&amp;M'S

Documents: Jelly Beans

Western Union: Gummy Lizard Giant"

(Laughter) I knew it was a word they used too.

Me: "Please call me KitKat in all future correspondence."

(Laughter) I didn't get an answer, and I thought I had gone too far.

I have to rewind a little

Me: "Solomon, is this case still alive?

From KitKat

(laughs) I have to be thorough about this.

and got a reply

Seo: “The transaction is in progress.

Then I got the most powerful email in my life.

(Laughter) I'm not kidding.

No~ it was fun

Seo: "The transaction is in progress.

I'm in the process of collecting money for the gummy bears -- (Laughter) I'm going to have him turn in all the cola gummies and jelly beans he needs to Cream Eggs to start the Peanut M&amp;M'S process.

(laughter) Send £1,500 via Gummy Lizard."

(Laughter) This was so much fun that it got me thinking: What if I answered as many scam emails as I could in the time I had?

I've been doing just that for the last three years on your behalf!

(Laughter) (Applause) When you start replying to scam emails, the impossible happens.

It's very difficult but please do try I don't think I'm being mean

A lot of people are mean to scammers

I'm just wasting their time

While I'm with them, they don't use their time to fool the gullible adults

If you decide to give it a go—highly recommended—create a fake address.

I can't use my real name address because that was the worst thing for me

When I wake up in the morning, a thousand emails have arrived

It's about penis enlargement.

But let me tell you something. Consider yourself lucky if you get an email that starts like this.

Oh, that Winnie Mandela! I tought

(laughs) I'm not the first person.

Winnie: "I have to move $45 million out of the country because my husband, Nelson Mandela, is not feeling well."

Do you have an image?

What she sent me was too funny

(Laughter) Here comes this too.

It's a seemingly decent certificate

But there's nothing written here, it's just a figure!

(laughs) Me: "Mr. Winnie, I'm so sorry.

Her husband passed away three months ago, so we can say that her condition is quite serious.”

(Laughter) Health-wise, it can't get any worse.

Wei: "Could you please follow the instructions of my representative at the bank?

ONE LOVE」

(Laughter) [Note: Bob Marley lyrics] Me: "Of course NO WOMAN NO CRY"

(Laughter) [Note: Bob Marley lyrics] (Applause) Wee: "One love, like sending $3,000 to the person in charge."

(laughs) Me: "Momantai!

I SHOT THE SHERIFF [Note: Bob Marley lyrics]

[(BUT I DID NOT SHOOT THE DEPUTY)] (laughs) Thank you.

(applause)

French fries are delicious

If you put ketchup on it, it's already the best

But the problem is, bottled ketchup doesn't give you the amount you need.

We're so used to serving ketchup that we don't realize its magical properties.

If the contents of the bottle were a solid like a lump of iron

Iron doesn't come out no matter how much you shake it

But if the same bottle contains a liquid like water,

Pouring is as easy as a dream

But ketchup seems undecided

Is it solid? Is it liquid?

the answer depends

Most common liquids such as water, oil, and alcohol react proportionally to the applied force.

Press twice as hard to move twice as fast

It's called a Newtonian fluid because Sir Isaac Newton, famous for his apple story, discovered this relationship.

But ketchup belongs to the group that doesn't obey proportionality and is called a non-Newtonian fluid.

Mayonnaise, toothpaste, blood, paint, peanut butter, and many other fluids do not respond proportionally to force.

The apparent viscosity of these fluids depends on how hard, long, and fast you push them.

Ketchup is actually non-Newtonian in two ways.

First: The stronger the force applied to ketchup, the easier it will flow.

Below a certain force, it basically behaves like a solid.

But beyond that breaking point, it suddenly loses its viscosity and becomes orders of magnitude easier to flow.

Do you have experience?

Second, even if the applied force is below this limit, the ketchup will eventually start to flow.

In this case, time, not force, is the key to freeing ketchup from its glass prison.

Why does ketchup behave so strangely?

Ketchup is made from finely ground and mashed whole tomatoes.

Can you see the tiny particles?

These are the tomato cells left over from the ketchup manufacturing process.

What is the liquid surrounding the particles?

mostly water with vinegar, sugar and spices

When the ketchup stays still, the tomato particles are evenly and randomly distributed.

Now let's add a quick, weak force.

Particles collide with each other, they get in the way, they can't get through, ketchup can't flow.

Now let's add a strong force at once

Enough force crushes the tomato into an oval instead of a little ball Boom!

The cluster of particles gets enough space to pass through and the ketchup flows.

Next, let's apply a small amount of force for a very long time.

I don't know exactly what's going on in this case

One possibility is that the tomato particles near the walls of the container were slowly pushed toward the middle, and the liquid that was dissolving the particles -- which was mostly water, I think -- was left near the edges.

This water acts as a lubricant between the mass of ketchup in the center of the bottle, so the ketchup flows better.

Another possibility is that the particles spread out into small clumps that make it easier for them to pass through each other.

Scientists who study fluid flow are still working hard on the flow of ketchup and allies.

Ketchup flows more easily with more force, but substances like oobleck and pure peanut butter stiffen with more force.

Some fluids continue to flow out of the beaker, climbing up the surface of the rotating bar, or once the flow begins.

But from a physical point of view, ketchup is one of the most complex mixtures of all.

To further complicate things, different types of ketchup behave quite differently, depending on their different ingredients and proportions of natural thickeners, such as xanthan gum, found in many fruit drinks and milkshakes.

But many of them exhibit two characteristics: they suddenly become easier to flow after a certain force, and they gradually become easier to flow even with weaker forces over a long period of time.

So there are two ways to get the ketchup out of the bottle: take your time and gently shake the container.

But the expert, with the lid still on, shakes the container vigorously several times to wake up the tomato particles, then removes the lid and pours just the right amount onto the delicious potatoes.

I have been a police officer for many years

I have a note because I'm black...and a pastor.

(Laughter) If you knew all about black pastors, we could finish this story and move on to another 20-minute talk.

(Laughter) Anyway, we need to move on.

I've been a police officer for many years, pre-technology.

I'll tell you what happened before the pager

(Laughter) You can laugh, but it's true.

Conflicts Between Humans - Before the "War on Drugs"

before all that

It was a long time ago, and I've been through the ups and downs in my life, the good times and the bad times, and I still love being a police officer.

I always felt like it was my vocation and never thought of it as my job.

Even so, I personally believe that law enforcement is at risk.

It's an invisible crisis, and it's been in a crisis for a long time.

Even we, law enforcement, say, "Listen, arresting people like this won't solve the problem."

Law enforcement also says, "Racial profiling is illegal."

did you know?

Even the police, as law enforcement, agree that they should adopt this way of thinking and become the police for their communities.

But all the while, the police culture continues to contradict what I just said.

That overshadowed me some years ago.

I was sick of racism and discrimination, sick of "somehow" and cliques.

I was really bored

I'm tired of the vicious cycle, and I'm tired of the police that I still have a crush on today.

So my wife and I decided, after much thought, to set a date to quit.

I quit the police and suddenly I'm in my later years, and I can devote myself to my pastor and love my wife to the fullest.

you know what i mean

(Laughter) I decided to quit my job.

a stronger force worked

It was my love for the town, the town where I was raised and educated that drew my heart back to the police force.

we didn't quit

I held off on quitting, and then over the next 18 or 19 months, I was passionate about the police work, from the ground up.

In those 19 months, I went from being a narcotics agent.

It's called the Eastern District, which is the most violent, the poorest, and has an unemployment rate of 46 percent.

At the time, national assessments consistently ranked among the top 10 worst AIDS and tuberculosis rates, by city, or zip code area, across the country.

The worst 10 isn't a division of a state or a city, it's a small neighborhood near you.

That's why I said, "You should do something different."

I had to think radically about something different.

I had to change my mind

I had to listen to my inner voice to bring about the change I desperately wanted and felt I really needed.

I had to listen to my inner voice, denying everything I was taught to do.

we did

As I listened to my inner voice, there was one thing that I realized, and I did, and that is that if I'm going to have real police reform where I have authority over public order, I have to change my entrenched mindset.

to reform it

So we started with a holistic way of thinking instead of a military-based way of thinking.

thought from a different angle

And what I realized was that it wasn't "us" versus "them," and it shouldn't have been.

So I decided to go to the crossroads where I could meet people of all classes, races, religions, colors, economics, religions, education, medicine, and meet all the people who make up the communities in my jurisdiction.

I began to meet and hear opinions

the police have a problem

In the first place, the police bring something into the community, and even if they come up with crazy ways and ways to deploy it, they don't discuss it with the residents.

We just impose it on the community and say, "Do it this way."

But we said let's change our entrenched mindset and talk to the community.

"It's a place for community dialogue.

I want to sit close to you and hear your voice live.

What will work in this area? ”

And then something wonderful started to happen

For example, this: My 130 police officers needed to figure out a way to work with residents instead of holding them down.

had to find a way to migrate

Impossibly, the police have evolved into something amazing as law enforcement.

the police became great guardians

I know how to protect my citizens

We have also used our arm to a great extent.

If I was allowed to represent the police force in my birth law enforcement agency, I would see a wonderfully beautiful 60cm arm.

(laughs) Isn't it nice? tightened

It's nice to have no extravagance! It is good, is not it!

(Laughter) I protect it with these arms/weapons.

That's what police officers are, but sometimes there's been excesses and abuse in the use of police force.

Sometimes it was ruthless, it was callous, it lacked humanity.

We forgot that our police motto is to protect the people and serve the people everywhere in the United States.

Did you know that you protect and serve the residents?

(Laughter) Let's take a look at the other arm, look at this, this is...

(Laughs) You seem weak for some reason.

prone to illness

I'm going to wither and die, because I've spent so much money on protective weapons.

And police have forgotten to treat their communities as customers, as sons and daughters, as brothers and sisters, as parents.

In doing so, I lost my balance.

I'm so proud of my profession that it's hard for me to look back and see my mistakes.

It's harder to change

In order to get over this issue quickly, I have to say, "Not just in my role as law enforcement.

Each one of us is a member of our community

We are building a community together.”

From a Community Perspective – Can you say that? - We put too much emphasis on the responsibility of law enforcement.

too much

(Applause) On the other hand, when it comes to exercising power, they have the impudence and the courage to resent law enforcement.

It's absolutely outrageous to call a child in your community because they're throwing a ball in the street.

It's not something you should call the police on. Calling someone because your neighbor's music is loud or because your dog pooped in your yard is ridiculous.

the police handed over a lot of responsibility

When I was a boy in Baltimore, when I got into a fight in the street, the police didn't come and stop me.

Who came? I am old

Presence as a parent in the community

There was a guardian role, and that was the idea of ​​the village community.

They came and said, "Stop," or "Do this."

Every community had leaders.

everyone followed that idea

When I talk about community, I mean everything that makes up a community. And because I'm a pastor, I'm very critical of churches, because I think a lot of churches are MIA -- they're missing.

I think I've changed over the last 10, 20 years from leaving my house and walking a short distance to my local church.

It's changed from being a local church to being a regular church.

Churches, by doing nothing, are cut off from the communities in which they are supposed to be rooted.

And I stopped caring about the region.

I'd love to talk to you more, but I have to wrap things up.

We've lost everything that's precious to the community and to the maintenance of public order, what I call the relationship asset.

lost among each other

It's no one else's fault, it's our fault

we are responsible for this

But it's never too late to make our town and country good again.

it's never too late

In my four-and-a-half-year tenure as chief, three years later, I put a pastor in a patrol car, and three years later, a little secret, I knew what would happen is that when you patrol with a clergyman, it's hard to stay the cop you hate.

(Laughter) (Applause) When you leave the police car and come back, look at the passenger seat and say, "Pastor, please forgive my sins." I can't do this all day!

So I came up with something ingenious and cool: community and police making promises to build trust.

Started with young people and people who are likely to go down the wrong path Started with young people and people who are likely to go down the wrong path

We also had economic problems, so we started creating jobs.

We knew that the disease was spreading in our community and that we didn't have adequate medical care, so we partnered up.

We went to that crossroads and we partnered with people who wanted to work with us, never thinking about crime, and as a whole, we talked about what we needed.

At the end of the day, if you've addressed people's needs, and you've got to the root cause, then naturally you're going to fight crime.

It will naturally act as a countermeasure against crime.

(Applause) After three years in my four-and-a-half-year tenure, I looked back and found that crime and murder were at their lowest in 40 years, and everything was back to what it was in the 1970s.

It could go back even further, but unfortunately we only started storing data in 1970.

It's the lowest it's been in 40 years, so another chief called me, 'Mel, what have you done?

I have to do that here too! ”

(Laughter) And I taught you a few things.

In a short period of time, the city of Baltimore has the lowest crime rate in 30 years.

For the first time in 30 years, murders have fallen below 200 -- 197 to be exact.

I was able to celebrate it because I learned to be a great minister, and I was a great minister for the first time.

But there's something I have to tell you. I've learned everything I can in the last few years about how to be a proactive, community-connected police officer without falling behind.

It was a terrible shock

riots still hurt me

It still hurts me because I truly believe that the riots should not have happened.

I am deeply convinced that this should not have happened, if we were to serve our communities, to treat them as human beings, to treat them with respect, to love them first -

If we act like we used to, there will never be riots again.

But I managed to get back to business as usual.

i am motivated again

What motivates me again is that the Chief of Police doesn't just talk about policing his community, he completely understands it, and more importantly, he's willing to accept it.

so i'm very excited now

I have high hopes for Baltimore today, because I believe that, like many cities, it can be rebuilt from the ashes.

I truly believe (Applause) We can go back to being great.

I believe that we stand shoulder to shoulder and keep saying, "We're here together."

America will be great again

Because we all have the same goal, we all want peace—

Respect each other—

because i'm looking for love

I believe I'm on that path, and that's why I'm so excited.

Thank you for your valuable time.

God bless you all

(Applause) God bless you.

(applause)

In 479 B.C., when ancient Persian soldiers attacked the Greek city of Potidaea, the tide receded farther than usual, creating a perfect avenue for the invasion.

But this wasn't so lucky

Before the soldiers had even made it halfway, a wave like no one had ever seen rushed in and drowned them.

The Botidaeans believed they were saved by Poseidon's wrath.

But what really saved them was the phenomenon that has claimed countless lives: the tsunami.

Tsunamis are commonly thought of as tidal waves, but in reality they are not related to tidal forces and are not caused by the gravitational pull of the sun or moon.

In many ways, the tsunami

It's a larger version of a normal wave. It has valleys and peaks. It's not the flow of water itself, but the flow of energy that travels through the water.

The difference is where the energy is generated.

Normal waves are caused by the wind

Because the wind only affects the surface, it limits the size and speed of waves.

But a tsunami's energy comes from underwater, from volcanic eruptions, submarine landslides, and more generally from submarine earthquakes, when tectonic plates on the Earth's surface shift, releasing enormous amounts of energy into the water.

This energy reaches the surface of the water, displacing it above normal sea level, but gravity tries to pull it back, causing the ripples of energy to flip horizontally.

This is how tsunamis are born, and they travel at speeds of over 800 kilometers per hour.

Tsunamis that occur far from the coast are almost never detected because they travel deep in the water.

But when it reaches shallow water, shallow water deformation occurs.

Because there's no water to move, this huge energy is compressed.

The waves will slow down, but they will be over 30 meters high.

The word tsunami comes from the Japanese word for 'Irie no Wave', which means that it appears near the coast.

It comes from the fact that when a tsunami hits the coast, before it hits the coast, it's going to be much more ebb than normal, and this is misleading and very dangerous.

Tsunamis not only kill people near the coast, but they also knock down flat buildings and trees as far as two kilometers away, especially in low-lying areas.

As if that wasn't enough, when the water recedes, it sweeps away the debris created by the tsunami, as well as objects and people in its path.

The 2004 Indian Ocean Tsunami was one of the worst natural disasters in history, claiming more than 200,000 lives in South Asia.

How can we protect ourselves from the destructive forces of nature?

In some areas, people built seawalls, weirs, and diversion channels to stop tsunamis.

but it's not safe

In 2011, a tsunami over the embankment hit Japan's Fukushima nuclear power plant, causing a nuclear disaster that claimed 18,000 lives.

For early detection, many scientists and politicians are looking to monitor underwater pressure and seismic activity and issue rapid warnings through global communication networks.

When you can't stop the forces of nature, it's safe to stay out of its path.

Various studies have shown that taking vitamins is good or bad for your health.

Newly discovered herbs can improve memory, affect the liver, and more—

Articles about promising new cancer treatments come and go.

Almost every day there is a lot of interesting news about "scientific research" There is a lot of interesting news about "scientific research" But what is research?

How is it done?

How do you know it's a credible study?

When it comes to dietary and medical information, the first thing to remember is that research on animals and individual cells only points the way to further research, and human trials are the only way to know what's going on in humans.

When it comes to clinical trials, the scientific gold standard is the randomized controlled trial (RCT).

The whole point of RCTs is to randomly assign study participants to groups.

more strictly blind

The reason we do this is that we want the only difference between the groups to be what we want to study.

For example, in a test of a new headache drug, we randomly divide a large number of people with headaches into two groups, one receiving the drug and the other a placebo.

If it's well randomized, the only meaningful difference between groups is whether the drug was administered or not, and no other factors can influence it.

Randomized clinical trials are a great way to go, and in fact, the U.S. Food and Drug Administration often requires at least two RCTs before a new drug goes on the market.

The problem is that in many cases RCTs can't be done.

In those cases, we do epidemiological studies, where subjects are observed in their normal behavior, rather than recruited and randomized into pre-determined groups.

Suppose you want to find out if over-the-counter herbs cause nausea Suppose you want to find out if over-the-counter herbs cause nausea Suppose you want to find out if over-the-counter herbs cause nausea

Instead of deliberately administering something that can cause nausea, we're gathering people who regularly take it.

This group is called a "cohort"

A comparison group that did not receive the ingredient of interest is also required

and make a statistical comparison

A higher frequency of nausea in the herbal cohort suggests a relationship between the supplement and nausea.

Epidemiological studies are a great way to study most things that affect health without directly interfering with people's lives and without potentially dangerous exposures.

So why can't we, based on these studies, establish causal relationships between ingredients and health effects?

Unfortunately, epidemiological research methods, even when done well, have inherent flaws.

The problem is that test subjects are not randomly selected.

For example, in an herbal study, if the cohort were all people taking supplements for their health, and they were all taking supplements for their health, they might already have a higher nausea frequency than the control group.

Or maybe a cohort group uses health food stores and is blessed with special diets and medical services.

These factors that can affect the results in addition to the factors of interest are called confounding variables.

These two big pitfalls, along with common dangers like conflicts of interest and selective use of data, make the results of epidemiological studies questionable. A good epidemiological study must show that it has taken steps to eliminate such errors.

But even when this is done carefully, the very nature of epidemiological studies is that they only look at differences between groups that have already taken them, and not intentionally differentiated in homogenous subjects, so a single study can only show a correlation between a substance and health, not a true cause-and-effect relationship.

But in the end, epidemiological studies have given us a good guide to people's health, and they've given us a warning against tobacco, asbestos, lead, and many other deadly health hazards.

These conclusions were drawn from several well-conducted epidemiological studies, all of which were in the same direction.

So next time you see a news headline about "New Miraculous Cure," or "The Most Dangerous Substances Around Us," look at the research that underpins it, remember the limitations of epidemiological studies and clinical trials, and don't jump to conclusions.

It was a night like any other, except that we climbed here as if to reach spiritual heights, but it was like Romeo's second date.

(Oh) I went there for that lady

She had imaginary eyes and endless curves

I hear in my heart she wants to go home

I'm sure I can help

and a wonderful reward awaits

But to climb a mountain...

Voice owner: Sokoni Irunoha

I'm Manny Blott, a private investigator.

Kokode What are you doing?

The master of beautiful numbers asked me to find something stolen.

Enter the Kono cave Luniha 3 horns Mystery 2 Answer Enakerebanaranai

What kind of riddle Why is it always three?

"Is there a problem with the egg?"

“Is that what you want?”

"Because it's always like that."

“What is it?”

"A dodo egg?"

"Egg dehanai!"

I took out the stone that nearly crushed my head earlier and thought desperately

From the bump on his head, I imagined that this guy has an area.

But what if we cut a triangle out of this?

Any idiot would know that this is a quarter of the original triangle.

Do the same with the remaining small triangle.

Then the area is reduced by a quarter again.

Continuing with this

After an infinite number of iterations, a triangle with a vanishing area is created as desired.

There is a boundary, but the area is zero

I don't always do this great thing But my hands made something strange and new

"Good idea (ahem) Deha, the area is finite, the perimeter is saga, and the infinite things are shown."

"I'll give you a straight answer

If you cut part of the perimeter of the figure and stretch it straight..." "Docome.."

It just goes on forever.”

"The story is over Wattaka"

"ah"

"Look at the Deha figure, Setemiro"

Hmmm, I haven't had this much trouble since 1958 when I messed up on a Rubik's Cube.

Anything has a circumference

Circle: 2πr Triangle: sum of side lengths

what is this?

angular shape

it's a blessing from heaven

What happens when you pinch each side like this?

If you do all three sides, it will look like this

try again try again

Each time you pinch it, the circumference lengthens by one-third, because each side that was divided into three becomes four.

As for area, yes, each pinch creates a triangle.

getting smaller and smaller

And while the area of ​​the figure as a whole approaches a certain value, the perimeter just keeps getting bigger, and it's like an unstoppable birthday frenzy.

If you keep pinching it endlessly and play around with it, you'll see that there's a finite area and an infinite perimeter

It's done

"Well done, (ahem) Question 3: I used a microscope to magnify the figure.

"You're a bit of a weirdo"

"Sourashiina"

When I was running out of ideas, I looked at my goddess, complex Dora.

"Who is Sono woman?"

I flashed at that time

"The woman who cuts my heart, she's a fractal fairy.

Is she the answer?"

"Souda, she's right."

(Flash) It was dark There at first I thought the cave was empty But after a while I noticed a box

she treated me like a triangle

she should have said she wanted to go home

(Flash) I really wanted to make this place my home.

fractals are scattered

No matter how far you look inside, it looks almost the same No matter how far you look inside, it looks almost the same It's like a portrait of Dora

Objects with infinite perimeter, objects without area or volume, are all made up of infinite repetitions.

You wanted to know what a fractal was, right?

Look boy, that's what dreams are made of

(music)

Light: You can measure the speed of even the fastest thing in the world. By slowing down the animation, you can analyze the movement of light in a space-time diagram.

In this lesson, we'll also consider an empirical fact: the speed of light is a constant value of 299,792,458 meters per second, regardless of who measures it at any given time.

But as we learned last time, velocities -- the angles that the world lines make -- have different values ​​depending on the point of view of the viewer.

To understand this paradox, let's see what happens when I start moving, I don't move, and I shoot a laser at Tom.

First, let's draw a space-time diagram.

To do that, we stack each panel at a different time.

When you look at it from here, the worldlines of the laser light are at exactly the right angle, just like you saw earlier.

So far so good

But this is a space-time map from Andrew's point of view.

What would it look like from my point of view?

In the last lesson, to get Tom's point of view, we shifted the panel so that his world line was vertical.

But look at the world line of light

Adjusting the position of the panel increases the slope

That's faster than Andrew's speed of light.

But no matter how many times you measure it, no matter how precise you measure it, no matter who does it, the speed of light has always been constant.

let's start over

In the 1900s, the genius Albert Einstein succeeded in correcting Tom's point of view while keeping the speed of light constant.

First of all, we glue the disjointed panels together to make a block.

This makes space and time in space-time one smooth, continuous thing.

and here is the miso

Stretch the space-time block along the world line of light, then squash it by the same amount in a direction perpendicular to the world line of light Abracadabra!

Tom's worldlines are now vertical, the world from his point of view. Now, the most important thing is that the angle between the worldlines of light doesn't change, so Tom's measurements of the speed of light are correct.

This neat trick is known as the "Lorentz transformation."

not only that

Space-time again -- breaking it down into panels gives us a physically correct animation.

I sit still in my car, and other things come closer and pass me, and the speed of light is exactly that constant, which should be the same no matter who measures it.

However, something strange happens

The fence posts are no longer one meter apart, and if my mother sees it, she'll worry I'm skinny.

That's cunning Why can't I lose weight too?

I thought the laws of physics were the same for everyone I thought the laws of physics were the same for everyone

yes, but you look skinny too

To stretch and contract space-time together merges space and time, which we thought were separate things, merges space and time.

This phenomenon in which an object appears to shrink is called "Lorentz contraction".

But I don't look skinny

yes but you look skinny

Now that I have a better understanding of space-time, I'm going to redraw the world as I see it.

From your point of view, I am Lorentzian contraction.

But from your point of view, I have more Lorentzian contraction.

that's right

I'd say it's fair

And speaking of fairness, not only does space distort with time, but time distorts with space, an effect known as time dilation.

But at speeds in everyday life, like Tom's car speed, these effects are very, very small compared to what you're seeing here.

But careful experiments -- for example, observing the behavior of particles in the Large Hadron Collider -- have confirmed that these effects do exist.

The concept of space-time has been confirmed experimentally as a real phenomenon.

What if we started thinking in terms of matter in space and time?

I will explain this in the next animation.

We like to think of romantic feelings as something that comes naturally from the heart and cannot be expressed in theory.

But the truth is, your brain performs complex calculations in seconds that determine whether or not you're attractive.

Not very poetic, is it?

But just because you're doing the math in your brain, it doesn't mean that all those warm, vague emotions are just in your head.

In fact, all five of your senses play a role. They decide whether you're attractive or not.

Eyes are the first element of attraction

In many cases, standards of visual beauty vary across cultures and over time, but symbols of youth, fertility, and health -- long, shiny hair, smooth, flawless skin, for example -- are almost always very popular because they are associated with reproductive fitness.

And when our eyes catch something we like, we instinctively move closer to it and our other senses explore it.

The nose's contribution to love is much more than recognizing perfumes and colognes.

The nose picks up natural chemical signals, which are pheromones.

Pheromones not only carry important physical and genetic information in the person emitting them, but they also activate physiological or behavioral responses in the recipient.

In one study, women in different ovulatory cycles wore the same T-shirt for three nights.

After male volunteers were randomly assigned to smell either the worn shirt or a new shirt, an increase in testosterone was detected in the saliva samples of the men who smelled the shirt worn by the ovulating woman.

That kind of testosterone boost pushes men to seek out women, otherwise he might not have noticed.

Women's noses are particularly sensitive to MHC molecules, which are disease-fighting substances.

In this case, I am attracted to the opposite type.

In one study, women were asked to smell T-shirts worn by different men, and the odors they preferred were those of men whose MHC molecules differed from their own.

this is easy to understand

Genes that lead to having a diverse immune system will increase the chances of offspring survival.

Our ears also determine attractiveness

Men like women's high, breathy voices and voices with wide formant intervals, characteristics associated with their small body size.

Females, on the other hand, prefer voices with lower, narrower formant intervals, which means a larger body size.

And, not surprisingly, touch is a crucial element in love.

In this experiment, without being informed that the study had started, participants were asked to pick up a cup of coffee for a short time, either hot or iced.

Participants then read a story, which was about a fictional character, and were asked to rate the character's character.

Participants with hot coffee perceived the person as happier, more outgoing, open-minded, and good-natured, whereas those with iced coffee rated the person as cold, stoic, and unsympathetic.

If a potential couple manages to pass all of these tests, there's still one more: the infamous first kiss, a rich and complex exchange of tactile and chemical signals, like the smell of one's breath and the taste of each other's mouths.

This mystical moment is so important that many men and women report losing their attraction to their partner after a terrible first kiss.

Once the attraction is confirmed, norepinephrine increases in a person's blood, activating the person's "fight or flight system."

Your heart is beating faster, your pupils are dilating, your body is releasing glucose for energy, and it's not because you're in danger.

To help you focus, norepinephrine creates a kind of visual field constriction that blocks out distractions, disrupts your sense of time, and even enhances your memory.

That's why people don't forget their first kiss

Our ideas about attraction are influenced by chemicals and evolutionary biology, but they're more heartless and scientific than romantic. But the next time you find someone you like, feel how your body plays the role of the matchmaker to determine if the "beautiful stranger" is the right person for you.

When you hear the word symmetry, you may think of geometric figures, like squares and triangles, or even the pattern of a butterfly's wings.

If you have an artistic flair, you might think of the subtle rhythms of a Mozart concerto or the pose of a prima ballerina.

In everyday life, the word symmetry refers to vague concepts like beauty, harmony, and balance.

But mathematics and science have a different and clearer meaning.

Technically speaking, symmetry is a property that objects have.

So many things have symmetry, something with a clear shape like a butterfly, or something abstract like a geometric figure.

So what does it mean for an object to have symmetry?

Here's the definition: symmetry is a transformation that doesn't change the object

It's a little abstract, so let's take a look at it

For example, when you look at this equilateral triangle, symmetry helps.

Now turn it 120 degrees around the axis that goes through the middle, and you'll end up with the exact same triangle you started with.

At this time, the triangle is the object I mentioned earlier, and the transformation that doesn't change the object is a rotation of 120 degrees.

So an equilateral triangle is said to have symmetry when rotated 120 degrees about its central axis.

If you rotate it 90 degrees, you'll end up with a different triangle than you started with.

In this case, the equilateral triangle is not symmetrical when rotated 90 degrees about the central axis.

But why are mathematicians and scientists interested in symmetry?

Because symmetry is very important in mathematics and science.

Let me give you an example: symmetry in biology.

You may have noticed that there is symmetry closer to you, which I haven't talked about yet, is the left-right symmetry of the human body.

The transformation that obtains symmetry here is called reflection, and we imagine a mirror passing through the body vertically.

biologists call this symmetry

Like the symmetry in all living things, it's not perfect symmetry, but it's a distinguishing feature of the human body.

Humans are not the only symmetrical creatures

Many other animals, such as foxes, sharks, beetles, even the butterflies we just saw, have symmetry like humans, and even flowers like orchids.

And other organisms have different symmetries, which is most evident when you rotate them around their center point.

It's like the rotational symmetry of the equilateral triangle we saw earlier.

But when rotational symmetry is found in animals, this is also called radial symmetry.

Some sea urchins and starfish, for example, have pentaradial symmetry.

You can see this in plants, if you cut an apple horizontally, you'll see it.

If you rotate it 90 degrees, you have a jellyfish that is symmetrical, and an anemone is always symmetrical no matter how you rotate it.

Corals, on the other hand, have no symmetry at all.

it's completely asymmetrical

But why do organisms have such different symmetries?

Can you tell the life of an animal by looking at its body symmetry?

Let's take one group as an example: symmetrical animals.

Here we are now with foxes, beetles, sharks, butterflies and, of course, humans.

What all bilaterally symmetrical animals have in common is that their bodies are built around mobility.

When you want to go in a certain direction, it's convenient to have a fixed front side of your body, so you can concentrate your sensory organs there: your eyes, ears, and nose.

It's convenient to have a mouth there too. Food is found on the front side of the body, and enemies are easy to find.

These organs and mouths are on the front of the animal's body, and you know what they're called.

head

By having a head, it becomes symmetrical

In addition, streamlined fins for fish, aerodynamic wings for birds, and running legs for foxes are helpful.

But what does this have to do with evolution

Apparently, biologists can use these symmetries to find relationships between animals.

For example, I said that starfish and sea urchins have five radial symmetry.

More precisely, adult starfish and sea urchins have five radial symmetry.

In the larval stage, they are symmetrical like humans.

For biologists, this is compelling evidence that humans are more biologically related to starfish than, say, corals or other animals that lack developmental symmetry.

One of the most wonderful and important problems in biology is to reconstruct the genealogy of organisms, to find out when and how they branched off.

Thinking about something as simple as body symmetry can help us explore how we evolved and understand where we humans came from.

Welcome to Baku. The river community of Ikorodu Lagos is Nigeria's leading river community, but aquatic plants have encroached on the waterways and infested them, disrupting economic activity for years: fishing, maritime transport and trade. Fish yields are declining and children are out of school for days, sometimes weeks.

Who would have thought that this plant, with its round leaves, thick stems and bright lavender flowers, would wreak such havoc on a community?

Known as water hyacinth, the scientific name for this plant is Iconia crassipus.

Interestingly, in Nigeria, it is also known by other names, which derive their names from historical events and myths.

In some places this plant is called "babangida"

The word babangida reminds me of an army or a military coup.

associated with fear and restraint

In the Nigerian region of the Niger Delta, this is also known as "aviola."

The word aviola reminds us of invalid elections and of dashed hopes.

In the southwestern part of Nigeria, this is known as "vebulun."

In the Yoruba language, it means someone who spreads gossip and bad rumors.

When you think of gossip, you think of rapid dissemination and destruction.

In the Igala-speaking parts of Nigeria, the plant is known as 'Api poma', a name associated with death.

Literally translated, this means "reaper to mother and child."

I first encountered this plant in 2009.

It was just after I moved from America to Nigeria.

I quit my job at an American company and decided to believe in this big decision, a bet out of a deep conviction that much could be done here for the sustainable development of Nigeria.

And I was in 2009, actually at the end of 2009, in Lagos, on a long bridge over an island.

When I looked to my left, a certain landscape caught my eye.

A fishing boat was surrounded by water hyacinths.

It broke my heart, because I thought, "How are these poor fishermen going about their lives under these constraints?"

Then I thought, "There must be a better way."

There must be a win-win solution that removes the weeds to improve the environment, and that the communities whose livelihoods have been most impacted by the infestation of the weeds can benefit economically from the weeds.

It was a real epiphany moment

And I continued my research to find a beneficial use for this aquatic plant.

Out of several ideas, one brilliant idea came to mind

It was to use aquatic plants for handicrafts.

"Great idea," I thought.

Because I love handicrafts, especially woven crafts that have a story.

I thought, "This is something we can easily create in this community without any technical skills."

My next thought was, "Three easy steps to a mega-solution."

Step 1: Go to the waterway and harvest the water hyacinth

Now you can secure your traffic.

Step 2: Dry the water hyacinth stems

Step 3: Knit the water hyacinth to make a product

Step 3 was difficult and rewarding

I'm a computer scientist by background, not a creative artist.

So I started looking for ways to learn how to knit.

I visited a community called Sabo in Ibadan where I lived.

Sabo means "home of strangers"

And most of this community was made up of people from the North.

I literally had a handful of dried waterweeds and knocked door after door looking for people in the community who could show me how to weave water hyacinth stalks into rope.

And finally, we arrived at Marami Yaya's hut.

The problem was that he didn't speak English and I didn't speak Hausa.

But little children came to my aid and helped me translate.

This was the beginning of my journey, learning how to weave and how to turn dried water hyacinth stalks into long ropes.

Now that I had a long rope, I was ready to make a product.

That was the beginning of the partnership

Created in collaboration with a palm basket manufacturer

This experience gave me confidence that I could bring this knowledge back to river communities and help them turn adversity into success.

We harvested aquatic plants and knitted them into products that we could actually sell.

Now we have pens, table supplies, wallets, and tissue boxes as products.

As a result, the community is now able to see water hyacinth from a different angle.

Water hyacinth is considered valuable, beautiful, tolerant, strong and resilient.

change your name change your life

From "Bevrun" or Gossip to "Orsteran" or Storyteller

And from 'Api Poma', which means death to mother and child, to 'Ya Durjun Wi Poma', which means 'provider of food for mother and child'.

I would like to end by quoting Michael Margolis.

If you want to learn about culture, listen to stories

If you want to change the culture, change the story

From the Makoko community to Aboviri to Eboi to Kuhar to Owawa to Esaba we changed the story.

Thank you for your attention

(applause)

For most of history, humans simply failed to understand the role of the heart.

Even Da Vinci gave up on studying because of the incomprehensibility of the heart.

Everyone could feel their own heartbeat, but it wasn't clear what each beat was doing.

Now we know that the heart pumps blood,

That fact wasn't always obvious, because if the heart were to be exposed or taken out, the body would perish very quickly.

You also can't see through your blood vessels, and even if you could, it would be very difficult to see the movement of the heart's valves because the blood is opaque.

Even in the 21st century, only a few people on surgical teams have actually seen a heart in action.

If you search the Internet for how the heart works, you'll find crude models, diagrams, and animations that aren't drawn correctly.

It's as if the idea of ​​accepting that it's impossible to learn how the heart works has been going on between teachers and students for hundreds of years.

The next thing you can do is simply open up the heart and give each part a name.

You may never fully understand how the heart works, but you can get a superficial understanding of it, and you can learn that the heart has four compartments, and so on.

In fact, mammalian bodies have a figure eight-shaped blood circulation system.

Blood is pumped from one pump in the heart to the lungs, back to the second pump, pumped throughout the body, and back to the first pump.

That's the key difference. The two are completely different structures.

This obscurity makes many students cautious when learning about the heart in biology, thinking it's a difficult topic full of complicated names and diagrams.

Ultimately, only those who study medicine will fully understand how the heart works.

Medical students can get a clearer understanding of how heart valves work by observing them.

Now imagine you're a medical student today.

The first thing you need is a freshly removed heart, preferably a sheep's or a pig's heart.

Try submerging the heart in water, and you'll see that when you hold the heart in your hand, it doesn't pump out water.

This is because water doesn't get into the heart as well as the heart pumps.

This can be solved in a surprisingly simple way.

What you have to do is find the two atria, cut them off, and cut them all the way to the top of the ventricles.

Now you can see the heart a little better, because the atria have several veins.

Once those vessels are gone, there are only two vital arteries left: the aorta and the pulmonary artery. These arteries extend like columns from between the two ventricles.

It looks and works very simple

Try running tap water into the right ventricle (the left ventricle is fine, but it's not as effective as the right ventricle) and you'll see the ventricular valves try to close against the incoming flow of water.

Ventricles filled with water will eventually expand

Squeeze it in your hand and the water will rush out of your pulmonary artery.

The right ventricular valve is called the tricuspid valve, and the left ventricular valve is called the mitral valve. If you look through clear water, you'll see these valves open and close like parachutes when the ventricles are squeezed in a steady rhythm.

This flow resembles the flow of real blood

The effect of these valves is outstanding

You'll notice that no water escapes when the ventricle is squeezed.

Over time, it stays closed with virtually no wear and tear, and that's why the heart is able to beat non-stop, more than two billion times in its lifetime.

If you study the heart, you can actually hold the heart in your hand and try to move it and see how it works.

Put your hand on your heart and feel the rhythmic beating of your heart.

When you understand how this trusty pump works inside your body, the excitement you feel when you're competing in a race, drinking lots of caffeine, or making eye contact with that girl, will make more sense.

Let's say you have 10 minutes to solve this puzzle.

How long would it take if you were to do it while receiving a constant electric shock to your hand?

longer, right?

because the pain distracts them from the task

No, maybe not, it depends on how you deal with pain.

Some people are distracted by pain

They take longer to complete assignments and their grades drop.

Some people use tasks to distract themselves from pain, and they complete tasks faster and perform better when they have pain than when they don't.

Some people distract themselves from pain by letting their mind wander.

How do people exposed to exactly the same painful stimuli experience pain in such different ways?

And why is this important?

What is pain in the first place?

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage.

Because pain is something we experience, the best way to measure it is by self-reporting.

Pain has an intensity and can be measured on a scale from 0 (no pain) to 10 (worst pain imaginable).

But each pain has its own characteristics: sharp pain, dull pain, burning pain, aching pain.

What exactly is it that creates this perception of pain?

When a person is injured, specialized nerve cells called "nociceptors" that sense damage fire and send signals down the spinal cord that reach the brain.

Cells like neurons and glia do the processing work.

This is the gray matter of the brain

And the brain highways send the information as electrical signals from area to area.

this is the white matter of the brain

The highway that carries pain from the spinal cord to the brain is the sensory pathway that leads to the cerebral cortex, the part of the brain that determines how pain signals are processed.

Another system, called the saliency network, is a system of interconnected brain cells that decides what to pay attention to.

Because pain can have serious consequences, pain signals instantly activate saliency networks.

now you pay attention to the pain

In addition, the brain has to react to pain and deal with it.

So the motor pathway is activated, and it makes you, for example, withdraw your hand from a hot stove.

It also activates regulatory networks, which are the mechanisms that transport chemicals like endorphins and enkephalins that are released during pain and during strenuous exercise to produce a runner's high.

This chemical system helps regulate and reduce pain.

These networks and pathways work together to create the person's experience of pain, prevent further tissue damage, and help the person cope with pain.

This system is universal for everyone, but the sensitivity and efficiency of this brain circuit determines how much pain a person feels and how he or she responds to it.

That's why some people feel more pain than others, and some people report chronic pain that responds poorly to treatments that others respond well to.

The magnitude of the difference in pain sensitivity is not that different from that of other stimuli.

It's like some people like roller coasters and some people get really sick from motion sickness.

Why does individual variability in the sensitivity of the brain's pain circuitry matter?

There are many treatments for pain that target different systems.

For mild pain, even over-the-counter drugs can act on the cells that initiate the pain signal.

Stronger pain relievers and anesthetics either reduce the activity of the pain-sensing circuits or enhance the effects of the coping system, the endorphins.

Some people can manage their pain by distracting it with something else or by learning some strategy, such as relaxation, meditation, yoga, or cognitive-behavioral therapy.

For people with severe chronic pain, people who have been healed for months and still have pain, the usual treatments don't work.

Traditionally, medicine tests the effects of treatments on large populations to determine what will benefit the majority of patients.

People who didn't benefit from the treatment or had side effects were left out.

New therapies have now been developed that use tools such as magnetic resonance imaging to map the brain's conduction pathways, tailor treatments to individual patients, and stimulate or block specific pain-sensing attentional and regulatory networks.

Knowing how your brain responds to pain is the key to finding the best treatment for you.

This is true personalized medicine.

how do you know what is happening in the world

There's an infinite amount of information available at the click of a button, but the time and energy required to understand and evaluate the content is not infinite.

Unless you know how to decipher the news, the world's flood of information isn't very useful.

This idea would have been unfamiliar to grandparents, parents, or even older siblings.

Just a few decades ago, the news was universally accepted by many.

The options were limited to a few popular magazines, authoritative newspapers, and three or four television networks with trusted newscasters reporting the daily news at the exact same time each night.

But as mass media became more popular, the problems with this system quickly became apparent.

While authoritarian states controlled and censored information, democracies also colluded with the media to mislead the public, as a series of scandals show.

Revelations of covert wars, assassinations, and political corruption have eroded public confidence in official news provided by mainstream sources.

Against this backdrop of this erosion of trust in the media, alternative newspapers and radio and cable news emerged that competed with the mainstream media and offered multiple perspectives on events.

And more recently, the Internet, with social media, blogs, online videos, and so on, has doubled the amount of information, offering a variety of perspectives, and every citizen can become a reporter.

But then there's the lack of real reporters, and there might be different sources of information that differ not only in their opinions, but in fact as well.

So how can we get the truth or something close to the truth?

The best way is to get the original news unfiltered by intermediaries.

Instead of reading articles describing scientific studies and politicians' speeches, find the actual material and judge for yourself.

Follow reporters on social media for current events

During major events such as the Arab Spring and Ukraine protests, newscasters and bloggers update stories and write records out of the chaos.

Many of these are later published in newspapers or broadcast on television, but remember that these are compilations of the ideas of people who were there and editors who weren't there.

At the same time, the more complicated the story, the less you should be chasing information in real time.

During events such as terrorist attacks and natural disasters, today's media continues to report even when there is no credible new information, sometimes misrepresenting or exposing innocent people to blame.

Incidents like this can be disturbing, but rather than checking the news every few minutes, try to get an update several times during the day, so that the time will give you a detailed picture, and you'll know that the misrepresentation is not the truth.

Good journalism strives for objectivity, but media bias is often inevitable.

When you can't hear directly from the source, get information from different channels with different reporters and different experts.

If you can get information from different sources and notice discrepancies with the facts, you can paint a more complete picture.

It's also important to separate fact from opinion

When you see words like "I think," "maybe," and "probably," you have to be careful with what's being reported, or you'll end up believing the speculation.

Also, be wary of reporting that relies on anonymous sources.

These could be people who had little to do with the incident, or people who were amused by the public reaction, and the anonymity makes it so far from the truth that it makes no sense.

Finally, and most importantly, before you disseminate information, you should check its authenticity.

Social media brings us the truth quickly, but it also spreads rumors before they can be verified, and false information persists long after it's proven wrong.

So before you share some incredible and outlandish news, go to the web and find out any additional information, events, or even other people's opinions you may have overlooked.

Today, we are less subject to the old-fashioned media controls that control the flow of information, and we have more freedom.

But with freedom comes responsibility, a responsibility to ensure that this flow of information doesn't become a flood, in the light of my own experience, so that I can stay away from the information without setting foot in it.

There are several advantages to switching all power generation to solar power generation.

It's often cheaper to produce electricity, and it's clearly more sustainable than traditional power generation, which requires natural resources like coal that will eventually run out.

So why aren't we replacing our existing power plants with solar power?

That's because there's one factor that makes solar power unsustainable: cloud shielding.

When the sun's light hits the earth, some of it is absorbed by the earth's atmosphere, some is reflected back into space, and the rest reaches the surface of the earth.

The sunlight that reaches the surface of the earth is called direct solar radiation.

Sunlight that is blocked by clouds is called scattered solar radiation.

The light that reaches the photovoltaic system after being reflected off buildings is called reflected solar radiation.

Before we look at how clouds can affect sunlight and power generation, let's look at how solar power works.

The first type is the solar tower.

It's made up of a central tower and a bunch of mirrors all around it that track the sun and focus the direct rays of the sun to a single point on the tower, like someone who loves the ocean.

The heat produced from the sun's rays is so great that it can boil water, turn it into steam, and spin a turbine to produce electricity.

But when we talk about solar power, we usually mean power generated by solar panels. We usually mean power generated by solar panels.

In a solar panel, photons of sunlight hit the panel, releasing electrons and creating an electric current.

Solar panels can use all kinds of sunlight, but solar towers can only use direct sunlight, and clouds are a key factor here.

With just a few cumulus clouds in front of the sun, the power generated by a solar tower can be almost zero because it comes from direct solar radiation.

Solar panels produce less power, but not as much because they can use all types of solar energy.

In either method, it's important where the clouds are.

Through reflection, or specifically called Mie scattering, the sun's light is collected by clouds and can increase the amount of solar energy reaching the solar panel by more than 50 percent.

If you don't account for this increment, you might destroy the solar panel.

why is it a problem

It would be a shame if the clouds just passed over the roof panels and you couldn't see this class.

Solar towers are giant tanks of molten salt or oil that allow you to store excess heat and use it when you need it.

But in the case of solar panels, we haven't yet found an economical way to store excess solar energy.

Conventional power plants are still needed here, because they need to be able to make up for the shortfall in power with conventional power generation at any time to reduce fluctuations from solar power.

So why can't we just use a conventional power plant as a reserve rather than as a primary source of energy?

That's because workers at thermal and nuclear power plants can't turn a knob to control the amount of power they generate based on the amount of cloud in the sky.

response time is too slow

Instead, there should always be some power produced by conventional power plants to cover the fluctuations in solar power.

On a sunny day, the spare power may be wasted, but when the sky gets cloudy, the power will make up for the shortfall.

That's how we do it now to ensure that we always have a certain amount of power.

It's for this reason that many researchers use satellite photographs and sky cameras to predict cloud movement and development in order to maximize the production of solar power plants and minimize energy waste.

If we can do this, we can enjoy this video in any weather, using only solar power.

I'm an underwater explorer, specifically a cave diver.

When I was a little girl, I wanted to be an astronaut, but it was practically impossible for a Canadian girl.

But it turns out that we know a lot more about space than about the underground waterways that are the lifeblood of Mother Earth.

So I decided to do something even more amazing.

Instead of space, I wanted to explore the wonders of the Earth's interior.

Many people say that cave diving is probably one of the most dangerous activities.

Imagine yourself in this room, suddenly plunged into darkness, tasked with finding your way out, sometimes swimming across open spaces, sometimes crawling under chairs, following thin guidelines, waiting for life support to give you another breath.

that's my workplace

What I want to teach you today is that the earth is not one big solid rock.

more like a sponge

I can swim through the many holes in the Earth's sponge, but where I can't go, other life forms and matter travel without me.

I'm going to teach you about the interior of Mother Earth.

When I decided to be the first man to dive inside an Antarctic iceberg, I didn't have a guidebook.

In 2000, this was the largest moving object on Earth.

It's a breakaway from the Ross Ice Shelf, and we dived to explore the ice edge ecosystem and look for life beneath the ice.

we use a technology called a rebreather

It's very similar to the technology used for spacewalks.

This technology has allowed us to dive deeper than we could have imagined 10 years ago.

We can even do 20 hour missions under water with special gases.

I work with biologists

The cave turned out to be a treasure trove of amazing creatures and previously unknown species.

Many of these organisms live in unique ways.

They often have no pigment or eyes, and they live very long lives.

In fact, the animals that swim in caves today are the exact same species that survived as fossils of dinosaurs before they went extinct.

So imagine these are little swimming dinosaurs.

What can they tell us about evolution and survival?

For example, animals like the centipede shrimp that swim in this bottle have large venomous fangs.

It can attack and kill anything 40 times its size.

If this were the size of a cat, it would be the most dangerous thing on earth.

These animals live in very beautiful places, sometimes caves like this, very new, but the animals are ancient.

how did you get there?

I also work with physicists, and they're usually interested in global climate change.

They take rocks inside caves, cut them into slices, and study the layers inside the rocks, which look like tree rings, so they can go back in time and tell us about the Earth's climate at very different times.

The red part in this picture is sand from the Sahara desert.

picked up by the wind and flew across the Atlantic

In this case, it rained heavily on Abaco Island in the Bahamas.

Seeped through the ground and deposited on the rocks inside the cave.

Looking back at these rock formations, we can learn about a time when the Earth's climate was very dry, going back hundreds of thousands of years.

Palaeoclimatologists are also interested in where Earth's sea level was at other times.

Here in Bermuda, my team and I undertook the deepest manned dive in the region, hundreds of feet below sea level, searching for shorelines where waves once pounded.

I started working with paleontologists and archaeologists.

In several places, including Mexico, the Bahamas, and Cuba, we're investigating cultural remains and human bones in caves, and our research tells us a lot about the early inhabitants of the area.

My favorite project was more than 15 years ago when I was part of a team that created the first accurate 3D maps of underground terrain.

The device I was driving in the cave was creating a 3D model while driving.

We also used an infrasonic radio to tell the ground our exact location in the cave.

I swam under homes, businesses, bowling alleys, golf courses, even the Sony BBQ restaurant.

Our water planet is not just rivers, lakes and oceans, it's a vast network of groundwater that connects us all.

It's a shared resource that we all drink.

If we understand the connection between humans and groundwater and the earth's water resources, we will be addressing perhaps the most important problem of our century.

I couldn't be the astronaut that I always wanted to be, but this cartographic device designed by Dr. Bill Stone will.

actually transformed

Now it's a self-swimming, autonomous robot with artificial intelligence, and its ultimate goal is to go to Jupiter's moon Europa and explore its frozen subsurface ocean.

it's so wonderful

(applause)

Think about all the things that humans need to be successful in settlement: food security, housing, child rearing, and so on.

We need ways to allocate resources, organize large-scale activities, and allocate labor efficiently.

Now imagine having to do it without any planning or high level communication.

welcome to the ant colony

Ants build one of the most complex social systems in the animal kingdom, with structured colonies made up of different types of members, each with a distinct role.

This may sound similar to human society, but this organization does not arise from any higher-level decision-making, but rather is part of a biologically programmed cycle.

In many species, the winged males and winged virgin queens of all adjacent colonies in the population all come from different nests and use pheromones to guide each other to breeding grounds and meet at suitable locations for mating.

After mating, the male ants die off while the female ants try to build new colonies.

The few ants that manage to settle in the right place lose their wings and start laying eggs.

A fertilized egg produces a female worker ant who takes care of the queen and her eggs.

It then protects the colony and forages for food. The unfertilized eggs develop into male ants whose only job is to leave the nest and wait until they are ready to reproduce and start the cycle all over again.

So how do worker ants decide what to do and when?

I haven't actually decided

Although they have no intentional means of communication, individual ants communicate with other ants through touch, sound and chemical signals.

These stimuli serve many purposes, including warning that a fellow ant has been killed, as well as signaling that the reproductive queen ant is dying.

But one of the most impressive collective abilities of an ant colony is the ability to explore large areas efficiently without any pre-determined plan.

Many species of ants have little or no vision and can only smell nearby objects.

Combined with the lack of a high level of coordination, it sounds like a poor explorer, but there's a surprisingly simple way to maximize the efficiency of your exploration: change your behavior patterns each time the ants touch each other.

When two ants meet, they sense each other by touching their antennae.

If there are many ants in a small area, this happens more often, and the ants become more complex and erratic in their search.

But if there are fewer ants moving over a larger area, and less contact occurs, they'll walk in a straight line, allowing them to explore a wider area.

In the course of an ant's exploration of its surroundings in this way, there are any number of possibilities for an ant to come across anything from threats and predators to alternative nesting sites.

Some ants have another ability known as collective foraging.

When these ants find food, they return with it, marking their path with chemical scents.

Other ants follow the pheromone trail, remarking each time they manage to find food and return.

As soon as the place runs out of food, stop marking when you return

The smell is gone and the ants are no longer attracted to the trail.

These seemingly crude methods of searching and retrieving are actually so effective that they're applied to computer models, models that operate at random and exchange simple information to get the best solution out of distributed elements.

It has many theoretical and practical applications, such as solving the famous traveling salesman problem, sequencing computer tasks, optimizing Internet searches, and collective exploration of minefields and burning buildings by groups of robots without any central control.

But these fascinatingly simple yet efficient processes can be observed directly in a few simple experiments -- by placing ants in empty spaces of various sizes and paying attention to their behavior.

Ants may not be able to vote, hold meetings, or even formulate plans, but we humans can still learn something from how simple creatures like ants can make things work in such a complex way so efficiently.

Tattoos often appear in the mainstream media as a trend for dangerous people, social misfits, fashionable young people.

While tattoo styles come and go, and their meaning varies greatly across cultures, tattoos are as old as civilizations.

Tattooed remains have been found all over the world, the oldest being a Peruvian mummy from 6,000 B.C.

How is it possible to have a tattoo?

Skin naturally sloughs off, losing 30,000 to 40,000 cells per hour.

this is 10 million per day

So why isn't the tattoo slowly coming off?

The answer is simple, because tattoos put pigment deeper than the epidermis that peels off.

Throughout history, different cultures have used different methods.

The first modern tattoo machines were modeled after Thomas Edison's engraving machines and were electric.

Machines in use today insert tiny dye-filled needles into the skin and vibrate at 50 to 3,000 times per minute.

The needle pierces the epidermis and infuses the ink deep into the dermis, which is made up of collagen fibers, neurosecretory glands and blood vessels.

Every time the needle penetrates the skin, it creates a scar, and that scar causes inflammation in the body, which triggers the immune system to heal the skin.

It's this sequence of events that makes the tattoo durable.

First, special cells called macrophages eat whatever they attack in order to reduce inflammation.

As these cells flow through the lymphatic system, some dye-rich cells return to the lymph nodes, while others remain in the dermis.

There is no way to drain the pigment, so the pigment remains visible on the skin.

Some molecules of the dye remain in the jelly-like matrix of the dermis, while others are engulfed by dermal cells called fibroblasts.

At first, the epidermis is also saturated with ink, but as the skin heals, the damaged epithelial cells are sloughed off and replaced by new cells, sloughing off the surface of the skin, much like when a sunburn heals.

Blisters and hard skin are not seen with professional tattoos, and the epidermis is completely replaced over the course of 2-4 weeks.Avoid excessive sun exposure and swimming during this time to prevent fading of the tattoo.

Dermal cells stay in place until they die

When the dermal cells die, the younger cells take over the dye, so the dye stays.

Over time, the tattoo naturally fades as the body reacts to the pigment molecules and carries them to the immune system's macrophages.

UV light also contributes to pigment degradation, but it can be mitigated with sunscreen.

Dermal cells are relatively stable, so most of the ink stays deep within a person's skin for the rest of their lives.

If a tattoo stays on your skin for the rest of your life, is there a way to remove it?

Actually there is

Today, lasers can penetrate the epidermis and destroy pigments of different wavelengths deep within the skin, and black is the easiest color to target.

The laser breaks the ink globules into smaller molecules, making them more digestible by macrophages.

Some ink colors are difficult to remove, and this complicates matters.

So removing a tattoo is more difficult than getting one, but it's possible.

So while tattoos may be short-lived, they have a history longer than any culture.

It's still popular today, so the art of tattooing will probably be inherited.

You've probably heard that carbon dioxide is causing global warming, but how does that work?

Is it like glass in a greenhouse, or is it like an insulating blanket?

no, not necessarily

We'll need quantum mechanics to answer that question, but don't worry, let's start with the rainbow.

If you look closely at sunlight that has been spectroscopically separated through a prism, there are dark gaps and missing colors.

What happened to that light?

Different gases have absorbed certain parts of the spectrum of light before it reaches our eyes.

For example, the oxygen gas grabbed some of the dark brown color, and the sodium took two of the yellow bands.

But why do these gases absorb certain colors of light?

This is where quantum mechanics comes into play.

Atoms and molecules have a fixed number of energy levels that each electron can have.

A molecule must gain a certain amount of energy in order to shift an electron from the ground level to an upper level.

No shortage is allowed

It gets its energy from light, which has an infinite number of energy levels.

Light is tiny particles called photons, and the energy contained in each photon corresponds to its color.

red light has lower energy and longer wavelength

Violet light has more energy and shorter wavelengths.

Sunlight provides all the photons in the rainbow, and gas molecules can pick out photons of the energy they need to shift to the next higher energy level.

When the combination is complete and the molecule receives energy, the photon disappears and a narrow gap appears in the rainbow, a narrow gap appears in the rainbow.

If a photon carries too much or too little energy, the molecule has no choice but to let the photon through.

That's why glass is transparent

Atoms in glass are incompatible with any of the energy levels in visible light, and photons pass through them.

So which photons does carbon dioxide prefer?

Where in the rainbow is the black gap that corresponds to global warming?

actually not

Carbon dioxide doesn't absorb light directly from the sun.

Carbon dioxide absorbs light from an entirely different object.

It's from a celestial body that doesn't seem to emit light at all, and that's the Earth.

The reason the Earth doesn't appear to glow is because it doesn't emit visible light.

the earth emits infrared

Visible light, which includes all the colors of the rainbow, is all the colors of the rainbow, but only a small portion of the wider spectrum of electromagnetic radiation.

It may seem strange to call it light, but there is no fundamental difference between visible light and other electromagnetic radiation.

It's the same in terms of energy, just whether the corresponding level is high or low.

In fact, it's a little presumptuous for us, with our limited ability to see light, to even define "visible light."

Because snakes can see in the infrared, and birds can see in the ultraviolet.

If we could see 1900 megahertz light with the naked eye, if we could see 1900 megahertz light with the naked eye, cell phones would become flashlights, and cell towers would look like giant streetlights.

The Earth also emits infrared light because everything with a temperature above absolute zero emits light.

This is called thermal radiation

The hotter an object is, the higher the frequency it emits.

When you heat a lump of iron, it emits more and more infrared frequencies, and when it reaches 450 degrees Celsius, the light it emits reaches the visible spectrum.

At first, iron looks hot red.

And when you heat it up even more, it covers all frequencies of visible light and emits white light.

That's why traditional light bulbs are designed this way, and that's why they're so wasteful.

95% of the emitted light is invisible

is wasted as heat

Infrared radiation emitted by the Earth would go out into space if there were no greenhouse gas molecules in the atmosphere.

Carbon dioxide and other greenhouse gases are compatible with infrared photons, just as oxygen gas prefers dark brown photons.

The energy received from the infrared photons can shift the gas molecules to a higher energy level.

A carbon dioxide molecule that absorbs an infrared photon quickly returns to its original low energy level and emits a photon in a random direction.

Some of that energy returns to the surface and contributes to warming.

With more carbon dioxide in the atmosphere, more infrared photons return to the surface, causing climate change.

I do a lot of video and animation work, and I'm a DJ and musician myself.

I've always been interested in music videos.

So what I tried was to let go of my notion of being a creator, to let go of my ego and bring the voice of music to the fore, and let the animation follow that voice.

We shot a track with our designers Christina and Tolga. You know, it's a song by the duo David Byrne and Brian Eno, about 25 years ago. We didn't use a lot of animation.

What I find interesting here is that you're dealing with two issues: rising sea levels and religion.

God warned Noah to build an ark before destroying mankind on earth

After Noah built the ark, God would have said to Noah, "Noah, warn the people to change their wicked ways, before I destroy them all."

When the ark was completed, someone began to sing in a disturbing voice.

the song starts like this

when the ark is completed

Moving forward...

We were all tired The darkness and the rain came and we were paralyzed by fatigue

Noah knocked on the old woman's door

"Who are you?" the old woman asked at the door.

"Will you let me stay tonight?" said Mama Jackson Lee

“We are far from home and we are all very tired.”

"Okay, come on in," said the old woman

This darkness and rain make people tired…..

(applause)

We have evolved with our tools, and our tools have evolved with us.

Our ancestors made these hand axes 1.5 million years ago, and they shaped them not only for the task at hand, but also for the shape of their hands.

But as the years went by, the tools became more specialized.

These sculpting tools have evolved over time, each shaped to suit its particular function.

They take advantage of the manual dexterity of the user and allow them to process objects with greater precision.

But as tools become more complex, more complex controls are needed to control them.

So designers have become adept at creating different interfaces that allow us to control different elements while we're doing other things, like changing the focus or adjusting the aperture while we're taking a picture.

Computers have fundamentally changed the way we think about tools, because computers are powerful.

Computers can do so many things and run so many applications.

But the computer keeps the same physical form and the same interface elements for different applications.

I think this is fundamentally a problem, because it doesn't allow us to use our hands to communicate our intentions or capture the dexterity that our bodies have.

I think we need a new interface, one that can capture the richness of our capabilities, one that can physically conform to us, and one that can communicate our intentions in new ways.

I do this research at the MIT Media Lab and now at Stanford University.

Together with my colleagues Daniel Leissinger and Yutaka Ishii, I created "inFORM," an interface that leaves the screen and can be physically manipulated.

Or you can physically visualize information in 3D, and you can make sense of it in new ways by touching it.

You can use gestures to communicate your intentions, or you can use direct touch to change shape and mold digital clay.

Elements of the interface pop out of the plane and change as needed.

The basic idea is that the shape can change to suit individual applications.

I think that by making the exchange of information physical in this way, we are embodying a new way of interacting with information.

The question is how can we take advantage of this

Traditionally, urban planners and architects create physical models of cities and buildings in order to understand them.

So I worked with Tony Tan from the Media Lab to create an inFORM interface that allows city planners to design and view entire cities.

Now you can walk around cities, dynamic, physical, tangible.

You can look at it from other perspectives, like population or traffic, but it's also represented physically.

We believe that these dynamically shape-shifting displays will dramatically change the way we collaborate with people in remote locations.

When you're collaborating face-to-face, you're not just looking at someone's face, you're making gestures and moving objects, which is difficult when you're using a tool like Skype.

With inFORM, you can reach beyond the screen and move distant objects.

You can use the pins on the display to represent a human hand that can actually touch and move distant objects.

3D datasets can also be manipulated and collaborated, and gestures can be used to manipulate the display.

This allows for much richer collaboration on new kinds of 3D information than with traditional tools.

You can also use existing objects, which are input in one and output in the other.

Or you could use two locations and a linked object, so if the ball moves in one, it will move in the other.

This is accomplished by using depth-sensing cameras, such as the Microsoft Kinect, to remote users.

If you're wondering how this all works, it's basically a 900 linear actuator mechanically linked like this, transmitting motion to a pin at the top.

It's not as complicated as the machines that are used at CERN, but it took a long time to build.

We started with one motor, one linear actuator, and we designed our own circuit to operate it.

made a lot of this

The problem with having 900 identical parts is that you have to repeat each step 900 times.

done a huge amount of work

So we set up a mini workshop in the Media Lab, and we brought in undergraduates and convinced them to do "research."

Look, it's "research."

(Laughter) Anyway, we're excited about what inFORM can do.

With the increased use of mobile devices, we are in a constant state of communication.

But mobile devices, like computers, are used for a variety of purposes.

For talking on the phone, surfing the web, playing games, taking pictures, and much more.

Yet the physical form is the same for every application.

So I wanted to see what would happen if we took the interactions that we developed for inFORM and applied them to mobile devices.

So at Stanford University, we built a tactile edge display, which is a portable device with linear actuators that can change shape in different ways, so that while you're reading a book, you can touch and see how far you've read.

Or you can feel a new sensation in your pocket, richer than vibration.

You can also choose where you want the buttons to pop out from the sides.

There will be buttons that you can actually touch when you play the game.

To do this, we attached 40 tiny linear actuators to the device so that they could not only be touched, but also be manipulated.

We also looked at other ways to change shapes in more complex ways.

By using air pressure, what looks like a phone can be moved

I made a device that turns into a wristband.

Together with Ken Nakagaki at the Media Lab, we've created a highly detailed version where servo motors turn an interactive wristband into an input device and into a phone.

(Laughter) We're also interested in how we can transform the interface into the device that the user wants to use.

You make a shape, like a game controller, and the system recognizes that shape and switches to that mode.

where is this going?

How do we proceed from here?

I think we're in a new age of the Internet of Things, where computers are everywhere, in your pockets, in your walls, in almost every device you'll buy in the next five years.

But what if we stop thinking about devices and think about the environment?

How can we have smart furniture, smart rooms, smart environments, smart cities? Something that can physically adapt to us so that we can collaborate with others in new ways and do new kinds of tasks.

For Milan Design Week, I created TRANSFORM, an interactive table-sized display that allows you to move objects on a surface, like remembering your keys.

It can also be transformed to suit different interactions.

If you work, it will change to a workplace-like environment.

As you approach the device, it creates the necessary structure around it and aligns other objects to achieve your goals.

Ultimately, I think we need to think about new ways of interacting with computers that are fundamentally different from what we're used to.

We need a computer that physically adapts to us and adapts to what we want to use it for, a computer that can physically represent information and take advantage of the dexterity and spatial awareness of the human hand.

But as we look to the future, we need to think of new ways to connect people beyond devices and get information out into the world. Think smart environments that physically adapt to us.

I'm going to end this by sharing this idea with you.

thank you

(applause)

Look at this. It's got a lattice pattern. It's just a plain lattice.

If you look closely, focus on the white dot in the middle, where the vertical and horizontal lines intersect, this point.

Look closely Is there anything strange?

nothing

But don't take your eyes off me, just stare at me

Keep your focus on this white dot and see what's happening in your peripheral vision.

Are the other dots still white? Or is it flashing gray?

Now look at this muffin tin

Oops, it looks like one is sticking out the other way around.

No, if you turn it over, can't you see five popping out this time?

Either way, this mold is useless.

This is a picture of Abraham Lincoln This is a picture upside down

There is nothing strange

Well, if you turn it upside down, Lincoln is a little weird.

Here are three types of optical illusions, images that trick us.

What's going on?

Is there something magical about the image?

Sure, I could have caused the gray flashes to appear in the grid of white dots, but let me start by saying that I didn't do that.

You would have seen the same thing with a grid printed on old-fashioned paper.

In fact, this grid is just a grid, and the brain makes it look like it's not.

This is how the brain receives light information called lattices.

The white dot you were looking at is surrounded on all four sides by more white than any other white dot.

The retinal ganglion cells, through lateral inhibition, make the difference more pronounced and perceive more white around the dot.

What makes the difference stand out is that you can see the contours better.

And our eyes and brains have evolved to see things.

The retinal ganglion cells pay less attention to the crossover point, because the white area around it, the line surrounded by black, has more lateral inhibition.

This is not an eye defect. If you see it this way, you can see it with your glasses, on paper, or on a screen.

What you see through optical illusions is how your photoreceptors and brain organize visual information into a three-dimensional world, where you need to pay attention to contours, because contours can be useful or life-threatening.

Look at the muffin pan again Can you see the reason for the confusion?

The brain's visual cortex makes assumptions about how this image will be lit.

It expects there to be one light source shining from above.

So these shadows can only be caused by the light shining from above, either on the slope of the protrusion or on the bottom of the hole.

If we carefully reproduce these cues by drawing shadows, our brains will reflexively perceive 3D textures, even if they are drawn on paper.

What about Lincoln's spooky upside-down face?

When we see a face, the part of our brain that evolved to recognize a person's face becomes more active.

Such as the fusiform facial regions in the occipital and temporal lobes.

It should be so. Humans are social animals, and we communicate with each other in complex ways.

When you see a face, you have to recognize it's a face and immediately understand what it's saying.

Especially focus on the eyes and mouth.

This is how you determine if the other person is angry or friendly.

In pictures of upside down faces, the eyes and mouth aren't actually upside down, so I didn't realize what was wrong.

But when you put it back upside down, the most important parts of the face, the eyes and the mouth, are now upside down, and you realize something's wrong.

Your brain jumps in and you realize you've overlooked something.

The brain isn't lazy, it's very busy.

It uses our cognitive energy as efficiently as possible and weaves assumptions into our visual information to modify the world we see.

Imagine your brain making these edits on the fly, like, "Okay, that square could be an object.

Let's emphasize the difference between white and black on the side with lateral restraint

Darken the corners!

A change from dark gray to light gray?

Let's assume that the light from above hits the curved surface Next!

There doesn't seem to be anything wrong with your eyes."

you see? Optical illusions reveal the work of the brain, and I'm busy as a director of 3D animation in my studio in my skull, allocating cognitive energy to present the world on the fly, with technology I can trust and technology I'm sure, if not always.

Why do you think you exist?

It's a question I never questioned until I'm asked. Let's take it seriously.

How do you know you exist?

To answer that question, Rene Descartes began by throwing away his preconceived notions and opinions and going back to the basics in Reflections.

All of Descartes' knowledge comes from his perception of the world.

Are you the same?

You see this video and you hear it with your ears.

Your five senses reflect the world as it is

I don't cheat you, but sometimes I do.

You mistake someone in the distance for someone else, or you think you could catch a fly ball that falls to the ground in front of you.

But at this moment, you realize that the world that unfolds before your eyes is real.

your eyes, your hands, your body, that's who you are

Even if crazy people deny it, you know you're not crazy

Those who doubt it must be dreaming

No, what if I'm dreaming?

make dreams come true

Even when I'm lying in bed, I think I'm swimming, I'm flying, or I'm fending off monsters with my bare hands.

no no no i know i'm awake when i'm awake

But you can't know you're not awake unless you're awake, so you can't prove that you're not dreaming.

Perhaps there is no self-perceiving body out there.

Everything in reality, even abstract concepts such as time, shapes, colors, and numbers, may be false, and all may be the work of evil spirits.

no it's not

Descartes asked if he could disprove the idea that evil spirits trick you into thinking reality is reality.

You may have been deceived by this evil spirit.

This world you perceive it and your body

You can't disprove their existence, and could you exist without them?

couldn't and can't exist

Life is like a dream Don't you row the oars all the time cheerfully?

Like deceived people or non-existent idiots, they row the oars exhausted.

Was it persuasive?

Are you convinced?

If you're not convinced, that's good. If you're convinced, it's even better.

If you're thinking about something, you can't be nothing, even if you're thinking about nothing, because no matter what you think, you're thinking things.

Imagine throwing a ball into the sky

Can you predict the movement of a thrown ball?

Of course it's easy

The ball goes up until it reaches its highest point, then goes down and back into your hand.

This is what actually happens. You've seen this many times.

We've seen physics in everyday life.

But what about the atomic world?

Can you answer from everyday physical experience?

It's impossible, but why?

Because at such a small scale, the physics that governs what we see every day is different.

The everyday world, as we know it, behaves according to classical mechanics.

But atomic-level systems behave according to quantum mechanics.

The quantum world is a very mysterious place.

That weirdness is explained in the famous thought experiment, "Schrödinger's Cat."

A cat-hating physicist put a bomb in a box with a cat that had a 50% chance of detonating after the lid was closed.

Until we open the lid, we won't know if the bomb went off, or if the cat is alive.

In the world of quantum physics, until you open the box and observe, the cat is said to be in a state of superposition.

It's not a state of life or death, it's a mixture of possibilities, a 50% chance of each.

Something similar happens in physical systems on the quantum scale, like an electron orbiting a hydrogen atom.

It's not like the electrons are actually orbiting.

It can be everywhere in space at any given time, just because it's more likely to exist than any other place. Only after we've measured our position can we tell you where we are at that moment.

Just like you don't know if a cat is alive or dead until you open the box.

So let me explain the strange and beautiful phenomenon of quantum entanglement.

Now let's say you put one cat in each of the two boxes.

If you were to do a Schrödinger's cat experiment with these two cats, the result would be one of four things.

Either cats are alive, or both are dead, or one is alive and the other is dead, or vice versa.

Both cat systems are superimposed, and now each has a 25% chance instead of a 50% chance.

What's cool here is that quantum mechanics allows us to erase from the state of superposition the state where both cats are the same.

In other words, in a system of two cats, you can always assume that one cat is alive and the other is dead.

This is technically called the cat being in a state of quantum entanglement.

The real surprise of quantum entanglement is yet to come.

If you put two cats in this state of entanglement and move two boxes to the opposite ends of the universe, you'd get similar results.

We can never really determine which cat is alive before we measure the results, but there is always one cat alive and the other dead.

How is that possible?

How could the states of a cat on the other side of the universe be so entangled?

How could two bombs conspire to detonate one and not the other when they are too far apart to contact each other?

You might think, "This is just a theory.

Is it something that happens in the real world?"

But in fact, this quantum entanglement has been confirmed in real-world experiments.

When two subatomic particles become entangled in a superposition, one spins in one direction and the other always spins in the opposite direction, even though there is no way to transfer information from one particle to the other, but they spin according to the rules of entanglement.

At the core of quantum information science, entanglement is no wonder. In this rapidly growing field, we're looking at how to apply the mysterious laws of the quantum world to the macroscopic world.

It seems that everyday physics has begun to approach the mysterious world of quantum.

Quantum teleportation research may one day allow your cat to escape to a safer galaxy where there are no physicists and no boxes.

I have a question for you

can a computer write poetry

this is a provocative question

Think about it for a moment, and you'll immediately have a lot of questions: What is a computer?

what is poetry

What is Creativity?

These are questions that take a lifetime to answer, and you can't do it in just one TED Talk.

So today I think we should change our ways

here are two poems

One is a poem written by a human hand, the other is a poem written by a computer.

Which poem was written by a human being?

Verse 1: Little fly / Your summer play / My thoughtless hands / have crushed

Aren't I the same fly as you? Aren't you/Are you the same person as me?

Verse 2: We feel / Activists are blue / In your age Stop and look at the pope and hate / Let's start tonight / It's time for another great (...)

Raise your hand if you think number one was written by a human.

The majority

Raise your hand if you think number 2

You have courage. Number one is a poem by the poet William Blake.

Number two is a poem written by an algorithm, and that algorithm scraped words from my Facebook feed one day and regenerated them algorithmically.

Let's see another poem

It won't take long, so trust your intuition.

Poetry 1: Lions roar Dogs bark Interesting birds do not growl and do not bark Just flying birds The funny stories the animals spin are in my dreams Shall I sing to you this time / If only I had the energy to do so

Verse 2: Ah! Kangaroo sequin chocolate and soda! / Beautiful things indeed!

Pearl/harmonica jujube and aspirin! They're all/talking about these guys (...) Yes, that's all

So whoever thinks the first poem was written by a human, please raise your hand.

got it

So if you think the next poem was written by a human, please raise your hand.

It's about 50/50

It was difficult this time

So here's the answer. The first poem was written by an algorithm called Lactor, which was created in the 1970s.

(Laughter) This test is the Turing test of poetry.

The Turing test was invented by Alan Turing in 1950 to answer the question, Can computers think?

If a computer can have a text-based conversation with a human, and if that conversation is so natural and superior that humans don't realize it, then we can say that the computer has intelligence.

In 2013, my friend Benjamin Laird and I put the Turing test for poetry online.

"Bot or human?" Anyone can use it and play by themselves.

But basically it's the same game as before.

It's a game of guessing whether the given poem was written by a human or by a computer.

Thousands of people have used this test and got results.

So what are the results?

Turing thought that a computer was intelligent if it could trick 30% of humans.

On the other hand, the "Bot or Human" poetry database tricked 65 percent of its readers into believing it was a human poem.

By now you should know what you want to say

In terms of the Turing test, can a computer write poetry?

yeah i can write i can definitely write

But if you feel uncomfortable hearing that, that's okay.

You may have an intuitive sense of rejection. It's okay. The story continues.

Third and final test

Read the poem again and guess which one was written by a human

Verse 1: Red flag Why is there a cute flag / And the ribbon

Yes Ribbons of banners / Ornaments / Why do you adorn yourself (...) Poem 2: Wounded deer fly high / Daffodils say / Banners say / And hunters say / That's the height of death / The end of rest is near (...) Yes it's time

So who thinks number one is human poetry?

People who think number 2 is a human poem

Number 2 is much more common

What if number 1 was a poem written by a human being? Yes, this is a poem by Gertrude Stein, a true human being.

Number two is the poem of an algorithm called RKCP.

So before we move on, let me give you a little quick explanation of how RKCP works.

RKCP was conceived by Ray Kurzweil, one of Google's chief developers, who is a strong believer in the potential of artificial intelligence.

First, you let the RKCP read the sentences, and the RKCP analyzes the sentences, learns the writing style, and reconstructs the words by imitating the writing style of the original sentence.

The second poem, which everyone believed was written by a human, was reconstructed from a large collection of poems. It's Emily Dickinson's poem. We analyzed her writing style, learned patterns, and regenerated patterns according to the same structure.

But the RKCP, surprisingly, don't understand the meaning of words at all.

Language is just raw material, whether it's Chinese or Swedish or a mixed language feed.

It's just material

And yet, RKCP can write poetry, poetry that seems more "human" than the poetry of Gertrude Stein.

What you just did is a reverse version of the Turing test.

Gertrude Stein was a human and could write poetry, but that tricked the majority of people into thinking it was written by a computer.

So, according to the reverse Turing test, the poet Stein is a computer.

(Laughter) Confused?

I think it's unreasonable

So far, so far, humans who write poetry like humans and computers who write like computers. Computers who write like humans.

What can we say from here?

Is Blake more human than Stein?

Conversely, is Stein computer-like?

(Laughter) I've been thinking about this for almost two years now, and I still haven't found the answer.

But it did give me some insight, and it made me realize the relationship between technology and humans.

The first finding is that somehow we associate writing poetry with being human.

That's why I asked, "Can a computer write poetry?"

When in doubt, ask yourself, "What makes you human? How do you draw the line between non-humans?

How can I say that it's human?"

I think that's a pretty philosophical question. You can't answer yes or no. It's not a Turing test.

I think Alan Turing understood that in 1950 and invented the test as a philosophical challenge.

The second finding is that the poetry Turing test doesn't actually measure the power of a computer, because the algorithms that generate poetry are so simple that they've been around since the 1950s.

The real purpose of the poetry Turing test is to gather opinions on what constitutes humanness.

I just realized that in this talk today, you decided that Blake was more human than Stein.

Of course, it's not that William Blake is actually more human and Gertrude Stein is more computer-like.

The line between being human and not being human is vague.

Based on this result, I came to the conclusion that human beings are not defined by hard facts.

Rather, it's a concept built on people's opinions, and it's human beings that change from day to day.

And the final finding is that computers are kind of like mirrors that reflect whatever thoughts humans present.

Show me Emily Dickinson, show me Emily Dickinson

Show William Blake, show William Blake

Show Gertrude Stein, show Gertrude Stein

There are many technologies out there, but the computer is a mirror that reflects the thoughts of the teacher.

We hear a lot about artificial intelligence these days.

A common debate is: Can artificial intelligence be created?

intelligent computer,

Can we build creative computers?

And I'm sure you're going to think over and over again, "Can we build computers that look like humans?"

But as you can see, humans aren't scientific facts. They're constantly changing, thinking concepts. They're not the same things forever.

When you're thinking about the future of artificial intelligence, you can't just ask yourself, "Can we build something like that?"

We should also ask, "What kind of human thoughts do we want to reflect?"

It's a philosophical question with truth, and one that software can never answer, but it's also a question for humans, for humanity as a whole.

thank you

(applause)

On September 1, 1953, William Scoville used a hand crank and a cheap drill saw to punch out a young man's skull, cut out a vital part of his brain, and suck it out with a metal tube.

But this is not a scene from a horror movie or a gruesome police report.

Dr. Scoville was one of the most famous neurosurgeons of his time, and the young man was a patient known as Henry Molaison H.M., and his case provided astonishing insight into how the brain works.

As a child, Henry injured his skull in an accident and soon began having epileptic seizures, fainting, and loss of control over bodily functions.

After years of recurring symptoms and high school dropouts, he decided to turn to Dr. Scoville, who was a reckless man known for performing dangerous surgeries.

Based on the idea that the brain is divided into regions that correspond to different mental functions, for decades the treatment of mentally ill patients has been surgery to partially amputate the frontal lobe.

Scoville, whose surgery had been successful in reducing seizures due to psychosis, decided to remove H.M.'s hippocampus, the part of the limbic system associated with emotion, but whose function was not well understood.

At first glance, the operation was a success.

H.M.'s seizures disappeared, he had no personality changes, and even his IQ improved.

But there was one problem: my memory was destroyed.

H.M. not only lost most of his memories of the past decade or so, but he was also unable to form new memories or remember the day of the week.

When Scoville informed another expert, Wilder Penfield, of the results, he sent a PhD student named Brenda Milner to study H.M., who lived at home with his parents, where he spent his days helping around the house and watching old movies over and over like it was the first time.

Through a series of tests and interviews, what she discovered was not only a significant contribution to memory research,

He even redefined what memory is.

One of her findings clearly highlighted the fact that H.M. was unable to form new memories, but was able to temporarily retain information for a period of time to finish a sentence or find the bathroom.

Milner gave him a random number and he managed to remember it for 15 minutes by repeating it over and over.

But after just five minutes, you forget you even took the test.

Neuroscientists believed that memory was a single entity, stored throughout the brain.

Milner's results provided the first clue to the now well-known distinction between short-term and long-term memory, and they also showed that each memory uses a different region of the brain.

We now know that there are several stages in memory formation.

Once the immediate sensory memory is temporarily read by neurons in the cerebral cortex, it reaches the hippocampus, where specialized proteins work to strengthen synaptic connections in the cerebral cortex.

If the impression of the experience is strong enough, or if you recall the experience periodically for a few days, the hippocampus sends the memory back to the cerebral cortex for permanent storage.

H.M.'s brain is capable of forming initial impressions, but without the hippocampus to anchor those memories, the memories have been eroded, like letters in sand.

But that's not the only type of memory that Milner discovered.

In her now-famous experiment, she asked H.M. to trace between two lines drawn in the shape of a star in a mirror where all she could see was paper and a pencil.

It's the first time he's done such a difficult task, and like everyone else, he's done terrible.

Amazingly, the more I did it, the better I got at it, even though I don't remember ever doing that before.

His unconscious motor center remembered what his consciousness had forgotten.

What Milner discovered was that declarative memory, such as names, dates, and facts, is different from procedural memory, such as riding a bike or signing your name.

And we now know that procedural memory has its roots in the basal ganglia and the cerebellum, which were intact parts of H.M.'s brain.

The distinction between "I know this" and "I know how to do it" has underpinned all memory research ever since.

H.M. died at the age of 82 after living a mostly peaceful life in a nursing home.

During his lifetime, he became the owner of the most studied brain in history, validated by more than 100 neuroscientists.

After his death, his brain was preserved, scanned, cut into more than 2,000 sections, then imaged and digitally mapped down to the neuron level, all broadcast live and viewed by 400,000 people.

H.M. spent most of his life forgetting things, but posterity will remember him and his contributions to the understanding of memory.

How many times does the chorus repeat in your favorite song?

Think about it, how many times have you heard that song?

You've probably heard the chorus dozens, if not hundreds of times, and it's not just Western pop songs that repeat themselves over and over again.

Repetition is a characteristic shared by music in cultures around the world.

So why is music so repetitive?

Part of the answer lies in what psychologists call the "mere exposure effect."

So people tend to like things they've been exposed to.

For example, if you don't particularly like a song on the radio, but you hear the same song at the grocery store, at the movie theater, on the street corner.

Eventually we'll ride the beat, hum the lyrics, and even download the songs.

This mere exposure effect isn't just for singing.

It applies to everything from object shapes to Super Bowl ads.

So why is repetition so common in music?

To test this, psychologists had people listen to music that avoided perfect repetition.

People were asked to listen to some of these songs, either in the original or edited to include repetition.

While the originals were written by the greatest composers of the 20th century, while the ones with repetitions were forced into music editing software, people found the ones with repetitions more enjoyable and more interesting, and expected them to have been composed by human artists.

Musical repetition makes a powerful appeal

Consider the Muppets example song "Manamana"

If you've heard it, you can't help but sing "du-du-du-du-du" after I sing "manamana"

Repetition connects each piece of music with irresistible force to the piece that follows it.

So when you hear a few sounds, you start imagining what's coming next.

You're subconsciously singing along in your head, and sometimes you're actually humming without realizing it.

A recent study found that people are more likely to move and clap their hands to the repetition of musical passages.

Repetition invites us into the music as participants rather than as passive listeners.

Studies have further shown that listeners pay attention to the relationship between musical repetitions, and that each new listening focuses on a different aspect of the sound.

The first time you hear it, you pay attention to the melody phrase, but the second time, you pay attention to the guitarist changing the pitch.

This happens in language, too, and it's called semantic saturation.

When you repeat words like "atlas" to the point where you're tired, you stop thinking about the meaning of the word and start paying attention to the sound, like the "T" followed by the odd "L."

In this way, repetition opens up new worlds of sound that may not be noticed the first time.

A "T" followed by an "L" may be aesthetically irrelevant to the word "atlas," but a guitarist's pitch changes may be very expressive.

Speech theories of auditory illusions show that repeating the same sentence over and over again shifts the listener's attention to pitch and timing so easily that the spoken word begins to sound like a song.

The same thing happens with any sequence of notes

Hearing an arbitrary sequence of sounds over and over again, people rate it as more musical than hearing it once.

Repetition gives the sound direction and makes us think of it as particularly musical, which means that we listen as we follow the sound and imagine what the next sound will sound like.

This way of listening has to do with sticky music, the phenomenon where a certain line of music sticks in your ear and feels like it's being repeated over and over.

Critics are often puzzled by the amount of repetition in music and consider it childish or unprogressive, but repetition is not only embarrassing, but an important feature that evokes what we perceive as musical experiences.

Heisenberg's uncertainty principle is one of the ideas that originated in quantum mechanics and has permeated pop culture.

It says it's impossible to know the exact position and exact velocity of an object at the same time, and it's used as a metaphor for everything in literary criticism and sports commentary.

This uncertainty is usually attributed to measurement, so measuring the position of an object changes its velocity, and vice versa.

The true origin is much more profound and surprising.

The Uncertainty Principle exists because everything in the world behaves as both a particle and a wave at the same time.

Exact position and exact velocity of matter are meaningless in quantum mechanics.

To understand this, we have to think about what it means to behave like a particle or a wave.

A particle is defined as something that exists in one place at a moment in time.

This can be represented by a spike-like graph that represents the probability of finding a substance at a particular location, so the probability of finding it at one location is 100%, and the probability of finding it at the rest is 0.

Waves, on the other hand, spread out in space like ripples on a lake.

Humans can clearly see wave patterns, but what matters most is their wavelength, which is also the distance between two side-by-side crests or two troughs in a wave.

but you can't pinpoint it to one place

It exists probabilistically in various other places.

Wavelength is essential to quantum mechanics. In fact, the wavelength of matter is related to its momentum, which can be expressed as mass times velocity.

So fast-moving matter has more momentum, which means it has a shorter wavelength.

Also, heavy objects move slowly, but they have a lot of momentum, which also means they have short wavelengths.

So we are unaware of the wave properties of the materials around us.

For example, if you throw a ball into the air, its wavelength will be a trillionth of a trillionth of a billionth of a meter, and it's so short that you can't detect it.

But small matter, like atoms and electrons, has wavelengths that can be observed in physics experiments.

So if you have a pure wave, you can measure its wavelength, which means you know its momentum, but you don't know its position.

We know a lot about a particle's position, but because it doesn't have a wavelength, its momentum is unknown.

To get a particle that has both position and momentum, you have to put the two diagrams together to get a graph with waves in a very small area.

What should I do?

It combines waves with different wavelengths, which means that it gives quantum objects the possibility of having different momentums.

If you add the two waves together, you'll notice that there are places where the mountains line up to create big waves, and there are places where the mountains fill the valleys.

As a result, we can separate areas with waves and areas without waves.

If you add a third wave, the range of wave cancellation increases, and with the fourth wave, the range of wave cancellation increases, and the wave range narrows.

If you keep adding waves in this way, you can create a wave packet with distinct wavelengths over a narrow range.

This is a quantum object with wave and particle properties, but when you do this, you lose the certainty of both position and momentum.

This position cannot be limited to one point.

It just shows that there's a high probability that you'll find it in a certain area near the center of the wave packet. Note that if you create a wave packet by adding multiple waves together, any single wave in the wave packet has a corresponding momentum and will be found with some probability.

Now, both position and momentum are uncertain, and those uncertainties are combined.

If you want to reduce the uncertainty of position, you have to add more waves to make the wave packet even smaller, but that increases the uncertainty of motion.

If you try to increase the accuracy of the momentum, the wave packet will become larger, and the position will not be determined this time.

This is the Heisenberg uncertainty principle, proposed in 1927 by German physicist W. Heisenberg.

This uncertainty is not a matter of measurement accuracy, but rather a result of the combined properties of particles and waves, so it is unavoidable.

The uncertainty principle doesn't just indicate the limits of measurement.

It's the limit of what matter can have, and it's built into the basic mechanics of the universe.

I believe that resurrection plants are the key to producing the very drought-tolerant crops that promise future food security for the world.

They look like they're dead, but they're not.

If you give it water, it will revive in 12-48 hours and start growing green.

The rationale for this proposal — What is the rationale for proposing drought-tolerant crops for food security?

The world population is now about 7 billion people

It is estimated that by 2050 there will be 9 to 10 billion people, most of them in Africa.

Food and Agriculture Organizations around the world are proposing that agricultural production needs to increase by 70 percent to meet that demand.

As you can see from the fact that plants are at the bottom of the food chain, most of our food is plants, so it makes sense.

The 70% that you just mentioned don't take into account the impact of climate change.

This is from a 2011 study by Aiguo Dai, who took into account the full range of possible impacts from climate change, and it shows that it's not raining, or it's not raining enough, and it's going to be drier.

The areas shown in red were until recently used for agriculture, but the lack of rainfall has made this impossible.

This is a prediction for 2050

Africa, or rather most of the world, will be in crisis.

We have to think of some efficient way of producing food.

Among the best among these are drought-tolerant plants.

In Africa, we must not forget that agriculture in most regions depends on precipitation.

Developing drought-tolerant crops is not an easy task.

the reason is water

Water is essential for life on earth

Water is the main component of life in all organisms that are constantly metabolizing — from microbes to humans.

life breathes in water

Some organisms die if they lose even a little water.

Humans are 65% water, and if you lose 1% of that, you die.

we can avoid it by action

plants can't

remains rooted in the ground

Plants have a higher water content than humans, about 95 percent, and depending on the species, they can survive losing more water than humans — anywhere from 10 to 70 percent, but only for short periods of time.

Most plants try to resist and avoid water loss.

An extreme example of this is found in succulents

Many succulents are small and beautiful, but they come at a cost to retain moisture and grow very slowly.

Examples of avoiding water loss are found in trees and shrubs.

They extend their roots into the ground, and constantly pump water taken from deep underground into their bodies to keep themselves hydrated.

On the right is a plant called baobab.

It's called an "upside-down tree" because the root-to-trunk proportions make it look like it's been turned upside down.

Of course, roots are what plants need to absorb water.

Common ``plant wisdom'' for avoiding water loss is found in annuals

Annuals make up the majority of our plant food.

Even though it doesn't seem like there's that much vegetation growing year-round along the West Coast of the United States,

When it rains in spring, flowers bloom in the desert like this

The wisdom of annual plants is that they grow only in the rainy season.

At the end of the rainy season, they produce seeds that are 8-10% moisture content, dry, but full of life.

Things that are dry but still alive are said to be drought tolerant.

The seeds remain dry and have to sit still for long periods of time in harsh environments.

When the next rainy season arrives, the seeds will germinate and the cycle of life will resume.

The evolution of drought-tolerant seeds is thought to have allowed flowering plants to proliferate and spread over land.

Now let's go back to our main food source, the annual.

Wheat, rice and corn make up 95% of plant foods

And it's very convenient because you can produce a lot of seeds in a short period of time.

Because the seeds are so concentrated in calories, they can be stored for drought when the harvest is bountiful, but there's a problem.

Annual roots and leaves, which are vegetative tissues, have no drought-tolerant, evasive, or resistant properties.

that there is no need

Because it grew in the rainy season and got seeds to survive the year.

Even if concerted efforts in agriculture try to produce crops that improve on those three traits -- especially the behavior of resistance and avoidance, which our model shows very well -- it still looks like this.

It's African corn. It's been two weeks without rain and it's dead.

The solution is in resurrection plants.

Resurrection plants can survive a loss of 95 percent of their water content, stay dry and dead for months and years, and when watered, they turn green and begin to grow again.

Drought tolerant like seeds

Can withstand harsh environments

Angiosperms with such rare properties

There are only 135 species in the world

I'm going to show you a video of it, showing the resurrection process of three species of resurrection plants, from left to right.

You can see how quickly it will respawn on the timeline below.

(Applause) Surprise, right?

I've been studying the mechanisms of this resurrection plant for 21 years.

How do resurrection plants dry out without dying?

I study a variety of different types and conditions of resurrection plants, such as the one here, for several reasons.

One of the reasons is that any of these plants can serve as models for drought-tolerant crops.

For example, ellagrostis nindensis in the far upper left corner, this cousin ellagrostis nindensis, which you all know, is a gluten-free Ethiopian staple known as teff, and we want to make it drought-tolerant.

Another reason why I'm looking at all these different plants -- at least initially, are the seeds and the drought-tolerant plants doing the same thing?

I wanted to find out if they both have similar mechanisms that keep them alive after dehydration.

So, to get a comprehensive understanding of drought tolerance, we used what we call a systems biology approach, which is to look from the molecular level down to the ecophysiological level of the whole plant.

For example, we look at changes in plant anatomy and ultrastructure during the drying process.

In the technical jargon, transcriptome analysis looks at genes that are either activated or repressed in response to drought.

Next, most genes code for proteins, so in proteome analysis

Find out what proteins are produced during the drying process.

There are also proteins that code for enzymes that produce metabolites, so the next metabolome analysis is

important for plants that cannot leave the soil

Plants protect themselves from all environmental stresses by means of what I call a highly regulated chemical weapon.

It is important to study the chemical changes in plants that occur during the drying process.

The final step at the molecular level is to look at changes in the lipidome — changes in lipids that occur in response to desiccation.

This is also important because the membranes of living organisms are made of lipids.

The reason why lipids exist as membrane tissue is because they are in water.

If you remove that water, the membrane will collapse.

Lipids also act as signals to turn genes on.

Finally, we perform physiological and biochemical studies to examine the function of substances that we discovered in our other studies and put forward as protective agents.

All these results help us understand how plants are coping with their natural environment.

I've always believed that we should have a comprehensive understanding of drought tolerance mechanisms in order to make meaningful suggestions to the applied life sciences.

And when I say that, some of you might be thinking, "Applied life sciences? Is she going to make genetically modified crops?"

The answer depends on how you define genetic modification.

All the grains we eat, wheat, rice, corn, etc., by their very nature, are highly genetically engineered.

So if you ask me, "Resurrection plant genes into crops," the answer is yes.

we tried it out right away

To be precise, UCT collaborator Jennifer Thomson Suhail Rahdeen spearheaded this approach, and I'm going to show you the data.

A very ambitious approach that we're going to take now is to turn on all the genes that are already present in all crops.

It just hasn't manifested itself in extreme drought conditions before.

Whether or not this is genetically modified is up to you.

I'm going to show you some data from the first method.

But before I do that, let me explain a little bit about how genes work.

As you all know, genes live in double-stranded DNA.

All cells, both human and plant, have chromosomes with that DNA tightly wrapped inside them.

If you stretch the DNA out, you'll find the genes.

Each of them has a promoter, the gene coding region that controls the gene, and at the end, a terminator, the end of transcription that marks the end of transcription and moves from there to the next gene.

Promoters aren't just switches that control genes.

Gene expression requires considerable fine-tuning and a variety of correct transcription factors.

Research in biotechnology commonly uses inducible promoters to drive gene expression.

We'll conjugate it to a gene of interest, introduce it into a plant, and see how the plant responds.

In the study I'm going to talk about, my collaborators used a drought-inducible promoter that we discovered in resurrection plants.

The nice thing about this promoter is that even if we don't do anything,

plants feel drought

We used it to isolate antioxidant genes from resurrection plants.

The importance of antioxidant genes

All stresses, especially drought stresses, generate free radicals - reactive oxygen species that are highly toxic and can kill crops.

Because antioxidants prevent that damage

This is data from a corn variety that is widely grown in Africa.

To the left of the arrow is a plant without antioxidant genes, and to the right is a plant with antioxidant genes.

After three weeks without water, people with antioxidant genes are doing much better.

Finally

In our study, we found that the drought tolerance mechanisms of seeds and resurrection plants are very similar.

Do they both use the same genes?

To put it another way, do resurrection plants use genes in their seeds that have evolved drought tolerance in their roots and leaves?

Could the gene from the seed be at work in the roots and leaves of the resurrection plant?

I'll answer that from our group's work and from recent collaborations with Henk Hilhorst in the Netherlands, Mel Oliver in the US, Julia Batink in France, and others.

The answer is yes, there are core genes involved in both.

To illustrate this briefly with maize, the maize chromosome under the repressor switch contains all the genes required for drought tolerance.

This gene is expressed when corn seeds mature and dry out.

Resurrection plants switch on that same gene when they dry out.

So all modern crops have this gene in their roots and leaves, just that they've never been turned on.

I'm only activating the seed tissue.

Now, we're trying to understand the cellular and environmental signals in resurrection plants that switch on those genes, and try to reproduce them in crops.

One last word

We're replicating at breakneck speed what nature has done over the course of 10 to 40 million years in the evolution of resurrection plants.

thank you

(applause)

Grief is something we all experience, but what it all boils down to and how to deal with it has been a hotly debated topic for centuries.

Simply put, grief is commonly thought of as a natural response to adversity.

It can be sad when a friend leaves or a pet dies.

When a friend says "sad" you ask "What's wrong?"

But your speculation that the cause of grief is external is a relatively new idea.

Ancient Greek physicians had a very different point of view.

They believed that the black fluid running through their bodies was the cause of their grief.

According to their tetrahumoral theory, the human body and soul are controlled by four bodily fluids, known as the 'four humors', and their balance directly affects a person's health and temperament.

Melancholia comes from the word "melaina colle," which means "black bile," and was believed to be the bodily fluid that caused grief.

It was believed that dietary changes and medical interventions could balance the body's fluids.

Despite today's better understanding of the systems that govern the human body, the Greek idea of ​​grief has something in common with today's view, not of the sadness we usually feel, but of pathological depression.

Doctors believe that certain long-term, unexplained psychiatric conditions are related, at least in part, to brain chemistry — the balance of chemicals in the brain.

Changing the balance of these chemicals, like the Greek theory, can dramatically alter our reactions to even the most challenging situations.

There's also a long tradition of trying to find value in grief, and in that debate you'll find strong opinions that grief is not only inevitable, but essential to life.

If you've never felt depressed, you've failed to learn what it means to be human.

Many thinkers argue that depression is necessary for wisdom.

Born in 1577, Robert Burton spent his life researching the causes and experiences of grief.

In Burton's classic book, "Anatomy of Melancholy," he said, "The more intelligent, the more sad."

Early 19th-century Romantic poets believed that melancholy helped us better understand deep emotions, such as beauty and joy.

Knowing the sadness of the trees dropping their leaves in the fall deepens our understanding of the cycle of life in which the flowers bloom in the spring.

But wisdom and emotional intelligence are likely to be fairly high on the "hierarchy of needs."

Does grief have any more basic, concrete, perhaps even evolutionary, value?

Scientists believe that crying and withdrawal originally helped our ancestors stay socially connected and get the help they needed.

In contrast to anger and violence, grief was an expression of anguish that quickly brought people together in distress, thus helping individuals and their communities move forward.

While grief probably played a role in strengthening the bonds that humans need to survive, many have wondered if the suffering others feel is the same as the suffering they've experienced themselves.

The poet Emily Dickinson wrote, "I weigh all the griefs I meet, And squinting my eyes -- Is it as heavy as my griefs, or less?"

And in the 20th century, medical anthropologists like Arthur Kleinman gathered evidence from how people talk about their pain, showing that emotions aren't universal, and that culture -- especially the way we use language -- can influence our sensitivities.

When we talk about heartbreak, the feeling of being hurt becomes part of our experience, and in a culture that talks about heartbreak, it actually seems to be a different subjective experience.

Some modern thinkers are not interested in whether grief is subjective or universal, but rather use technology to eliminate suffering in all its forms.

David Pierce proposes that genetic engineering and other modern methods can not only change how humans perceive emotional and physical pain, but can even reshape the world's ecosystems so that wild animals do not suffer.

He calls his project "Paradise Engineering."

But in a world without sorrow, isn't there something sad?

Our cave-dwelling ancestors and our favorite poets may not want a paradise like this.

In fact, the only universally accepted thing about grief is that most of us have felt it all the time, and for thousands of years one of the best ways to come to terms with this painful feeling is to speak it out, to express the feelings we can't put into words.

In the words of Emily Dickinson, "Hope is a winged creature Where it stops is in the soul Singing a wordless melody Never quitting."

democracy—

Western society makes the big mistake of taking it for granted.

We see democracy not as it really is, as fragile as a flower, but as what society has in store for us.

We tend to take things that don't move like rocks for granted.

There's a misconception that capitalism creates democracy.

That's wrong

As the former prime minister of Singapore, Lee Kuan Yew, and his masterful imitator, the Chinese government, have proved beyond any reasonable doubt, that thriving capitalism and spectacular economic development are perfectly possible even in a politics of zero democracy.

In fact, Europe, where we live, is moving away from democracy.

Earlier this year in 2015, when I attended the Eurogroup where the finance ministers of the eurozone met as finance ministers in the newly formed Greek government, I was made clear that our democratic process, the elections, cannot be allowed to interfere with the economic policies that are being implemented in Greece.

There's no other story that justifies Lee Kuan Yew or the CCP's ways, and that's what I felt at the time. In fact, my dissident friends always told me that democracy itself could be banned if anything threatened to change anything.

I'm here tonight to make an argument for what a true democracy is from an economic perspective.

Again, I want you to believe that it is wrong to think that Lee Kuan Yew, the Chinese Communist Party, and even the Eurogroup can do without democracy, and that we need real, controversial democracy.

Without democracy, our societies will continue to deteriorate, our future will be hopeless, and all of humanity's greatest innovations will go to waste.

Speaking of waste, let me introduce you to an interesting paradox, a phenomenon that is threatening our economy right now.

It's called the "Twin Peaks Paradox"

One peak, as you can see, is the pile of debt that casts a long, dark shadow over the United States, Europe, and the rest of the world.

We all know about mountains of debt

But few people can see the other half of the twin.

It's a huge pile of money that sits dormant, hoarded by the rich and corporations who are reluctant to invest in it, to generate income through production, to pay off huge debts, to produce the things that humanity desperately needs, like renewable energy.

Notice the two numbers here.

In the last three months, in the United States, the United Kingdom and the Eurozone, all together, investment in wealth-producing goods amounted to 3.4 trillion dollars: factories, machinery, office buildings, schools, roads, railroads, mechanical equipment, and much more.

$3.4 trillion sounds like a lot of money, doesn't it? But it doesn't seem that way when the countries I just mentioned had $5.1 trillion in the same time period just sitting idle in financial institutions, because that $5.1 trillion didn't do anything at all.

So the mountain of debt and the mountain of dormant assets, those two mountains, are not offsetting in the normal activity of the economic markets.

This leads to stagnant wages, and one in four 25- to 54-year-olds in the United States, Japan and Europe is unemployed.

As a result, the vicious cycle of total demand not rising continues, and the investor becomes pessimistic. Investments held back for fear of a shortage of demand are themselves reducing demand. This is exactly the same situation as Oedipus' father.

This is where I think capitalism is crazy

It's the total waste and this sleeping pile of money that should be invested in improving people's quality of life, in developing human resources, and most of all, in developing technologies -- especially green technologies that are essential to protecting the planet.

Should we believe that democracy will solve this problem?

I believe, but before we move on, let's take a look at the definition of democracy.

According to Aristotle, it refers to a system in which the majority of the free or poor rule the government.

Of course, the Athenian democracy excluded many people.

Women, immigrants and, of course, slaves were excluded.

But I think it would be a mistake to deny the importance of ancient Athenian democracy just because some people were left out.

More importantly, low-income workers were included. And it's still important. They had freedom of speech.

Of course, the Athenian democracy didn't last long.

Burned out quickly like a bright candle

In fact, the roots of today's liberal democracy are not ancient Athens.

Rather, it evolved from the Magna Carta, the Glorious Revolution of 1688, and the United States Constitution.

Whereas the Athenian democracy centered on the ownerless citizens and empowered the poor working class, our liberal democracy is based on the tradition of the Magna Carta, the Charter for Rulers.

In fact, liberal democracy emerged only after politics could be completely decoupled from the economic sphere, confining the process of democratic politics within the political sphere. This made the economic sphere, the corporate world, so to speak, irrelevant to democracy.

Now, in modern democracies, the separation of the economic and political spheres, and as soon as this began, an epic, uncontrollable conflict erupted between the two sides.

Have you ever thought there weren't as many good politicians as there used to be?

It's not because your DNA is degraded.

(Laughter) Today, being in the cabinet doesn't mean you're in power, because power has moved away from politics and into the business world.

I said earlier that I think capitalism is crazy.

If you think about it, it's kind of like a carnivore that eats too much of its prey, kills it, and ends up starving.

In the same way, the business world's political hijacking and cannibalism has gone so far that it's undermining the economy itself, creating an economic crisis.

Corporate power is growing, the value of political goods is declining, inequality is rising, aggregate demand is shrinking, and business owners are reluctant to invest their own money.

In other words, the more capitalism excludes the people (the demos) from democracy, the higher the two mountains rise, the more wasted human resources and the more wasted human wealth.

If this is true, the political and economic spheres must be merged, preferably people-centered, like ancient Athens, but without slaves and without excluding women and immigrants.

this is nothing new

100 years ago, the Marxist left was already advocating it, but it failed.

The lesson from the fall of the Soviet Union was that it took a miracle for the low-income workers to regain their power, like ancient Athens, without creating new atrocities and waste.

But there is a solution, get rid of the low-income workers.

Capitalism is replacing low-wage workers with automated machines, android robots, and more.

The problem here is that as long as the political and economic spheres exist separately, no matter how much automation we do, the two mountains will only get taller, the garbage piles up, the social conflicts will only get deeper, and soon it will be in places like China.

So we have to rethink the way things have been done, and reunite the economic and political spheres, but we must democratize those spheres, or we'll live in a hyper-dictatorial world of tightly controlled surveillance, where "The Matrix" becomes a documentary film.

(Laughter) The question here is not whether capitalism will survive in the face of technological innovation.

Instead, either capitalism will be replaced by a dark world like The Matrix, or it will evolve into a world like Star Trek, where machines serve humans and humans focus on exploring the universe, creating a high-tech version of the agora of ancient Athens, where people can freely discuss the meaning of life.

I think there is room for optimism.

What should we do to realize a Star Trek utopia from the dark Matrix, and what kind of world will it be?

Let me give you a quick, realistic look at two examples.

First, imagine a capital market where the more you work at the corporate level, the more capital you get. If you change jobs or companies, the capital will follow. Companies are wholly owned by the people who work inside them, regardless of which company they work for at the time.

All income comes from capital and profits, making the very concept of wage labor obsolete.

The divide between those who own companies but don't work in them and those who do but don't own them will disappear. The tug-of-war between capital and labor will end. The chasm between investment and savings will disappear.

What if, at the level of global politics and economics, our national currency had a free-floating exchange rate, and was issued by the IMF and the G-20 on behalf of mankind as a universal digital currency?

Taking this common currency, let's call it "cosmos" further, all international trade is done in cosmos, and every government agrees to pay into the common monetary fund an amount proportional to its trade deficit or trade surplus in cosmos.

We will use this fund to invest in technology for the environment, especially in under-invested regions of the world.

this is nothing new

It was actually proposed by John Maynard Keynes at the Bretton Woods Conference in 1944.

The problem was that at the time we didn't have the technology to put this idea into practice.

But now there is, it's much more certain if we combine politics and economics.

The world we're talking about has many facets. First, liberalism, because it prioritizes empowering the individual. Second, Marxism, because it makes the boundaries between capital and labor a thing of the past. And the third is global Keynesianism.

But most of all, it's a world where true democracy is possible.

Will such a world come?

Would it be better to fall into the dark world of The Matrix?

The answer depends on the political choices we make as a collective.

We choose ourselves, so we should choose democratically.

thank you

(Applause) Bruno Giussani: Giannis...

You wrote in your self-introduction that you were a "liberal Marxist."

How does Marx's analysis apply today?

Iannis Varoufakis: If you're even a little bit convinced by what I'm saying, then I'd say Marx is too.

The point of reintegrating politics and the economy is that if we don't, technological innovation will lead to a sharp decline in aggregate demand, a phenomenon Larry Summers calls secular economic stagnation.

As the economic crisis moves from one part of the world to another, this economic stagnation will destabilize not only our democracies, but also the emerging world, which is reluctant to liberal democracy.

If this analysis makes sense, Marx's ideas are also very useful.

But Hayek is right, so I'm a liberal Marxist, and Keynes is right, so I'm very confused.

(Laughter) Bruno: Most likely, so are we.

(Laughter) (Applause) Jannis: People who aren't confused aren't using their brains.

Bruno: That's a very Greek philosophical remark. Yannis: That's a quote from Einstein. Bruno: You've mentioned Singapore and China, and last night at the speakers' dinner, you were sharply criticizing the Western view of China.

Would you like to talk here too?

Yannis: Yes, I think it's pretty hypocritical.

Our liberal democracy looks democratic on the surface.

Because, as I said in my talk, if you lock democracy into the political realm, where things actually happen -- the economic realm -- there's no democracy.

In some ways -- if you'll forgive me for being provocative -- China today is more like Britain in the 19th century.

Because, as I said earlier, it's historically wrong to associate liberalism with democracy.

Liberals were particularly skeptical of the democratic process—

It's a stance similar to John Stuart Mill.

What's happening in China now is very similar to what happened in England during the industrial revolution, especially during the transition from the first to the second industrial revolution.

That's why it smells like hypocrisy to those who criticize China for doing what the West did in the 19th century.

Bruno: I'm sure everyone here would like to hear about your time as finance minister in Greece earlier this year.

Yannis: I thought you were coming.

Bruno: yes

Now, six months later, how do you feel about the first half of the year?

Giannis: For me personally, it was super fun, but I was very disappointed because it was a chance to redefine the Eurozone.

Not just Greece, but the entire eurozone.

It was also a chance to break out of complacency and break out of the denial of reality that there is a gigantic structural fault lying across the Eurozone that threatens the very structure of the EU.

It could have been based on the Greek Fiscal Consolidation Program, which, by the way, was the first program to articulate and articulate this denial of reality.

But unfortunately, the powers of the Eurozone and the Eurogroup remain in denial of reality.

But you can see ahead

This is the path taken by the Soviet Union.

If you try to keep an economic system alive that is structurally unsustainable through political will or dictatorships, even if you succeed in prolonging it, when something happens, rapid and catastrophic change will occur.

Bruno: What changes do you see?

Giannis: Well, unless we change the structure of the Eurozone, we definitely have no future.

Bruno: As Finance Minister What mistakes did you make?

Yannis: Every day

Bruno: For example? Giannis: Anyone looking back— (Applause) Seriously.

Minister of Finance, or any minister, after six months, especially in such a tense situation, who can say he didn't do a single thing wrong, is dangerous.

Of course I failed.

The biggest mistake was signing a loan extension application in February.

I was hoping that there would be creditors genuinely willing to find common interests with us.

it wasn't

All he had in mind was to bring down the Greek government, and only because he didn't want to get involved in the tectonic faults that lie in the Eurozone.

Because they don't want to admit that the five-year program in Greece was a disaster.

Greece lost a third of its nominal GDP.

Worse than the Great Depression

And they were imposing a restructuring policy—no one of the creditors ever stepped forward and said, "This was a big mistake."

Bruno: Contrary to all these facts and very critical statements, you have a very positive view of Europe.

Yannis: Of course

Because my criticism of the EU and the Eurozone is the language of a man who lives in Europe.

My biggest fear is the collapse of the Eurozone.

If it collapses, the stored centrifugal force will be released, and it will be terrifying and the EU will be destroyed.

If that happens, it will be a huge blow not only to Europe, but to the entire global economy.

Europe is probably the world's largest economy

So if we follow the same path that the postmodern 1930s did -- and that's what's happening now -- we're going to end up destroying the future of everyone, whether in Europe or not.

Bruno: I really hope this is a mistake.

thank you for your story

Yannis: Thank you

(applause)

Many people in the United States and Latin America have a holiday commemorating the voyage of Christopher Columbus. But was he the brave explorer who brought two worlds together, or the brutal explorer who brought colonization and slavery?

Did he discover America in the first place?

Now is the time to examine Columbus in history and the person Christopher Columbus himself.

quietly quietly

I wonder if I have to work today as well

(clears throat) Yes, Chief Justice

Effectively October 12th, Columbus Day has been celebrated in many parts of the United States since 1792 as an anniversary.

But while Columbus Day was declared an official holiday in 1934, states don't have rules to follow.

Only 23 states have public services closed, and many more spend their anniversaries completely unrelated.

(clears throat) What the hell

In the '70s, they moved Columbus Day to the second Monday in October, so people could have a great three-day weekend.

Hmmm, what are you trying to celebrate again?

Your Honor, everyone is studying at school.

Christopher Columbus persuaded the King of Spain to send him to find the best route to India by sailing westwards around the globe, instead of sailing overland eastwards.

He said it was crazy because people still thought the world was flat, but he understood it better.

And in the 1492 voyage, in the azure sea, he found something better than India, and it was a whole new continent.

what a bullshit

First, educated people have known since the time of Aristotle that the earth is round.

Second, Columbus didn't discover anything.

People have lived there for thousands of years.

And he wasn't even the first white man to visit the Americas.

Norwegians have lived on Newfoundland for about 500 years.

No way! So why aren't we wearing horn helmets?

Actually, they didn't wear such things either.

(clears throat) Nobody cares what pirates did when.

Their settlement didn't last long, but Columbus did.

And the information he brought to Europe spread far and wide, attracting more explorers and immigrants to come.

Without him, none of us would be here today.

And it's because of him that millions of Native Americans don't exist on this continent today.

do you know what he does in the colonies

He took the first indigenous people he met prisoner, and wrote in his diary that it was very easy to conquer and enslave the indigenous peoples.

No, at that time, the tribes were just fighting

Didn't the natives tell Columbus about the other tribes who were raiding and capturing sacrifices?

No, but tribal strife was sporadic and limited.

It wasn't a struggle that would wipe out 90% of the population.

Hmmm, anyway, why is it so important to celebrate this Columbus?

Your Honor, Columbus' voyage was an inspiration to the needy across Europe and symbolized freedom and new beginnings.

And his discovery gave our grandparents, our great grandparents, the opportunity to come to this continent and build a better life for our children.

Shouldn't there be a hero so that people don't forget that our country was built on the hardships of immigrants?

Then the indigenous peoples who were almost wiped out and forced into reservations, and their descendants who still suffer from poverty and discrimination.

What are their struggles like?

That's history, you can't judge a 15th-century person by modern standards.

People in those days even considered it a moral duty to spread Christianity and civilization around the world.

In fact, he was a villain even by the standards of his time.

When he ruled Hispaniola, he abused and mutilated indigenous people who didn't bring enough money, sold young girls as young as nine years old into sex slaves, and was brutal enough to eventually be stripped of power and imprisoned in the other colonies he ruled.

When missionary Bartolome de las Casas visited the island, he wrote: Between 1494 and 1508, more than three million people perished in war, slavery and mining. Will posterity believe this fact? Well, that number is a little unreliable.

Isn't that holiday celebrated in some other way?

Some Latin American countries celebrate the same day with different names, such as Día de la Raza.

In these places, there's a strong tinge of indigenous people who survived the colonial era and a celebration of mixed cultures.

Some parts of the United States changed their name to Native American Day, or Native American Day, and changed the way they celebrated along with it.

If there's a problem, can't we just change the name?

because it's a tradition

Originally, people needed heroes, they searched for myths.

Shouldn't we continue to celebrate the way we've been doing it for 100 years, instead of doing this thorough research and digging into it?

No one is celebrating genocide.

Traditions change, and how we try to preserve them defines our values.

I don't think a tired judge taking a day off has anything to do with those values.

Traditions and holidays are important in any culture, but the hero of one era may become the villain of the next as historical knowledge expands and values ​​evolve.

And determining what these traditions mean today is a key theme of this "Judge History" series.

Austrian physicist E. Schrödinger is one of the pioneers of quantum mechanics, but what made him famous was an experiment that never happened: a thought experiment involving cats.

Suppose you put a cat in a box and seal it, and then put in a device that has a 50% chance of killing the cat over time.

Ultimately, we asked, "What's going to happen to the cat?"

Common sense tells us that a cat is either alive or dead, but according to Schrödinger, according to quantum mechanics, until you open the box, the cat is both alive and dead at the same time.

Only when the box is opened is its state determined.

Until then, life and death for cats is a vague, probabilistic, half-and-half situation.

This is Schrödinger's point of view.

Quantum mechanics was so philosophically contradictory that he abandoned the theory he had been involved in and turned to writing about biology.

It may seem silly, but Schrödinger's cat is real.

In fact, it is essential

If it weren't possible for a quantum object to be in two states at the same time, neither would this computer you're watching a lesson with.

The quantum phenomenon of superposition is the result of the wave-particle duality that exists in everything.

For a substance to have wave properties, it must have some degree of spatial extent, meaning it must occupy multiple positions at the same time.

The wavelengths of matter are limited to a certain amount of space, but this cannot be fully defined.

So they exist at different wavelengths at the same time.

We don't see this wave characteristic in everyday matter, because as momentum increases, the wavelength shortens.

Cats are too big and too heavy for that.

If you bloat one atom to the size of the solar system, the wavelength of the cat that escapes the physicist will be as small as the atoms in the solar system.

It's too small to see the cat's wave-like behavior.

But small particles such as electrons show dramatic evidence of this duality.

If you shoot electrons through two narrow slits in a screen, each electron behaves like a particle, and at one moment it will be detected at a point on the other side.

But if you repeat this experiment over and over again and follow the trajectory of each particle, you'll see a pattern that's characteristic of waves: a series of fringes, divided between areas with multiple electrons and areas with nothing.

If you block one slit, the fringes disappear.

So this pattern shows that each electron is the result of passing through both slits at the same time.

An electron doesn't choose to go left or right, it goes through both left and right at the same time.

This state of superposition leads to modern technology.

Electrons near the nucleus are in broad, wavy orbits.

When you bring two atoms closer together, the electrons are shared between the atoms rather than belonging to one atom.

This is how chemical bonds are made

1 electron in a molecule belongs to A+B, not to atom A or atom B

As you add more atoms, the electron spreads out further and is shared among many atoms at once.

Electrons in solids are not bound to any specific atom, but are shared and spread out among all atoms.

This gigantic superposition of states determines the movement of electrons as they pass through a material, and determines whether the material is a conductor, an insulator, or a semiconductor.

By understanding how electrons are shared between atoms, we can control the properties of semiconductors like silicon.

The clever combination of different semiconductors allows us to put millions of tiny transistors on a single computer chip.

Semiconductor chips and widely distributed electrons power the computer watching this video.

It's a familiar joke that the internet is for sharing cat videos.

If you go all the way back, the internet exists thanks to an Austrian physicist and an imaginary cat.

We usually think of rhythm as an element of music, but it's actually everywhere in the world around us.From the sound of crashing waves to the beat of our hearts, rhythm is essentially a regular, recurring event in the flow of time.

Even the ticking sound of a clock is a kind of rhythm.

But when it comes to the rhythm of music, it's not enough just to have one beat at regular intervals.

You need at least a pair of beats on another note, which can be unstressed down beats or stressed back beats.

There are several ways to distinguish between these types of beats, using high and low drums, long beats and short beats.

There's no hard and fast rule as to which beat is heard as the dominant beat, and, like the famous Rubin's vase painting, it can be opposed by cultural perception.

In standard music notation, rhythms are written on staff notation, but there are other ways to write them.

Remember the ticking clock

Just as the round dial of a clock can represent the linear flow of time, the flow of rhythm can also be represented by a circle.

A continuous circle is a more intuitive and accessible way to visualize rhythm than a linear sheet of music that bounces back and forth on the page.

The beats can be placed in various places around the circle Main beats are blue dots Underbeats are orange dots Secondary beats are white dots

So that's the basic dichotomy, which is a key beat and a pair of weak beats.

Or a triple with main beats, weak beats, and secondary beats

The interval between beats can be divided into subbeats in multiples of 2 or 3.

By layering multiple patterns using concentric circles, you can create more complex rhythms.

For example, you can combine a basic 2-beat with an underbeat to make a 4-beat.

It's the backbone of many popular genres around the world, from rock and country and jazz to reggae and cumbia.

Or you can combine 2-time signatures with 3-time signatures.

If you remove one main beat and rotate the inner ring, you get a rhythm that feels like a 3/4 beat.

This is the basis of Sufi whirlwind music and various rhythms found in Latin America, such as the Holopo, as well as the rhythm of Bach's famous Chaconne.

Now if you think of Rubin's vase and listen to the underbeat as the main beat, you'll get something like a 6/8 beat, something you'll find in genres like chacarrera, queca, Persian music, and so on.

The so-called eight beat has three concentric circles, each rhythm played by a separate instrument.

Add one more layer of rhythm to the outermost side, and you'll accentuate the main beat and give it more precision.

Now, let's get rid of this rhythm combination and all but the basic dichotomy.

This rhythmic structure can be found in Cuban cinquillo, Puerto Rican bomba, and northern Romanian music.

If you rotate the outer circle counterclockwise 90 degrees, you get patterns found in Middle Eastern music, Brazilian choro, and Argentine tango.

All of these examples share a basic dichotomy, but they can be expressed differently depending on how they're arranged and the cultural context.

The "Wheel Method" isn't just a clever way to visualize complex rhythms.

Because we are freed from the limitations of a linear staff notation, we can visualize rhythm in terms of time, and we can simply spin a circle and encounter music from all over the world.

If humans didn't exist, wouldn't mathematics exist?

People have long debated whether mathematics was discovered or invented.

Did we create mathematical concepts to make sense of the universe around us, or is mathematics the native language of the universe itself, which exists whether we discover truth or not?

Do numbers, polygons and equations really exist, or are they merely ethereal representations of theoretical ideals?

Some of our ancestors were advocates of the existence of mathematics.

The Pythagorean school of fifth-century Greece believed that numbers were living, universal principles.

They saw the number 1 as the "monad," the origin of all other numbers and the origin of all creation.

Numbers were a living force in nature

Plato argued that mathematical concepts are concrete, independent of our knowledge, and as real as the universe itself.

Euclid, the father of geometries, believed that nature itself was the material expression of mathematical laws.

Some argued that while numbers may or may not exist physically, mathematical propositions certainly do not.

What they value as true is based on human-made rules.

Mathematics, therefore, does not exist outside of human conscious thought, but is a language of abstract relationships based on patterns identified by the brain, and has been adapted to harness these patterns to invent a convenient but artificial order out of chaos, a logical thought exercise invented by humans.

One person who advocated this kind of thinking was Leopold Kronecker, a 19th-century German professor of mathematics.

His conviction is encapsulated in a famous sentence: God created the natural numbers, and everything else is man-made.

In the days of mathematician David Hilbert, there was a tendency to establish mathematics as a logical structure.

Hilbert tried to axiomatize all of mathematics, like Euclid did to geometry.

He and others who have attempted this thought that mathematics was a deep philosophical game, although it was still just a game.

Henri Poincaré, one of the fathers of non-Euclidean geometries, worked with non-flat hyperboloids and ellipsoids to prove that Euclidean geometry is not a universal truth, but a result of using one game rule.

But in 1960, Nobel Prize winner in physics, Eugene Wigner, coined the term "the irrational potency of mathematics," which strongly argues that mathematics is real and discovered by people.

Wigner pointed out that many purely mathematical theories, developed in a "vacuum," so to speak, without the perspective of representing physical phenomena, proved decades or centuries later to be the framework necessary to explain how the universe works.

For example, the British mathematician Gottfried Hardy, who boasted that none of his work would be useful in describing all phenomena in the real world, helped establish cryptography.

Another part of his purely theoretical work, known as the Hardy-Weinberg Law of Inheritance, won him a Nobel Prize.

And Fibonacci came up with the famous number sequence after watching rabbit breeding.

Humans later found that sequence everywhere in nature, from the array of sunflower seeds and petals, to the structure of the pineapple, to the branching of the bronchi in the lungs.

In the 1850s, there was work by the non-Euclidean geometer Bernhard Riemann, which Einstein used a century later as a model for general relativity.

Then there's the giant leap forward: the mathematical knot theory, first devised in 1771 to describe positional geometry, was used in the late 20th century to explain how DNA naturally unwinds during the replication process.

It may also be an important explanation for string theory.

The most influential mathematicians and scientists in human history have often matched their inventions with other problems in surprising ways.

So is mathematics an invention or is it a discovery?

Is it an artificial construct or is it a universal truth?

Is it man-made, or is it nature's or God's creation?

These questions are so profound that the discussion becomes of a spiritual nature.

I think the answer depends on the specific concept you're looking at, but it feels like a twisted Zen invention.

If there are many trees in the forest and no one counts them, does that number exist?

"Sorry my phone is broken"

"Nothing, I'm fine"

"There is no basis for that allegation."

“The company knew nothing about illegal activity.”

"I love you"

Everywhere we go, we hear between 10 and 200 lies a day. There's a long history of finding ways to detect those lies. Medieval torture devices, lie detectors, blood pressure and breathing measurements, voice dynamics analyzers, eye movement monitors, infrared brain scanners and electroencephalography costing £400.

While these instruments have worked well in some situations, they can often be fooled if well-prepared, and none of them are considered accurate enough to be used in court.

But what if the problem isn't in these methods, but in the premise that lying changes physiological states?

What if, in a more direct way, we could use communication science to analyze the lie itself?

Psychologically speaking, sometimes we lie to make ourselves look better, as we associate ourselves with our ideal selves rather than with who we really are.

So while your brain is fantasizing, it's sending out a lot of signals.

We consciously control only 5% of the cognitive functions in our brain, including communication functions. The other 95% are things that happen unconsciously. According to the literature on "reality monitoring," stories based on phantom experiences are qualitatively different from stories based on real experiences.

So you could say that if you make up false stories about yourself, you're going to change the pattern of how you use language.

A technique called linguistic text analysis has identified four linguistic patterns that occur unconsciously when you're lying.

First, when you're lying, you mention yourself less often.

Instead, I write and talk about other people in the third person, to keep myself away from lies and to separate myself from them, but it sounds more like a lie.

Second, when we lie, we tend to be negative, because even liars subconsciously believe that lying is bad.

For example, a lie like this: "I'm sorry.

Third, liars explain things in simple terms, because telling complex lies takes a lot of brain power.

Making judgments and evaluations is a complex thing for the brain.

One American president famously insisted, "I never had a sexual relationship with that woman."

Finally, liars tend to use long, complex sentence structures that are easy to explain, and try to cover up their lies by putting in unnecessary words and saying things that seem irrelevant but seemingly true.

For another president who faced a scandal, he said, "According to this investigation, absolutely no one on the staff of the White House, who is currently in the administration, was involved in this bizarre affair."

Let's apply linguistic analysis to a famous example

Take Lance Armstrong, who won the Tour de France seven times.

In a 2005 interview, he denied using performance-enhancing drugs, but in a 2013 interview, he admitted to doping, with about a three-quarter increase in personal pronoun usage.

Compare the two quotes

The first one is, "As you already know, someone in the lab in Paris will open your sample, and someone named Jean Francis will test it.

Then the newspaper called you and said, 'We've confirmed six positive EPO tests.

Second, "I completely lost myself because of that.

I'm sure there are other people who can't stand it I certainly couldn't I was in control of everything in my life

I was in control of all the results."

In denial, Armstrong was talking about hypothetical situations, focusing on other people and isolating himself from the situation.

In my confession story, I delve into my emotions and motivations.

But using personal pronouns is only one sign that you're lying.

Take another example from former senator and US presidential candidate John Edwards, who said, "I only know that the supposed father said publicly, 'I'm the father of this baby.'

There was no financial demand from the woman or the apparent father of the baby, nor was there any form of consent or assistance."

Not only is it very roundabout to say, "That baby isn't mine," but Edward doesn't mention anyone else's name at all.

Let's take a look at what he later said when he admitted he was the father: "I'm Quinn's father.

I'm going to give her all the love and support she deserves."

It's a simple and direct way of saying it, calling the baby by name and clarifying her role in her life.

How can this kind of deception detection be used in everyday life?

First, many of the lies we encounter on a daily basis are much milder and harmless than the example above.

But it's worth knowing the keys to spotting a lie, such as less self-referencing, negative phrasing, brief explanations, and complex sentence structures.

You may be able to avoid overpriced inventory, unusable products, and bad socializing.

I'm a marine biologist and a National Geographic explorer and photographer. Let me tell you a secret.

This image is completely wrong It is completely wrong

You can see people crying in the background because I messed up the concept of mermaids.

Okay, let's assume mermaids are real, but if you've ever been underwater, you know what they look like.

The ocean is a big filter, so as soon as you're in the water, it loses its color, it quickly turns dark and blue.

humans are terrestrial mammals

I have trichromatic vision, so I can see red, green, and blue. I'm a total color addict.

I love eye-popping colors, and I try to bring vivid colors into the water.

So there's a long, dull history of trying to bring color underwater, which started 88 years ago with Bill Longley and Charles Martin, who wanted to take the first underwater color photographs.

They were in the water in old-fashioned diving suits, pumped with air, and had magnesium powder floats with powerful explosions. And it blew up so hard, and this lightened the water just a little bit, and I took this beautiful picture of a wrasse.

It's a very beautiful photo, but it's not real.

They created an artificial environment to satisfy our color addiction.

When I looked at it the other way around, I realized that instead of coloring the water, I was looking at the blue ocean, which was a blue crucible, and over millions of years, the animals that lived there had evolved in all sorts of ways to capture blue light and give off other colors.

I'll show you what this secret world looks like.

It's like an underwater light show

(music) There's a blue light

These animals absorb blue light and immediately convert it to this light.

If you think about it, 71% of the earth is ocean, and blue light can reach down to about 1,000m.

As you go deeper into the water, after about 10 meters, all the red color disappears.

If you see something red at a depth deeper than 10 meters, it's a unique red color created by living organisms.

It's the largest and only monochromatic blue environment on Earth.

My gateway to the world of biofluorescence was coral.

I'd love to do a TED Talk about corals and their wonders.

One of the amazing abilities of corals is that they produce a lot of fluorescent proteins, fluorescent molecules.

This coral can produce up to 14% of its body weight in fluorescent protein.

You won't build 14% of the muscle that you don't use, so it's likely to have some functional role.

This has been very special to me for the last 10 to 15 years, because this molecule turned out to be one of the most revolutionary tools in biomedical science, allowing us to see better inside the human body.

So how do we investigate this?

To study biofluorescence, I swim at night.

When I started my research, I covered the strobe with a blue sticky tape filter, so I could be sure that it was indeed the light that was converted by an animal.

We were setting up an exhibit for the Natural History Museum to showcase the wonders of fluorescent coral reefs, and something truly amazing happened: this.

In the middle of the coral is a green fluorescent fish.

It was the first time I'd seen a green fluorescent fish or vertebrate.

Rubbing my eyes, checking the filter, using the camera, I thought someone was making fun of me, but the eel was real.

I found my first green fluorescent eel, and it completely changed my direction.

I had to put coral research aside and work with ichthyologist John Sparks to start a survey around the world to see if this was a common phenomenon.

The fish were more interesting than the corals, because they have really advanced vision, and some of them even had lenses in their eyes that magnified fluorescence, just like the way I photographed.

So I wanted to pursue this further.

We designed a new set of equipment to scour reefs around the world for fluorescent organisms.

A bit like "E.T. Home Phone"

We're swimming with blue lights, and we're looking for reactions that organisms absorb and return.

Finally, the rock eel was secretly photographed

Very shy, private, almost unknown

It's about the size of a finger and spends about 99.9% of its time hiding under rocks.

Rock eels come out to mate on the night of the full moon, when the moon is full the water is illuminated blue.

Maybe this is how they look at each other, find each other quickly, mate, go back to their burrows, and hang out again for a long time.

And then I started discovering fluorescent marine life, like this green fluorescent sea bream, with stripes running down its head and neck, almost camouflaged by the same brightness as the fluorescent corals there.

After this fish, I found this red-fluorescent scorpionfish, hiding on top of a rock.

The only time I saw this was on red-fluorescent algae or red-fluorescent coral.

Then we found this sneaky green fluorescent lizard.

This lizard has many different patterns, but under white light they look almost the same.

But when you look at it under fluorescent light, you can see a lot of patterns and you can tell the difference between individuals.

I reported just last year, and in total, we found more than 200 species of biofluorescent fish.

I was inspired by the French artist and biologist Jean Painlevé.

A truly entrepreneurial, creative mind in biology.

He designed his own equipment, built his own camera, was fascinated by seahorses, and filmed the birth of a seahorse for the first time.

this is male

It was one of the first fish to learn to swim upright with its head up.

It's a marvelous creature that males give birth to.

Painlevé stayed up for days

I even captured this moment by wearing an electric visor on my head that shocked me.

I wanted to show Painlevé the moment we found a biofluorescent seahorse in the exact same species he was studying.

this is a picture we took

(music) They are the most mysterious fish

You can't see a seahorse even if you swim directly over it.

They're just immersed in red-fluorescent algae. They have very good eyes and perform long courtship rituals, which is probably why fluorescence is so effective in courtship.

And then there was something very horrifying. We found green fluorescence in stingrays.

there are sharks

Well, I'm a coral biologist.

Someone needs to dive in and see if sharks are fluorescent.

there i am

(Laughter) It's like, "Maybe we should go back to coral."

(Laughter) Turns out this shark isn't fluorescent.

then i found

In a deep, dark canyon off the coast of California, we spotted the first biofluorescent swell shark, right below the surfers.

This one

It is about 1m in size and is called a swell shark.

It's called a swell shark because when it senses danger, it drinks water and doubles like a tire tube, burrowing under rocks to avoid being eaten by predators.

This is the first footage of a biofluorescent swell shark.

It's amazing -- I mean, they have a unique pattern, some of them are fluorescent and some of them aren't, but they also have some shimmery specks that are a lot brighter than the rest.

Everyone is beautiful when you look at this

I feel gorgeous

But what does this mean for sharks?

Can you see the shark?

I looked in the literature, but nothing was known about this shark's vision.

So I took it to Ellis Lowe, an ophthalmologist at Cornell University, and they discovered that they could see a distinct line between blue and green, maybe 100 times better in the dark than we do, but we could only see blue and green.

They're in this blue world, absorbing blue to make green.

They're the ones who actually create the visible contrast.

This model demonstrates the ability to see all patterns.

We also found that males and females have distinctive patterns.

We made our latest discovery just a few kilometers from where we are now in the Solomon Islands.

While swimming at night, I encountered my first biofluorescent sea turtle.

I started with fish and sharks, then moved on to reptiles, which happened only a month or so ago, but I realized that I knew next to nothing about hawksbill turtle vision.

It got me thinking about how much more there is to learn.

Here in the Solomon Islands is one of their hotspots, but there are only a few thousand breeding female hawksbill turtles.

This shows us the compelling need to protect them, something we want to understand while they're still around.

How deep does biofluorescence exist?

All the way to the bottom of the sea?

We started using submarines with special blue lights on the front.

And as I dived down, I noticed one important thing: when you get close to 1,000 meters, they start to disappear.

There was no biofluorescent marine life below 1,000m, almost nothing, just darkness.

It was primarily a phenomenon in shallow water.

Below 1,000m, we encountered a bioluminescence field, where nine out of ten were making their own light and blinking.

I'm trying to dive deeper, so I'm wearing a one-person diving suit.

(Laughter) But as I explored underwater, I started thinking, "How to treat the creatures kindly."

We're in a new era of exploration, and we have to be vigilant and lead the way in exploration.

That's why I worked with Harvard roboticist Rob Wood to design a flexible underwater robot finger that can gently handle underwater life.

Most of the technology for deep sea exploration comes from oil, gas, military, and they don't really care to be nice.

Some corals may be 1,000 years old

You don't want to crush it with your big claws, do you?

my dream is like this

You board a submarine at night, and you use force-feedback gloves to carefully create a laboratory in front of the submarine, where flexible robotic fingers gently collect samples, place them in jars, and conduct research.

Let's go back to useful applications

This is a living brain, and we're using DNA from marine organisms, in this case from jellyfish and coral, to look at neural connections from luminescence in living brains.

It's interesting that they're using the three primary colors of light to satisfy human intuition, but they give us a much better look at our brains.

What's even more amazing is that a good colleague of mine, Vincent Pieribong at Yale University, actually devised and designed a fluorescent protein that responds to voltage.

So now we can see neurons firing.

As you can see, a gateway to consciousness was created using marine life.

This reminded me of the future perspective and its relevance.

From deep space, our galaxy looks like a human brain cell.

My hope is that with this enlightened mind, we will be able to contemplate the holistic relationship of all living things and understand how beneficial it is to maintain healthy oceans.

thank you

(applause)

The largest organ in your body is neither your liver nor your brain.

It's the skin, and it's surface area is two square meters in an adult.

Although different parts of the skin have different characteristics, they mostly have similar functions, such as perspiration, the perception of cold and heat, and hair growth.

But after a deep cut or injury, the new skin that repairs looks different than the surrounding area and may not fully restore function for some time, or may never.

To understand why this happens, we have to look at the structure of human skin.

The top layer of the skin, called the epidermis, is made up mostly of hardened cells called keratinocytes that act as a barrier.

The outer layer is constantly being sloughed off and regenerated, so it's very easy to repair.

But injuries sometimes reach the dermis, which contains blood vessels, various glands, and nerve endings, enabling many functions.

When this happens, four overlapping stages of the regeneration process begin.

The first step is hemostasis, the skin's response to two sudden threats: one is blood loss and the other is that the physical protection of the epidermis is compromised.

In a process known as vasoconstriction, blood vessels constrict to minimize bleeding, and clot formation averts both threats.

A special protein called fibrin creates cross-links on the surface of the skin to prevent bleeding and invasion of bacteria and pathogens.

After about three hours, the skin begins to turn red and moves on to the next stage called inflammation.

Bleeding is controlled, barriers are secured, and the body sends special cells to fight any pathogens that may invade.

The most important of these are white blood cells, known as macrophages, which devour bacteria and damaged tissue in a process called phagocytosis and produce growth factors that promote healing.

And as these little warriors have to move through the blood to the wound, the previously constricted blood vessels now widen in a process called vasodilation.

A few days after injury, the proliferative phase begins, and fibroblasts begin to enter the wound.

In the process of collagen deposition, fibroblasts produce a fibrous protein called collagen at the wound site, which replaces conventional fibrin to form skin connective tissue.

Epidermal cells divide to remake the outer layer of skin, and the dermis contracts to seal the wound.

Finally, in the fourth and fourth stage of remodeling, the newly deposited collagen rearranges and converts into specific types, stabilizing the wound site.

This process takes over a year and improves the tensile strength of the new skin, strengthening blood vessels and other connections.

Over time, the function of the new tissue recovers to 50-80% of the original healthy tissue, depending on the severity and function of the original injury.

But because the skin never fully heals, scarring remains a major clinical challenge for doctors around the world.

Although researchers have made great strides in understanding this healing process, many fundamental mysteries remain unsolved.

For example, do fibroblasts come from blood vessels or do they come from the skin tissue near the wound?

And why are some mammals, such as deer, able to heal wounds so much more efficiently or completely than humans?

By finding answers to these questions, we may one day be able to heal so well that wounds are just memories.

Have you ever noticed something swimming in front of you?

It may look like a tiny bug or a transparent enigma, but when you look closer, it disappears, and when you look away, it reappears.

But don't wash your eyes

In fact, this happens often and it is "floating matter"

The scientific name for these floaters is muskai volitantes, which is Latin for "floaters," and as such, they're a nuisance.

But it's not really an insect, it's not a foreign substance.

Rather, it's something that exists in the eyeball.

The floating object moves and changes shape, so it may look like a living thing, but it's not alive.

Floaters are small objects that cast shadows on the retina, the light-sensitive tissue at the back of the eye.

Floaters may be small pieces of tissue, red blood cells, or protein clumps.

It's suspended in the vitreous humor, which is the gel-like fluid that fills the inside of the eye.

In most cases, floaters are barely noticeable

The closer you get to the retina, the clearer you see, and it's kind of like moving your hand closer to a table under an electric light, and you're creating sharper shadows.

Floaters are especially noticeable when looking at a uniformly bright surface, such as a blank computer screen, snow, or a clear sky, because the uniformity of the background makes the floaters more visible.

The brighter the light, the more the pupil constricts.

This has the same effect as replacing a large, spread out light source with a single light source, which creates sharp shadows.

There are other things that are similar to floaters' vision, but they're completely different.

You've probably seen tiny dots of light move quickly when you look at a bright blue sky, an experience called "bluefield entropia."

In a way, it's the opposite of seeing floaters.

In this case, you're not looking at a shadow, but a small moving window that allows light to pass through to your retina.

This window is actually made by white blood cells that move through capillaries on the surface of the retina.

When a white blood cell is large enough to fill a capillary, there is a space in front of the white blood cell that contains only plasma, and both the white blood cell and this portion of the plasma.

It lets more blue light through than the red blood cells inside the capillaries, so whenever this happens, you'll see a moving dot of light that follows the flow of the capillaries in the same rhythm as the pulse.

If the conditions are right, you can even see something like a black tail behind the dots.

These are red blood cells clustered behind white blood cells.

A science museum has a display of blue light screens where you can see these blue light fairies much more clearly than you normally would.

Anyone can experience this eye, but the number and type of objects vary greatly from person to person.

Most of the time you don't notice it because your brain learns to ignore it.

But abnormally high numbers or large floaters obstructing vision indicate a more serious condition and require immediate medical attention.

But most of the time, endoscopic phenomena, like floating objects and blue sky fairies, quietly tell us that what we think we're seeing isn't actually something that exists outside of us, it's biology and psychology.

Imagine yourself in Rome facing the Vatican Museums

Walk slowly through long corridors past sculptures, frescoes and other objects

Aiming for the Sistine Chapel

Beyond the long corridor, stairs and doors

The entrance of the chapel appears

what would you expect?

A spacious dome? A choir of angels?

Actually there is no such thing

It might be better to think of it this way: what's there?

Curtains hang on the walls of the chapel

It's literally surrounded by curtains painted on the walls, and this is the original decoration of the chapel.

Churches used tapestries not only to keep the cold out during long masses, but to represent "the great theater of life."

This human drama is a grand narrative in which we're all given a role, a narrative that embraces the whole world, and the painting of the Sistine Chapel unfolds along three stages.

It was originally a space built for the few rich and educated Christian clergy.

They prayed here, they elected the Pope here.

500 years ago, this was the ultimate "man's hideout" for priests.

So how did this place come to attract and attract five million people from all different cultures each year?

It's because of the explosion of creativity in this small space, where the frenetic excitement of discovering new geopolitical territories has inspired an age-old tradition of ecclesiastical missionary work to create some of the greatest works of art in history.

This development was a major breakthrough that started with a small elite and ended up speaking to a global audience of masses.

This progress went through three stages, each linked to a historical event.

the first stage is quite limited

It reflected a very narrow view.

The second stage came about as Columbus' historic voyage dramatically changed the worldview. And the third stage occurred when the Age of Discovery was well advanced and the Church was facing the challenges of globalization.

The original decoration of this church reflects a small world.

It has vibrant scenes telling the lives of Christ and Moses, and shows the progress of Jews and Christians.

Pope Sixtus IV, who commissioned it, assembled a dream team of the Florentine art scene, including Sandro Botticelli and Ghirlandaio, who later became Michelangelo's teacher.

They covered the walls with decorations of pure color, and you'll find familiar sights in this story, bringing in Roman monuments and Tuscan landscapes to make the story far, far away more accessible.

The pope's own friends and family were also included, and would have been a perfect decoration for a small continental European court.

However, by the time the New World was discovered in 1492, the world had expanded so much that it became necessary to expand this microcosm, which is 40 meters deep and 14 meters wide.

And it happened thanks to a genius of creativity and vision and a great story.

This genius was Michelangelo Buonarrotti. He was 33 when he was commissioned to decorate the 1,100-square-meter ceiling.

In Florence, there were many clients who were furious, because they left a pile of unfinished commissions and went to Rome in hopes of a big sculptural project.

All he was left with was the contract to paint the Twelve Apostles over a decorative background on the ceiling of the Sistine Chapel, a decorative painting that could be found anywhere in Italy.

But this genius tries

At a time when men had bravely crossed the Atlantic Ocean, Michelangelo wanted to chart a new art.

He also tried to tell a story, but not the story of the Apostles, but the story of the great beginning, the story of Genesis.

Painting a story on the ceiling is no easy task.

How can you read the lively scene from 19m below?

For 200 years, the techniques of painting that had been handed down in the Florentine workshops weren't enough to tell a story like this.

But Michelangelo wasn't a painter by profession, so he decided to play to his strengths.

Instead of mastering the art of crowd-filling spaces, he took a hammer and a chisel and carved a block of marble out of which he carved out a human figure.

Michelangelo focused on substance and used his dynamic, majestic body to tell the story.

The plan was backed by the extraordinary Pope Julius II, who did not fear Michelangelo's daring talent.

He was the nephew of Pope Sixtus IV, and had been immersed in art for 30 years, so he knew its power.

Historically known as the "Fighting Pope," he left the Vatican with neither fortresses nor artillery, but art.

Raphael's Room and Sistine Chapel

Peter's Basilica and a large collection of Greco-Roman sculpture, certainly not Christian, but this collection formed the basis of the world's first modern art museum, the Vatican Museums.

A man named Julius wanted to give the Vatican eternal significance through splendor and beauty, and he was right.

When two giants, Michelangelo and Julius II, met, the Sistine Chapel was born.

Michelangelo immersed himself in this project, completing it in three-and-a-half years, using minimal manpower, spending many hours, most of the time, reaching over his head and painting the story on the ceiling.

So let's take a look at this ceiling painting and see how the story unfolds around the world.

The familiar relationship between art and our world no longer exists.

There is nothing but space, structure and energy, imposing frames surrounding nine panels, driven by sculptural forms rather than pictorial colors.

We stand at the end of the room near the entrance, away from the altar, through the fence with the entrance for the priests, we peer in, looking for the beginning in the distance.

Whether it's a scientific inquiry or a biblical tradition, we think first of all about the primordial light.

Michelangelo expressed the primordial energy by drawing in a small space a vaguely throbbing figure in the distance, as if light and darkness were divided.

And then you see it grow bigger and move from left to right with tremendous force.

After that, we're left with the sun, the moon, and the plants.

Unlike other painters, Michelangelo doesn't focus on what he creates.

I focused on the act of creation itself.

And like a pause in poetry, the movement is stilled and the creator stops.

What are you doing?

Are you building the land, or is it the sea?

Or are we looking back at the universe and all the treasures we've created, and like Michelangelo, are we looking back at our creations on the ceiling and saying, "Good."

Now that the scene is set, we come to the climax of creation, the creation of man.

Adam stands out brightly against a dark background.

But if you look closely, your feet are resting loosely on the ground and your arms are leaning heavily on your knees.

Adam lacks the inner radiance that propels him toward greatness.

The Creator is about to give that brilliance from the tip of his finger, just a millimeter between Adam's hand.

This is what drives us crazy, because we're almost at the touch of a finger, and we're about to find our purpose, rise up, and reach the pinnacle of creation.

Michelangelo throws a curveball here.

Who is in the other arm?

first woman eve

But Eve isn't just an idea, it's part of the plot

It was in Michelangelo's head from the beginning.

Look at Eve, you're close enough to put your arms around the arms of God

For me, as a 21st-century American art historian, this was the moment when painting really spoke to me.

Because I realized that the human drama represented here is that of a man and a woman, and that's why the heart of the ceiling, the center, is not the creation of Adam, but the creation of women.

Indeed, they were together in the Garden of Eden, and together in their depravity, together in their dignified appearance and in their shameful stooping.

We've just reached a critical point in the ceiling.

We're at a point in the church where we can't go any further.

It's like an exiled Adam and Eve, because it's a fence with an entrance and you can't get to the altar inside.

The later scene painted on the ceiling reflects the crowded world around us.

Noah, the Ark and the Flood

Noah makes a sacrifice and makes a contract with God

he may be the savior

Meanwhile, Noah grows grapes, makes wine, gets drunk, and sleeps naked in his barn.

It's a strange ceiling design, because it goes from God creating life to a man getting drunk in a barn.

If you compare it to Adam, you'd think Michelangelo was kidding us.

But he blasts out the darkness by placing bright colors just below Noah, emerald, orange and scarlet, the prophet Zechariah.

Zechariah prophesied that a light would shine from the east, and at that moment our eyes would be turned in a new direction, and lines of priestesses and prophets would guide us.

Follow your mothers and fathers, led by heroes who ensure your safety along the way

They power the great human engine forward.

Now, at last, we come to a point where all of the ceiling paintings come to a climax, where there are figures who step out of their own realm and invade our space.

here is the most important aspect

where the past meets the present

Because this man, Jonah, spent three days in the belly of a whale, for Christians he symbolizes the resurrection of man through the sacrifice of Jesus. But for the thousands of visitors of all faiths who come here every day, Jonah represents the moment when the distant past meets the present reality.

All of this leads us to the gaping altar arch, where we see Michelangelo's The Last Judgment, painted in 1534, after the world had once again been transformed.

The Reformation had split the church, the Ottoman Empire had spread the name of Islam, and Magellan had discovered the sea route to the Pacific.

How does a 59-year-old artist who has never been farther than Venice speak to this new world?

What Michelangelo tried to portray was destiny, the universal desire shared by all humankind to leave something of excellence to future generations.

To tell the apocalypse from the Christian perspective of "The Last Judgment," Michelangelo painted human figures with amazingly beautiful bodies.

With a few exceptions, he's wearing nothing and no portrait of anyone.

Made up entirely of physical bodies, none of these 391 people are the same, they are all unique, just like us.

People struggle to get out of the ground in the bottom corners and up.

Ascended people reach out to help others, and in this wonderful scene, blacks and whites are pulled together, a perfect example of human harmony in a new world.

The biggest part of the screen is given to the winner.

There are men and women who are naked like athletes.

They are the people who have overcome hardships, the figurines of Michelangelo's imagination of people who fight hardships and overcome obstacles, just like athletes.

A man and a woman flexing and posing in a tremendous spotlight.

This group is led by Jesus, the man who endured pain on the cross is now the glorious ruler of Heaven.

As Michelangelo showed in his paintings, hardships, setbacks and obstacles create virtue rather than stifle it.

By the way, this leads to strange results.

This is the Pope's private chapel, but it's probably best described as "a crowd of nudes."

Yet Michelangelo tried to use the highest artistic language possible, the most universal artistic language imaginable: the human body.

So instead of using methods of demonstrating virtues such as fortitude and self-control, I took a cue from Julius II's stunning collection of sculptures to represent inner strength as an outward force.

By the way, one of those days wrote that this chapel was so beautiful that controversy would be inevitable.

it actually happened

Thanks to the printing press, Michelangelo became aware of the widespread critique of nudity. Soon, this masterpiece of human drama was labeled "pornographic." It was around this time that he added two more portraits, one of the chief of ceremonies who condemned him, and the other of himself, not as an athlete, but as a parched skin, in the hands of a tortured martyr.

In the year he died, a veil was added to a few figures, and the glories he preached were thwarted by superfluous things.

now we are in this world

This space between the beginning and the end is trapped in the entire grand human experience.

We look around in the Sistine Chapel like we look into a mirror.

Who am I in this picture?

Are you in the crowd?

Is it that drunk?

Are you that athlete?

And by the time we leave this paradise of breathtaking beauty, we're left with the biggest question of our lives: Who am I? What role do I play on the big stage of life?

thank you

(Applause) (Bruno Giussani) Thank you, Elizabeth Lev.

You brought up the subject of pornography, which was too much nudity, too many scenes of everyday life, too much inappropriate stuff for people at the time.

but the problem is more serious

It's not just a matter of adding a cover,

The art was on the verge of being destroyed

(Elizabeth Lev) "The Last Judgment" had a huge impact.

Because printing made it available to everyone.

This problem didn't just happen in a week or two.

It's been a problem for 20 years, and the church has received comments and criticisms like, "There's no way the church can tell us how to live.

There's porn in the Pope's chapel."

Despite all these criticisms and claims to destroy the work, in the year Michelangelo died, the church finally came up with a compromise to protect the work, and that was to add 30 additional coverings.

It all started here: the church wanted to protect the artwork, not defile it or destroy it.

Bruno: That's a very different story from the tour guides you hear in the Sistine Chapel.

(Laughter) (Elizabeth) How about it's an advertisement?

(Laughter) (Bruno) No, no, it's just my opinion.

Now, when we experience art, there are some problems.

Too many people want to be there, five million people walk through the little door of the chapel, and it's nothing like what we're going through right now.

CA: Well, it's certainly nice to stop and look.

But I want you to understand that even when 28,000 people were visiting every day, when there were a lot of people looking around and feeling the wonder together, the 500-year-old mural attracted everyone standing around them, and they were all looking up at the ceiling and being moved.

It's a stunning testament to how true beauty can travel across time and geography to all of us.

(Bruno) Grazie

(Elizabeth) Grazie

(Bruno) Thank you

(applause)

Since the earliest days of human existence, we've been fascinated by death and resurrection.

It's told in nearly every corner of the world, from ancient myths to the latest blockbusters, where the dead keep coming back to life.

But can the dead really come back to life?

What really is the difference between a living person and a dead person?

To understand death you must know life

According to the ancient theory of vitality, life itself is wonderful because it's filled with a special substance and energy that is the basis of life.

It's called qi, blood, and body fluids.

Vitalism began to fade in the West during the Scientific Revolution in the 17th century.

Rene Descartes developed that the human body is basically a machine, but that the pineal gland in the brain is animated by a God-created soul.

In 1907, Dr. Duncan McDougal claimed the weight of the soul, and to prove it, he weighed his patients before and after death.

Like the theory of vitality, this experiment was questioned, but his theory is still talked about today.

What do these discredited theories tell us?

What we now know is that while magical substances and sparkles don't bring life, the biological processes at work do.

To understand these processes, we need to drill down to the level of individual cells.

Chemical reactions are constantly taking place inside cells, and glucose and oxygen work together to create ATP, the energy-carrying molecule in the body.

Cells use that energy to do everything from repair to growth to reproduction.

It takes a lot of energy to make the molecules we want, but it takes more energy to get the molecules where they are needed.

The natural law of entropy is that molecules tend to randomly diffuse from high concentrations to low concentrations, becoming smaller molecules and atoms.

Cells have to constantly slow down the increase in entropy, and they use energy to keep molecules in their extremely complex structures in order to function biologically.

When all cells succumb to entropy, this arrangement breaks down, resulting in death.

This is why once an organism dies, it doesn't come back to life.

Pumping air into your lungs won't revive you because many processes in the respiratory cycle aren't working.

Similarly, the electric shocks of a defibrillator cannot move a stopped heart, but they can synchronize dysfunctional heart muscle cells back into a normal heart rhythm.

This only prevents death, it doesn't wake up corpses or monsters stitched together from corpses.

Various medical miracles can delay or prevent death, but they cannot bring it back.

But it's not a simple matter either, and thanks to ever-advancing technology and medicine, there is a chance that people diagnosed with a coma who were previously thought to be dead may be brought back to life.

life expectancy may increase in the future

Some animals extend their lifespans and survive harsh environments by slowing biological processes to the point of almost stopping.

Human freezing research attempts to freeze people who are dying and later bring them back to life when new technology is available to help them.

As you can see, when you freeze a cell, the molecules move very little, effectively stopping diffusion.

Even if all of a human's cellular processes were destroyed, by using nanobots to move all the molecules into place and injecting ATP into every cell at the same time, perhaps it would come back to life, returning to the state it was in when it was frozen, and perhaps the body would begin to move.

So if we understand life not as a magical spark, but as a highly complex, self-perpetuating structure, then death is a process of increasing entropy that upsets this precarious balance.

The moment someone dies completely is not universally defined, but it depends on the amount of entropy increase that is currently controllable.

Various forms of slavery have existed all over the world, treating people as assets and disenfranchising them.

Among them, the one that is unique in its scale and impact on posterity is

The Atlantic slave trade, which existed from the late 15th century to the mid-19th century and affected three continents, forcibly exiled more than 10 million Africans to the Americas.

The transatlantic slave trade left its mark not only on the enslaved people, but on their descendants and on the economy and history of much of the world.

Originally, Europe and Africa had been in contact for centuries through the Mediterranean.

But the transatlantic slave trade began in the late 1400s with the Portuguese colonies in West Africa and the subsequent Spanish colonization of the Americas.

The sugar cane, tobacco, and cotton produced in the new colonies required a great deal of labor, and settlers and indentured servants were simply not enough to clear the land.

They enslaved the Native Americans, but many died from the diseases they brought with them, and many resisted.

So Europeans looked to Africa as a source of labor.

African slavery has existed in many forms for centuries.

Some of the slaves were indentured servants for a set period of time, and they could even buy back their freedom.

There were also slaves who were closer to European serfs

In some areas, slaves were included in the master's family, owned their own land, and even held positions of power.

But when white sea captains began offering industrial goods, weapons and rum in exchange for slaves, African kings and merchants had no reason to hesitate.

They saw slaves not as their fellow countrymen, but as criminals, debtors, prisoners of war of rival tribes.

By selling these people into slavery, the kingdom became rich and could compete with its neighbors.

Thus, the slave trade prospered the African kingdoms, but it also increased competition to meet the growing demand from Europe.

Slavery took the place of other punishments, and obtaining slaves became the object of the war itself.

To protect themselves from slave hunters, kingdoms sought European guns, which they obtained by selling slaves.

Thus, the slave trade led to an arms race that transformed the social and economic landscape of Africa.

An unimaginably cruel fate awaited the slaves.

They were forced to walk to a coastal slave market, shaved to keep out lice, branded and stuffed onto ships bound for the Americas.

About 20% of slaves never saw land.

At the time, every captain packed as many slaves in the hold as he could.

Many died of disease in unsanitary conditions, others fell ill or were thrown into the sea as an example. Captains secured their own profits by cutting off slaves' ears as proof of purchase.

Some of the slaves did their own thing

Many people in inland Africa had never seen a white man before, and they thought they were cannibals, so they often kidnapped people and came back for more people.

Fearing being eaten, they would sometimes choose to kill themselves or even starve to escape further suffering, believing that dying would allow the soul to return home.

Those who survived were stripped of their human dignity and treated as mere cargo.

Women and children were abused on deck by sailors, and men were forced to dance, to keep them exercising and to prevent mutiny.

The scars of slavery on the Africans who arrived in the New World and their descendants are well known.

Less discussed is the impact of the Atlantic slave trade on Africa's future.

Africa didn't just lose tens of millions of healthy inhabitants; the long-term demographic impact was far greater, as most of the slaves were men.

Ultimately, when the slave trade was outlawed in the Americas and Europe, the economies of the African kingdoms that depended on the slave trade also collapsed, resulting in conquest and colonization.

The competition and influx of European weapons continues unabated, fueling wars and social unrest to this day.

And the Atlantic slave trade played a role in spreading racism.

For the most part, slavery in Africa had no deeper meaning than punishment and tribal warfare, but Europeans, who preached a "world religion" and traditionally forbade the enslavement of Christians, had to justify an act of slavery that was in direct conflict with the idea of ​​equality.

So they went to great lengths to justify this theory, claiming that Africans were biologically inferior and destined to be slaves.

Thus, slavery in Europe and the Americas took root in a discriminatory environment, preventing slaves themselves and their descendants from attaining equal social status.

So, in every way, the Atlantic slave trade is an injustice on a colossal scale that continues to reverberate even after the system has been abolished.

The human eye is such an amazing machine that it can capture anything from a few photons to intense sunlight, and it takes only a third of a second to switch focus from the screen in front of you to the horizon in the distance.

The structures that enable this amazing flexibility were once thought to be extremely complex, and Charles Darwin himself admitted that it's extremely unlikely that something like that could have come about through evolution.

But that's exactly what happened, and it started more than 500 million years ago.

The origin of the human eye is a simple light-sensitive spot that can be seen in single-celled organisms like euglena.

It's a collection of light-sensitive proteins that are attached to the flagella and that move toward the 'bait', the light.

A slightly more complex form of photosensitive spots is found in flatworms like planarians.

Being concave rather than flat allows us to better discern the direction the light is coming from.

These eyes allow us to find cover and hide from predators.

Over the years, in certain organisms, these photosensitive pits became deeper and narrower.

As a result, the pinhole camera system dramatically improves resolution and reduces image distortion by allowing only a narrow beam of light to enter the eye.

The nautilus, the ancestor of the octopus, uses this pinhole eye for high resolution and orientation.

A pinhole eye can still produce simple images, but the lens is the key step towards the human eye.

The evolution of the lens is based on clear cells that line the openings to prevent infection, allowing the eye to fill with fluid, increasing its sensitivity to light and its ability to process light.

A crystalline protein formed on the surface of the eye was effective in focusing light to a single point on the retina.

This lens is the key to the eye's adaptability, allowing it to focus near and far by varying the degree of curvature.

This pinhole camera structure with a lens was the basis for the evolution of the human eye.

Elements that further improve the eye include the iris, the colored disc that regulates the amount of light entering the eye, the sclera, the tough, white outer layer that supports the structure of the eye, and the lacrimal glands that secrete tears, which act as a protective film for the eye.

Just as important to vision as the eye itself is the evolution of the brain, the expansion of the visual cortex has made it possible to process sharper and more colorful images.

We now know that the design of the eye is far from the ideal masterpiece, and the eye has left its mark of evolution through stages.

For example, the human retina is attached inside out, with the light-sensing cells facing backwards.

It's what causes the blind spot, because we need to make a hole in the retina for the optic nerve to go to the light-sensitive layer.

The eyes of cephalopods look the same, but they evolved separately, with forward-facing retinas and no blind spots.

as indicating another adaptation

The four-eyed fish has eyes that are divided into two parts so that it can see above and below the surface of the water, so it can look for prey and predators at the same time.

Originally nocturnal hunters, cats have evolved a reflective layer that maximizes their ability to detect light, giving them excellent night vision and glow-in-the-dark eyes.

These are just a few examples of the wide variety of eyes found in the animal kingdom.

If you were to design an eye, what shape would you choose?

this is not such a weird question

Today, doctors and scientists are looking at different eye structures to design bionic implants for blind people.

In the not-too-distant future, artificial eyes with the precision and flexibility of the human eye may surpass the evolution of the eye.

It was one autumn afternoon in 2005.

I was working as a scientific advisor for the American Civil Liberties Union.

I loved my job, but I was a little demotivated at the time.

So I wandered down the hallway to my colleague Chris Hansen's room.

Chris had worked for the American Civil Liberties Union for more than 30 years, so he was very knowledgeable and insightful about the organization.

So I told Chris, "I feel like I'm stuck."

I've been investigating all the issues that arise between science and civil liberties, and it's been a very interesting job.

I just wanted the association to be more deeply involved and influential on these issues.

Chris said straight out, "What are the top five problems you're working on?"

"Yeah, genetic discrimination and reproductive technology, biobanks, and then

Yes, there was a big problem with using fMRI as a lie detector.

Then there is the gene patent.”

"Gene patent?"

"Yes, patent the human gene."

"Impossible!

Are you saying that the US government allows patents on parts of the human body?

that would be funny"

So I went back to my room and sent three articles to Chris.

Twenty minutes later, he rushed into my room and said,

"Really! Who are you going to sue?"

(Laughter) Chris is a great lawyer, but he knew very little about patent law, and he knew nothing about genetics.

I know genetics, but I'm not a lawyer, much less a patent attorney.

So it was clear that I had a lot to learn to sue.

The first thing we needed to understand was what could be patented with gene patents.

Gene patents typically contain dozens of claims, but the most controversial are so-called "isolated DNA," fragments of DNA that have been removed from a cell.

Advocates of gene patenting argue that we're patenting isolated genes, not genes in the body.

Yes, but the problem is that in order to use a gene, it must be isolated.

And patents cover not only isolated specific genes, but all variations of those genes.

what does this mean?

It's no longer possible to give your gene to a doctor and have it tested and tested for mutations without permission from the patent owner.

In addition, the patent holder has the right to stop research and clinical trials using that gene.

Many patent holders are private companies, but if they can secure parts of the human genome, it's the patients who suffer.

Let's take the example of Abigail. At age 10, she had "long QT syndrome," a serious heart condition that can lead to sudden death if left untreated.

A company that owns patents on two genes associated with the disease has developed a test to diagnose the syndrome.

But the company went bankrupt, and no inspection was carried out.

Another lab tried to do it, but the company that held the patent threatened to sue the lab for patent infringement.

As a result, I couldn't test for two years.

In the meantime, Abigail died without being diagnosed with long QT syndrome.

Gene patents were clearly problematic, and they were plaguing patients.

But was there a way to combat this situation?

I did some research and found that the Supreme Court has made it clear through numerous lawsuits that there are things that are not patent eligible.

What cannot be patented are natural products, such as air, water, minerals, substances on the periodic table, and so on.

Also, we can't patent the laws of nature, we can't have the law of universal gravitation or E=mc^2.

These very fundamental existences of nature should be free for everyone to use, not monopolized by anyone.

And because DNA, the basic structure of life, encodes all the proteins that make us who we are, we thought of it as a natural product, a law of nature, whether it's in our bodies or in a test tube.

To really delve into this issue, we traveled around the country talking to different experts -- scientists, medical experts, lawyers, patent law experts.

Most of the people decided that we were right, politically, theoretically, legally.

But all the experts believed that the odds of winning a lawsuit against a gene patent were almost zero.

Why

In fact, the Patent Office has been recognizing gene patents for over 20 years.

There were literally thousands of human gene patents.

Patent barriers to entry were so entrenched that the bioindustry grew out of this practice, and a bill banning genetic patents had been before Congress for years, but had completely stalled.

The bottom line is that courts are unlikely to overturn these patents.

Chris and I weren't the type to run away from difficult things, and when people said, "You can't just be right," it made sense to take the fight.

So I started collecting evidence.

A common form of patent litigation is, for example, Company A suing Company B over a very detailed and esoteric technical issue.

But we weren't interested in those lawsuits, and thought the subject was much more serious.

It was about scientific freedom, medical progress and patient rights.

So we've decided to move this litigation closer to being a civil rights litigation than a typical patent litigation.

First, we identified the holders of the gene patents that were actively asserting their patents, and then assembled a large panel of plaintiffs and experts to prepare them to argue with the courts that such patents would harm patients and innovation in every way.

And we found our prime candidate, Myriad Genetics, a company based in Salt Lake, Utah.

Myriad had patents on two genes, the BRCA1 and BRCA2 genes.

Women with certain mutations in this gene have a much higher risk of developing breast and ovarian cancer.

Myriad is using this patent to maintain its exclusive U.S. BRCA test monopoly.

I put a hold on multiple labs that were trying to do this test.

Myriad charged a hefty fee of over $3,000 for testing.

We also withheld clinical data from the global scientific community.

Worse still, for several years, Myriad refused to update its tests to include the mutations newly identified by the French researchers.

An estimated 12 percent of women tested during this multi-year period received an incorrect result - a negative result when they could have been positive.

she's kathleen maxian

Her sister Eileen was diagnosed with breast cancer at age 40 and tested by Myriad.

the result is negative

family was relieved

Because the results showed that Eileen's cancer probably wasn't inherited from her family, and her family didn't need to be tested.

But two years later, Kathleen was diagnosed with very advanced ovarian cancer.

Kathleen's sister was one of the 12 percent of women who tested falsely negative.

If Eileen had gotten the correct test results, Kathleen might have been tested and ovarian cancer could have been prevented.

Once we had our sights set on Myriad, it became necessary to assemble a plaintiff panel that included experts who could figure out the problem.

We ended up with 20 aspiring plaintiffs: genetic counselors, geneticists who had received a cease and desist letter of patent infringement, an advocacy group, four scientific societies representing a combined 150,000 scientists and medical professionals, and private women who couldn't afford to be tested by Myriad because of their patents, or who wanted a second opinion but couldn't get one.

The hardest part of preparing for the lawsuit was how to communicate the science in a way that was easy to understand.

What Myriad did was not an "invention." To prove that the isolated BRCA gene was a natural product, they had to explain some basic concepts: What is a gene? What is DNA?

How is DNA isolated and why is it not an invention?

We spent hours with plaintiffs and experts trying to figure out how to explain those concepts simply and accurately.

As a result, we often rely on metaphors, like the "money" metaphor.

Isolated DNA is like digging gold out of a mountain or collecting it from the bottom of a river.

You may be able to patent a method of mining gold, but you can't patent the gold itself.

It may take hard work and a lot of effort to get gold out of a mountain, but it still can't be patented, because it's gold.

You can't use gold when it's in the mountains, but you can mine it and make jewelry, for example. And you can't even patent it. Gold is gold.

In 2009, I was ready to file a lawsuit.

It filed a lawsuit in federal court for the Southern District of New York and was assigned to Judge Robert Sweet for random allocation.

In March of 2010, Judge Sweet published an opinion, 152 pages long, and it was our complete victory.

When I read the judge's opinion, I was amazed at how eloquently he explained the scientific content of this case.

Our dossier was pretty good, but it wasn't quite there.

So how did the judge come to such a deep understanding of the matter in such a short period of time?

we didn't know how

As it turned out, the clerk working under Judge Sweet at the time was not just a lawyer, he was also a scientist.

And he wasn't just a scientist, he had a PhD in molecular biology.

(Laughter) It was a stroke of luck.

Myriad appealed to the Court of Appeals for the Federal Circuit.

Things get interesting from here

First of all, the U.S. government changed its position at a crucial stage in this case.

The government had filed a letter defending Myriad in district court.

But on appeal, the government took the opposite position from the patent office, stating in writing that it reconsidered the case based on the judgment of the district court and concluded that isolated DNA is not patentable.

This was very important and unexpected.

The Court of Appeals for the Federal Circuit hears all patent litigation, and is known to take patent protection seriously.

So even with all this impressive progress, I was prepared to lose the case.

it turned out that way

"almost" lost

Because the judgment was divided 2 to 1

But the two judges ruled against the case for completely different reasons.

The first, Judge Raleigh, came up with his own new biological hypothesis, which was irrelevant.

(Laughter) Myriad decided that they had created a new chemical, which makes absolutely no sense.

Myriad didn't make that claim either, and it was a sudden decision.

Another Justice Moore basically agreed with us that isolated DNA is a natural product.

Their opinion was, "We don't want to disrupt the bioindustry."

Judge Bryson, the third, upheld us.

So I then filed a petition for a new trial with the Supreme Court.

If you file a complaint with the Supreme Court, you must submit questions for the court to answer.

Normally, this question would be a very long sentence, a full page of sentences filled with phrases like "for this reason" and "therefore."

On the other hand, the question we posed was probably the shortest ever.

It's just this: Can we patent human genes?

When Chris first asked me what I thought of this, I said, "I don't know —

“Can we patent isolated DNA? '" "No

I want the judge to have the same reaction as when you brought this case to me seven years ago."

I couldn't argue with that

About 1% of all complaints are heard by the Supreme Court, but ours were granted.

It was oral argument day, and I was really excited, and there was a long line outside, people had been lining up since 2:30 a.m. to be heard in court.

Two breast cancer advocacy groups, Breast Cancer Action and FORCE, were demonstrating on the steps outside the courthouse.

Chris and I were sitting quietly in the hallway just before giving oral argument in the most important case of Chris' life.

I was obviously more nervous than he was.

But when I stepped into the courtroom, the hustle and bustle outside died down. I looked around and saw a line of familiar faces. Women who had personally commissioned me to share their most personal stories with me.

There were also three leaders of the Human Genome Project, one of whom was the co-discoverer of DNA, James Watson.

(Laughter) The fact that the various organizations represented in this courtroom all contributed to the realization of this day speaks volumes about the importance of the issue.

The oral argument itself was compelling.

Chris' argument was brilliant

But the most thrilling thing for me was watching the Supreme Court justices work on the isolated DNA, using different metaphors and engaging in lively debate, just like our legal team has been doing for the last seven years.

Judge Cagan likened DNA isolation to extracting ingredients from Amazonian herbs.

Judge Roberts said isolating DNA is different than making a bat out of a tree.

And then, in my favorite scene, Judge Sotomayor said that isolated DNA is "just nature there."

(Laughter) When I walked out of court that day, I was pretty confident, but I didn't expect a result like this, a 9-0 victory.

“Naturally occurring fragments of DNA are products of nature and are not patent-eligible by mere isolation.

Nor can Myriad create anything."

Within 24 hours of the ruling, five laboratories announced they would begin BRCA genetic testing.

And there were a few that would do it for less than Myriad.

Some laboratories offered more comprehensive tests than Myriad.

On the other hand, the impact of the ruling goes beyond the Myriad issue.

Put an end to the 25-year-old US practice of patenting human genes.

It also removes a major barrier to biomedical discovery and invention.

In addition, patients like Abigail and Kathleen and Eileen were able to get the tests they needed.

A few weeks after the court issued its ruling, a package was sent to me.

It was from Duke University professor Bob Cookdeegan, one of the first people Chris and I met when we started considering filing a lawsuit.

When I opened it, there was a small stuffed animal inside.

(Laughter) We took a big risk and filed a lawsuit.

What gave me the courage to take risks was the belief that I was doing the right thing.

The litigation process took nearly eight years to come to a conclusion, with multiple twists along the way.

Maybe it has something to do with luck, but it's because we've connected various organizations and built alliances that pigs can fly.

thank you

(applause)

How exactly does your smartphone calculate where you are?

The answer lies in orbiting satellites flying at an altitude of about 20,000 km, orbiting by ticking time with atomic clocks that follow the principles of quantum mechanics.

Phew

let's explain

First of all, why is satellite time so important in determining a location?

First of all, the smartphone has to determine the distance to the satellite.

Each satellite is constantly transmitting a radio signal that travels at the speed of light from space to your smartphone.

Your phone records the time of arrival of the signal and calculates the distance to the satellite using the simple formula distance = c times time, where c is the speed of light and time is the time it took the signal to arrive.

But here comes the problem

the speed of light is too fast

If you round the time to the seconds, all parts of the globe, even those far away, appear to be at the same distance from the satellite.

So, to calculate distances to tens of meters, you need the best clock ever invented.

That's where atomic clocks come in. They're so accurate that even if they were to run 300 million years from now, they won't gain or lose less than a second.

Atomic clocks work according to quantum mechanics

A clock needs a certain period

So the clock has to repeat the same movement to set the units that divide time.

Just as your grandfather's old clock relies on a pendulum swinging back and forth at regular intervals under the influence of gravity, atomic clocks are maintained by transitions between two energy levels of an atom.

This is where quantum mechanics comes into play.

Quantum mechanics tells us that atoms have energy, but that amount of energy cannot be arbitrary.

Atomic energy levels are limited to a strictly defined set of values.

This is called quantum

For the sake of simplicity, let's say you're driving on the highway.

When you speed up a car, it usually accelerates from, say, 30 km/h continuously to 110 km/h.

Instead of continuously accelerating in the case of a quantum mechanical car,

Instantly jump to another speed

When an atom transitions to another energy level, according to quantum mechanics, this difference in energy is equal to the natural frequency times a constant, and the change in energy is equal to the frequency times a constant called Planck's constant.

The clock should have this natural frequency

GPS satellites use cesium and rubidium atoms as frequency standards

For cesium-133 the natural frequency is 9,192,631,770 Hz

So 9 billion cycles per second.

It's a very fast clock

No matter how skilled a watchmaker you are, pendulum clocks and screw-winding quartz clocks will inevitably have a resonance shift.

But the eigenfrequencies of all atoms of cesium-133 are exactly the same.

Thanks to this atomic clock, we can tell the time with an accuracy of one billionth of a second, and this gives us the exact distance from the satellite.

Let's forget for a moment that we are here on Earth.

We know we're at a certain distance from the satellite.

That means we're somewhere on the sphere centered on the satellite.

If you measure the distance between you and the second satellite, you'll get the overlap of the two spheres.

And if you keep doing this, take measurements from four points, and fine-tune it with Einstein's theory of relativity, you can pinpoint your place in the universe.

All it takes is a multi-billion dollar satellite network, oscillating cesium atoms, quantum mechanics, relativity, a smartphone, and you.

This is all right

"Good morning Bob"

"Good morning Kelly, what a beautiful tulip."

Have you ever imagined the world that dogs experience?

looks like this

It's not uncommon

But when dogs use their noses, it's a completely different story.

It starts with a wonderfully developed nose.

When the dog catches a hint of fresh air, the wet, spongy exterior captures the wind-carried scents.

Each nostril has the ability to sniff, and because it smells three-dimensionally, so to speak, it can tell the direction of the source of the smell.

When you have air in your nose, it's a small tissue fold that separates it into two halves, one for breathing and one for smell.

As this second stream of air comes in, it fills the olfactory receptor cells, which are hundreds of millions of cells, compared to five million cells in humans.

Unlike humans, who inhale and exhale through a single path, dogs exhale through openings on the sides of their noses, so this air current draws in new odor molecules and, with repeated snuffs, concentrates the odor.

It's not enough to just have a nice nose structure, you have to process the information you gather.

And it turns out that the dog's olfactory system occupies, in relative terms, many times more brain area than humans, and processes odors.

That's what allows dogs to discriminate and perceive a wide variety of odors, which can capture less than 100 million times less than humans.

If humans can smell perfume in a small room, dogs can do the same in a stadium, even the ingredients of it.

So if you go out into the street, you can see the people, the cars, the garbage in your neighborhood, the type of tree, the birds and the insects on them, each with its own unique smell, and you can tell what it is, where it is, and where it's going.

In addition to this remarkable ability, dogs can also smell things they can't see.

An entire independent olfactory system on top of the palate called the vomeronasal organ is able to detect hormones naturally released by humans and other organisms.

This allows dogs to distinguish between mates and friendly animals and those that are hostile to them.

It can understand our emotions, and even recognize pregnant women and sick people.

Because the olfactory system is more primitive than other senses, bypassing the thalamus and being directly connected to brain structures such as emotions and instincts, a dog's senses may be more direct and instinctive than humans.

The best thing about a dog's sense of smell is that it can travel through time.

With the scents left by people we passed and the warmth of the car that was just parked, I can tell where I have been and what I have been doing.

Landmarks like faucets and trees become smell billboards, telling you who passed by, what they ate, how they were feeling.

I can see the future in the breeze, and before I see it, someone will tell me that it's coming.

We use sight and hearing, but dogs smell all the time.

A great example of human-canine collaboration is when people share their stories.

They offer comfort to those who are grieving and respond with hostility when threatened. Stress and anger manifest as a cloud of hormones that dogs can smell.

With proper training, they can even warn you of invisible threats like bombs and cancer.

Mankind's best friends not only share their experiences with us, but they also tell us about the invisible world with their wonderful noses.

Many older left-handed people were probably trained to write and eat with their right hand.

Teaching children to use the "correct" hands is still commonplace in many parts of the world.

The fact that the word "right" means "correct" or "good" is not only found in English, but in other languages ​​as well.

But if left-handedness is so wrong, why are there left-handed people in the first place?

About a tenth of the world's population is now left-handed.

Archaeological evidence suggests this has been the case for the past 500,000 years, with roughly 10 percent of human remains showing differences in arm length and bone density related to handedness, and some ancient tools and artifacts showing left-handed use.

Despite what many people think, handedness isn't something you choose.

The position of the fetus in the womb can be predicted even before birth.

If handedness is born, is it inherited?

can't say

Even identical twins with the same genes can have different handedness.

In fact, I have the same percentage of different handedness as my other siblings.

The odds of being right-handed or left-handed depend on the handedness of your parents in a surprisingly consistent ratio.

If the father is left-handed and the mother is right-handed, there is a 17% chance that you will be left-handed, and if both parents are right-handed, there is a 10% chance that the child will be left-handed.

Handedness seems to be determined by chance, but the odds are determined by genes.

Perhaps there's a reason why evolution has produced only a handful of left-handed people, and it's been around for millennia.

There have been several theories as to why handedness exists in the first place and why most people are right-handed, but recent mathematical models suggest that the actual proportion reflects the balance between competitive and cooperative pressures in human evolution.

The advantage of being left-handed is that there are no obstacles in activities involving adversaries, such as combat and competitive sports.

For example, 50% of baseball's top hitters were left-handed.

Why?

Think of it as a power that takes you by surprise.

Left-handers are a minority, so both right-handed and left-handed people most often encounter or practice with right-handed opponents.

So when the two meet, the left-hander is ready to face the right-hander, while the right-hander is confused.

The hypothesis in this battle is that the imbalance in population favors left-handed warriors and athletes, an example of "negative frequency-dependent selection."

But the principles of evolution say that a group with relative advantage will continue to grow until that advantage disappears.

If humans had only fought and competed over the course of human evolution, natural selection would have increased left-handedness to the point where it was so common that it was no longer an uncommon trait.

In a purely competitive world, 50% of the population would be left-handed.

But human evolution has been shaped as much by cooperation as by competition.

Collaborative pressure pushes the handedness distribution in the opposite direction.

Only 4% of top players are left-handed because golf performance is independent of opponents, a widespread phenomenon of sharing equipment.

In the same way that aspiring golfers can easily find right-handed clubs, many of the important tools that have shaped society are designed for the right-handed majority.

Left-handed people are less likely to use these tools well and are more likely to have accidents, so in a purely cooperative world they are less likely to succeed and eventually disappear from the population.

By correctly predicting the distribution of left-handedness in the general population and comparing data across different sports, the model shows that a small but constant number of left-handers reflects a balance between competitive and cooperative influences, both working together over time.

The most interesting thing is that the numbers tell us a lot about different populations.

From the lopsided distribution of handedness in cooperative animals, to the slightly more left-handed population in competitive hunting societies, we may already have some answers to the mysteries of early human evolution.

Programming is the universal language of the next generation

In the '70s, punk music was driving an entire generation.

In the 80's, it's probably money.

For people of my generation, software has become a window between the imagination and the world.

What that means is that we need a dramatically wider range of people to build software than ever before. Instead of seeing computers as just machines, lonely things, boring things, magic, we need to start seeing computers as something we can tinker with, explore, change.

My journey into the world of programming and technology began when I was just 14 years old.

Like most teenagers, I fell in love with a much older man, and that man was Al Gore, then Vice President of the United States.

That teenager did what every kid wants to do.

I wanted to somehow express this feeling, so I created his website, and this is it.

It was 2001, and there was no Tumblr, no Facebook, no Pinterest.

To express this feeling of love and longing, I had to learn to code.

That's how I started programming.

as a means of self-expression

It's the crayons and Lego blocks from when I was younger,

It's the same thing I did later on with guitar and theater.

But after that, I found other things I was obsessed with: poetry, knitting socks, French irregular verbs, making fictional worlds, the philosophy of Bertrand Russell.

And I've come to see computers as boring, mechanical and lonely.

but i think

Little girls don't know they can't fall in love with computers

little girl is amazing

He's focused, methodical, and asks sharp questions: "What?" "Why?" "How?" "What if?"

And I don't know you can't fall in love with computers.

that's what parents do

Adults know that computer science is a hard and strange field, and it's people who don't understand why they're doing it.

I think it's something far removed from everyday life, like nuclear physics.

It's not that I didn't hit it

Programming has a lot of syntax, controls, data structures, algorithms, conventions, procedures, paradigms.

And we're making computers smaller and smaller.

There are so many layers of abstraction between humans and hardware that we no longer know how computers work or how to talk to them.

We teach our children how the human body works, how the internal combustion engine works, and we tell them that if they want to be, they can be astronauts.

But kids come up and say, "What is the bubble sort algorithm?"

"How does a computer know what happens when you press play — how does it know which video to play?"

If you ask, "Where is the Internet?"

adults suddenly shut up

Some people say "it's magic"

Some people say, "It's too complicated to explain."

but no

It's not magic, it's not complicated

It's just that it's moving really fast.

Computer scientists have built some amazing machines, but the computers themselves and the language that makes them seem intimidating to the average person, and without a nifty user interface, it's hard to talk to a computer.

That's why people don't realize that when they were conjugating French irregular verbs, they were actually exercising their pattern recognition skills.

When I was hooked on knitting, what I was really doing was following a series of command symbols, including loops.

And Bertrand Russell's lifelong pursuit of a precise language bridging English and mathematics found a home in the computer.

I just didn't realize it, and I've been a programmer all my life.

Kids these days tap, swipe, pinch to explore the world.

But if you don't give computers the tools to build with them, you'll only grow consumers, not makers.

There was this girl at the end of my journey

A six-year-old girl named Ruby.

He's fearless, imaginative, and has a bit of a big attitude.

When I'm learning to program, I often run into questions like, "Object-oriented design?", "Garbage collection?"

So I wrote an illustrated book about this kid, how Ruby teaches —

Ruby tells me not to be afraid of bugs under the bed.

And even a big problem is just a collection of small problems

Ruby introduced me to her friends and showed me the varied side of internet culture.

Snow Leopard is a beautiful child, but he doesn't like to play with other children very much.

Green robots get along with everyone, but they're sloppy.

Penguin's Linux is super competent, but he's kind of hard to understand.

Then there are the idealist foxes.

In Ruby's world, we learn technology through play.

For example, computers are good at repeating tasks, but Ruby teaches loops like this.

Ruby's favorite dance step is "pachi pachi ton ton pachi pachi jump!"

And by repeating this four times, we learn about the "for loop."

Then you learn the "while loop" by repeating while standing on one leg.

Then you learn the "until loop" by repeating until your mom is really pissed off.

(Laughter) The most important thing is to learn that there is no one-size-fits-all answer.

When we were creating the curriculum for Ruby's World, we needed to know how children see the world and what questions they had, so we created an opportunity to try it out together.

First, I showed them these four pictures.

To the car, to the supermarket, to the dog, to the toilet, to the car, to the supermarket, to the dog, to the toilet

And I asked, "Which one of these do you think is a computer?"

Conservative kids answer, "None of them are computers.

You know what a computer is. It's a glowing box that Papa and Mama are sitting in front of." It's a glowing box that Papa and Mom are sitting in front of."

But when we talk together, we realize that the car is also a computer, it has a navigation system.

And then the dog, even if the dog itself isn't a computer, it might have a computer in its collar.

Supermarkets have computers of all kinds: cash registers, alarms.

do you know that?

In Japan, even toilets are computerized, and there are hackers who hacked toilets.

(Laughter) And then give me this little power button sticker.

I tell my kids, "Today, with the power of magic, you can turn anything in this room into a computer."

Children also say things like, "It's hard, I don't know what the right answer is."

"Don't worry, mom and dad don't even know the correct answer

I've only heard about the "Internet of Things" recently.

But everyone will live in a world where everything is a computer."

And then a little girl comes in with a bike light and says, "If this light was a computer, it would change colors."

I said, "Good idea. What else can we do?"

The girl thinks and thinks and answers, "Well, if this light is a computer, you can go on a bike trip with your dad, sleep in a tent, and this light will be a movie projector."

That's the moment I've been waiting for, the moment when children realize that the world isn't ready, that one of the coolest ways to make the world a better place is through technology, and each of us can make a difference.

Finally, we also built a computer.

You've got a CPU that's a partitioner, and you've got a RAM and a ROM that remember things and that's very useful.

Together we built a computer and designed an application for it.

One of my favorite stories is about a six-year-old boy who wants to be an astronaut.

I'm totally immersed in my little paper computer with my big headphones on, because I built an intergalactic navigation system.

The child's father is an astronaut stranded on the other side of the room in Mars orbit, and the child's mission is to bring his father back to Earth safely.

These kids will develop a radically different view of the world and the technology that underpins it.

The more accessible and inclusive and diverse the world of technology, the better and richer the world will be.

So imagine with me for a moment a world in which the story of how things are made involves not only guys in their twenties in Silicon Valley, but schoolgirls in Kenya and librarians in Norway.

A world where the little Ada Lovelaces of the future, living in a digital world, grow up to be technologically brave and optimistic people.

They accept the world's powers, opportunities and limitations.

It's a wonderful, whimsical, weird world of technology.

When I was a kid, I wanted to be a storyteller.

I love imaginary worlds and my favorite is waking up in Moominvalley in the morning

Walking around Tatooine in the afternoon

It's a day to fall asleep in Narnia at night.

Programming turned out to be the ideal job for me.

i still make the world

Using programming instead of storytelling —

Programming gives us tremendous power to create our own microcosms with their own laws, paradigms and conventions.

Create something out of nothing with the power of logic alone

thank you

(applause)

People have always been fascinated by speed.

The history of human progress is also the history of speed, and one of the most important feats in this historic race was breaking the sound barrier.

Shortly after the first successful flight, pilots were eager to make their aircraft fly even faster.

But flying faster increased turbulence, and the aircraft was subjected to greater forces, preventing further acceleration.

Some tried to get out of trouble by taking dangerous dives, sometimes with tragic consequences.

Finally, in 1947, aided by technological advances such as movable horizontal stabilizers and fully dynamic tails, U.S. military pilot Chuck Yeager flew a Bell X-1 fighter at 1127 kilometers per hour, breaking the sound barrier and becoming the first person to fly faster than the speed of sound.

The Bell X-1 was the forerunner of many supersonic aircraft, some later designs reaching speeds of Mach 3 and above.

Aircraft flying at supersonic speeds create shock waves with thunderous roars, known as sonic booms, that can harm people and animals on the ground and even damage buildings.

That's why scientists around the world are focusing on sonic booms, trying to predict their trajectory in the atmosphere, where they reach the ground and how loud they make.

To get a deeper understanding of how scientists study sonic booms, let's start with the basics of sound.

Imagine throwing a pebble into a still pond.

what will happen?

A pebble spreads waves with the same speed in all directions.

These circles of increasing diameter are called wavefronts.

Similarly, invisible, fixed sound sources, such as home stereos, create sound waves that radiate outward.

The speed of the wave depends on factors such as the altitude of the atmosphere through which the wave travels and the temperature.

Sound travels at about 1225 kilometers per hour at sea level.

But instead of two-dimensional flat circles, the wavefronts are concentric spheres traveling along rays perpendicular to those waves.

Now imagine the sound source moving, like a train whistle.

When a sound source moves in a direction, successive sound waves in front of the source are clustered at short intervals from each other.

These high-frequency waves are responsible for the famous Doppler effect, where sound becomes higher pitched when an object approaches.

But if the sound source moves slower than the sound wave, the sounds will stay within close proximity of each other.

Things change dramatically when objects move at supersonic speeds, faster than the sound they make.

When a sound source overtakes its own sound wave and emits another sound wave from its current location, the waves are forced together to form a Mach cone.

Objects move faster than the sound they emit, so when an object approaches, the observer cannot hear it.

After the object has passed, you'll finally hear the sonic boom.

When the Mach cone hits the ground, it forms a hyperbola and as it moves forward, it leaves a trajectory known as the boom carpet.

This allows us to understand the areas affected by sonic booms.

How strong is the sonic boom?

Finding out the strength requires solving the famous Navier-Stokes equation, which gives us the pressure fluctuations that occur when a supersonic aircraft passes by.

As a result, we can determine the pressure signature known as the N-wave.

What does this shape mean?

A sonic boom occurs when there is a sudden change in pressure, and the N-wave is associated with two explosions - one for the initial pressure rise at the nose of the aircraft, and one for the rapid return to normal after the tail has passed.

This creates a double boom, which is usually heard as one blast to the human ear.

In fact, computer models using these theories can predict the location and strength of sonic booms given atmospheric conditions and flight trajectory information, and research continues to reduce their effects.

Supersonic flight is prohibited over land for the time being.

So are sonic booms a recent phenomenon?

it seems not

We humans try to eliminate this sound, but some animals have successfully used the sonic boom for themselves.

A giant diplodocus would slam its tail into it, and it would go over 1,200 kilometers per hour, breaking the speed of sound and driving away predators.

Certain shrimp can emit similar shock waves underwater, stunning or killing prey from a distance with a single swing of their giant pincers.

So, while we've done some amazing feats in our relentless pursuit of speed, in nature, we've had pioneers.

A small organ in our neck, the command center of the body

the thyroid gland

The director of operations for a company — responsible for keeping the cells of the body functioning properly.

use hormones to send commands to each cell

This vital organ is made up of many lobules within which tiny cells called vesicles store hormones that the thyroid gland sends to the blood vessels.

Two important hormones produced by the thyroid gland, thyroxine (T4) and triiodothyronine (T3)

As a messenger, directing the absorption of oxygen and nutrients to cells

It boosts your metabolism, allowing your cells to supply your body with energy through a series of reactions.

A hormone from the thyroid gland that helps the heart to circulate blood efficiently and speeds up the process of breaking down nutrients in cells.

When the body needs more energy, the thyroid gland sends hormones to speed up metabolism.

Ultimately, it helps cells use energy to grow and reproduce.

The thyroid gland is controlled by the pituitary gland, a hormone gland deep in the brain, that directs the body as needed.

The pituitary gland senses whether hormone levels in the blood are too high or too low and sends commands throughout the body in the form of thyroid-stimulating hormone.

Even with such tight controls in place, sometimes management fails.

Certain diseases, tumors in the thyroid gland, and chemical imbalances in the body can confuse the thyroid gland and ignore commands from the pituitary gland.

One of these is hyperthyroidism, which is caused by overproduction of hormones from the thyroid gland.

In other words, the cells are given excessive instructions to take in nutrients and oxygen.

The result is an overactive metabolism, increased heart rate, overeating, rapid weight loss,

Symptoms include fever, sweating, anxiety, and insomnia.

The opposite is hypothyroidism, where the lack of hormones from the thyroid gland doesn't give enough instructions to the cells.

Cells slow down and metabolism slows down.

Symptoms include weight gain, fatigue, sensitivity to cold, swollen joints, and depression.

Fortunately, we can use medical therapy to normalize thyroid function and return the body's metabolism to a healthy state.

Even in a small organ, the thyroid gland is very dominant.

A healthy thyroid gland keeps its cells working efficiently and so smoothly that we don't even realize it's there.

Melati Weizen: Island of the Gods Bali

Isabelle Weizen: Green Paradise

Melati: Or...

paradise lost

bali garbage island

Isabelle: Bali produces 680 cubic meters of plastic waste a day.

That's the equivalent of a 14-story building.

And when it comes to plastic bags, less than 5% of that is recycled.

Melati: If you hear that, your image of Bali will change.

We felt the same way when we learned that in Bali, almost all plastic bags end up in sewers, through rivers, and finally into the ocean.

And plastic bags that don't even reach the sea are either burned or thrown away.

Isabelle: I decided to do something about this.

It's been about three years since I started a movement to ban plastic bags from my home island of Bali.

has had considerable success

Melati: We are sisters. We go to the best school on earth, Green School in Bali.

This school is made of bamboo, but it's not just the way it's built that's different, but the learning there is also different.

Get educated to be today's leaders, not your usual textbook education.

Isabel: In class one day, we learned about "great people," like Nelson Mandela, Princess Diana, Mahatma Gandhi.

On the way home that day, we wanted to be like that.

You don't have to wait until you're an adult to be a "great person," right?

i just wanted to do something

Melati: We spent the night together trying to figure out all the problems facing Bali.

The most prominent problem was plastic waste.

But it's a big problem

So we thought of a realistic goal that we as children could aim for: a plastic bag.

An idea was born

Isabelle: I started researching, but the more I researched, the more I realized there was no benefit to plastic bags.

I mean

I don't need plastic bags

I've been very inspired by the banning of plastic bags in foreign countries. It's happening all over the place, from Hawaii to Rwanda to Auckland to Dublin, and cities.

Isabelle: This inspired the "Bye Bye Shopping Bag" movement.

Melati: I've learned a lot in the years I've been working out.

Lesson 1: "You can't do it alone"

We need a lot of like-minded people, and that's how the "bye-bye shopping bag" team was formed.

Children from all over the island participate in the volunteer team, from international schools and local schools.

We're all working together. We've also started a multi-level approach, building on petition signings online and offline, educational and inspirational presentations in schools, using markets, festivals, beach clean-ups, etc. to raise public awareness.

Also, and this is important, we also distributed eco-bags -- net bags, recycled newspaper bags, 100 percent organic bags -- all made by locals on the island.

Isabel: We did a trial run in a village of 800 families.

The mayor was my first friend in the village, and it all started because he liked the T-shirt.

We focused on changing the mindset of our customers, because we need to change the mindset first.

Two-thirds of the shops in the village were already trying to get rid of plastic bags.

I tried to involve the Balinese authorities, but the first attempt failed.

So I thought, "Well, if I had a petition signed by a million people,

Will you listen to me? ”

Melati: Exactly!

Isabelle: But 1 million signatures is like 1000 people writing 1000 signatures?

(Laughter) It was a dead end, but I learned lesson number 2, "Abandon your preconceived notions."

Someone said that 16 million people get on and off at Bali airport every year.

Melati: But how do you get into the airport?

Now, here's lesson number three: persistence.

heading to the airport

pass the guard

The boss's boss, then the deputy manager, and then the manager, then...

And I was put back two places down again, and then I had to talk to the guards again, and so on.

After days of persevering as kids on a mission, I finally landed in the head of the commercial department at Bali Airport.

I gave a speech about plastic bags in Bali, and he was a really nice guy, and he said [imitating a man's voice], "I've never seen anything like this before, but I'm going to allow you to collect signatures outside customs and immigration."

(Laughter) (Applause) Isabelle: In the first hour and a half, we got about a thousand signatures.

Amazing, right?

Lesson 4: "We need allies at every level of society, from students to executives to celebrities."

Because of Green School's buzz, I was able to meet celebrities on a regular basis.

What I learned from Ban Ki-moon is that the UN secretary-general doesn't sign petitions. (Laughter) Even if a child politely asks.

But they promised to spread the word, and now we're working closely with the United Nations.

Melati: Jane Goodall taught me the power of human connection.

He's the one who took the one Roots & Shoots group and now has 4,000 groups around the world.

we also entered

A true role model

If there are any Rotary members here, please take care of them.

We are the youngest members of Rotary International.

Isabel: I learned a lot about patience Melati: How to deal with dissatisfaction Isabel: Leadership Melati: Teamwork Isabel: Friendship Melati: I learned more about Balinese people and culture Isabel: I learned the importance of responsibility

Melati: Matching words and deeds

It's not always easy and sometimes it's a little difficult

Isabelle: But last year we did.

I went to India to give a talk, and my parents took the two of us to Gandhi's former residence.

What he did to achieve his goals - I learned about the power of Hunger Strike.

So when I met my parents at the end of the tour, we both made up our minds and said, "We're going on a hunger strike!"

(Laughter) Melati: You can imagine the look on my parents' faces.

It took time to persuade, not only my parents, but also my friends and teachers.

we were seriously about to go on a hunger strike

I also met with a nutritionist, and we came to a compromise, which was to fast from dawn to dusk every day, until the governor of Bali agreed to meet and discuss how to eliminate plastic bags on the island.

Isabelle: Our "mogak makan" (hunger strike) as it is called in Indonesian has begun.

I used social media to reach my goal, and by the second day, the police were already coming to my house and school.

I wonder what the two of them are doing

Because of our hunger strike, I can't look like a governor - I knew it, and I could have been jailed.

But it worked

Twenty-four hours later, I was picked up at school and taken to the governor's office.

Melati: There is the governor -- (applause) -- the governor waiting for us, thanking us and fully cooperating with us in our willingness to protect Bali's environment and scenic beauty.

You signed a pledge to help ban plastic bags in Bali.

Now the governor is a friend, and I regularly remind him and his men to keep their promises.

In fact, the governor recently declared and pledged, "Bali will be bag-free by 2018."

(Applause) Isabel: Some of our supporters have plans to implement zero plastic bags at Bali International Airport by 2016.

Melati: Stop handing out free plastic bags and bring your own reusable bag.

Isabelle: This is the purpose of the short-term campaign One Island / One Voice.

We will inspect shops and restaurants that have self-proclaimed to ban plastic bags, put stickers on their entrances, and publicize their names on social media and major magazines in Bali.

This, in turn, makes shops without stickers stand out.

(Laughter) Melati: Here we are talking about various things.

One reason is that we take pride in the results we have achieved by working together with our colleagues.

And it's also because in the process, I've learned that there are things children can do.

we can make a difference

Isabelle and I started when we were only 10 and 12 years old.

I had no business plan, no solid strategy, no ulterior motives.

I just wanted to stop my hometown from being covered in plastic bags and suffocating.

Children have limitless energy and the motivation to make the changes the world needs.

Isabelle: That's why I say to the children of this beautiful and rugged world, Let's do it!

Let's make a difference

I wouldn't say it's an easy road

But it's worth trying

We children may be only 25% of the world's population, but we are 100% of the future.

Melati: We still have a lot of work to do, but we won't stop until the first question for people arriving at Bali airport is this: "Welcome to Bali. Do you have a plastic bag to declare?"

(laughter) Om Shanti Shanti... (May you be filled with peace)

thank you

(applause)

You're probably sitting in your seat watching this video, and if you just want to sit and watch it for a few minutes, it's fine.

But the longer you sit, the more your body starts to fidget.

I'm waiting impatiently for the moment when I stand up and start walking again

Sounds silly, right?

The human body should love to sit, right?

Actually it's not

Of course, sitting for short periods of time can help relieve stress, and it can also help you take a break after exercising.

Now, we spend more time in our lives sitting than we move, but our bodies weren't made to stay seated for long periods of time.

rather the opposite

By studying the anatomy of the human body, we can see that the human body is built to move.

The human body has 360 joints and 700 skeletal muscles that allow us to move effortlessly and fluidly.

It's this unique basic structure that allows you to stand upright without losing weight.

Blood can't circulate properly if we're not moving around.

Movement helps our nerve cells, and the reason our skin is elastic is to accommodate our movements.

If every inch of your body is ready and waiting for you to move, what happens when you don't?

Let me start with the literal backbone of the problem.

Your spine is an elongated structure made up of vertebrae and intervertebral discs (discs of cartilage) between them.

It is held in shape by the joints, muscles and ligaments that connect it to the bone.

What we often see in the sitting position is a hunched back and slumped shoulders, which puts uneven pressure on the spine.

Over time, this hunched posture causes disc wear and strain on some ligaments and joints, which puts the muscles in tension that need to be stretched to achieve proper posture.

Additionally, being hunched makes the chest cavity smaller while you're sitting, which means there's less room for your lungs to expand when you breathe.

The problem is that it temporarily limits the amount of oxygen that can get into your lungs, and less oxygen gets into your bloodstream.

The soft tissues of the human body are made up of muscles and nerves, arteries and veins that surround the skeleton.

The act of sitting is squeezing, pressuring, squeezing these delicate tissues.

Do you feel numbness or swelling in your limbs while sitting?

In areas of greatest compression, nerves, arteries and veins can become blocked and interfere with nerve signals, resulting in numbness and reduced blood flow to the extremities, resulting in swelling.

Sitting for long periods of time temporarily deactivates lipoprotein lipase in the walls of the capillaries, which is an enzyme that breaks down fat in the blood, so it's harder to burn fat when you're sitting than when you're moving.

What effect does this congestion have on the brain?

I think most of the time you sit to use your brain, and the irony is that sitting for long periods of time prevents you from using your brain.

Sitting slows down your blood circulation and reduces the amount of oxygen that your lungs take into your blood.

Both are essential for the brain to be agile, and less brain activity leads to less attention.

Unfortunately, the negative effects of sitting are not short-term.

Recent studies show that prolonged sitting is linked to some cancers and heart disease, and can even lead to diabetes, liver and kidney disease.

In fact, researchers attribute about 9 percent of all premature deaths worldwide each year to physical inactivity.

That's more than 5 million people

How seemingly harmless habits can affect your health

Fortunately, the solution to this growing threat is simple and intuitive.

If you really have to sit, don't slouch and straighten your back If you don't have to stay in your seat, try to move around more Try setting a reminder to get up every 30 minutes

Understand that the human body is meant to move, not to stand still.

I'm almost done with this video, so please stand up and stretch.

Let's move your body as a reward

you will thank me later

You probably think of Archimedes' "Eureka (I got it)!"

As it turned out later, at that moment, there was this background:

In the 3rd century BC, Hieron, king of the Sicilian city of Syracuse, chose Archimedes to oversee a building project of unprecedented scale.

Hieron ordered a sailing vessel fifty times the size of a standard ancient warship and named it Syracuse after the city.

Hieron planned to build the largest ship in history and give it as a gift to Ptolemy, the ruler of Egypt.

But can a ship the size of a palace float?

No one in Archimedes' time had attempted anything like this.

It's like asking, "Can mountains fly?"

King Hieron's wish rested on a solution to this problem.

Hundreds of workers will have to work for years to build the Syracuse, a hull made of pine and fir trees from Mount Etna, hemp rope grown in Spain, and pitch from France.

The top deck, which would house eight watchtowers, was to be supported not by pillars, but by a giant wooden Atlas statue, carrying the earth on its shoulders.

A huge trebuchet that can shoot 80 kilograms of stone at the bow

To entertain its passengers, the ship was to include a flower-lined promenade, a covered swimming pool, a heated bath, a library filled with books and statues, a temple to the goddess Aphrodite, and a gymnasium.

And to make Archimedes even more troubled, Hieron was trying to fill the ship with cargo: 400 tons of grain, 10,000 jars of salted fish, 74 tons of drinking water and 600 tons of wool.

It was supposed to carry well over 1,000 people, including 600 soldiers.

And the stall was supposed to house 20 horses.

What would happen if you built something of this scale and sank on its maiden voyage alone?

Let's just say that failure was not a favorable outcome for Archimedes.

And so he took on the question, "Will it sink?"

Perhaps he was sitting in the bathhouse one day wondering why a heavy bathtub floated, and an epiphany finally came.

An object partially immersed in liquid floats with a force equal to the weight of the liquid it displaces.

In other words, if the 2,000-ton Syracuse displaces 2,000 tons of water, it's barely afloat.

If you can push away 4000 tons of water, you'll float just fine.

Of course, King Hieron wouldn't be very happy if he just pushed away a thousand tons of water.

This is the law of buoyancy, which engineers still call Archimedes' principle.

He explains why steel supertankers float as easily as wooden rowboats and bathtubs.

If the weight of the water that a ship's keel displaces is equal to the weight of the ship itself, it will stay afloat no matter what is above the bottom.

It was so similar to another anecdote involving Archimedes and the bathtub, and because it could have been the same story, that it was misunderstood at the whim of history.

The classic story of Archimedes yelling "Eureka!" and then running through the streets is about the crown (corona in Latin).

The essence of the Syracuse story is keel, the Greek korone.

Are the two stories mixed up?

we have no way of knowing

On the day the Syracuse landed in Egypt after its first and only voyage, we can only imagine the inhabitants of Alexandria flocking to the harbor, marveling at the arrival of their majestic floating palace.

This insane ship is the Titanic of the ancient world, but thanks to the Archimedes we all know, it survived.

(Music) What do you think of this music?

do you think it's beautiful?

Creative?

Now, if the composer were actually this robot, wouldn't you disagree?

Believe it or not, humans have been grappling with the problem of artificial creativity alongside the problem of artificial intelligence for over 170 years.

In 1843, Countess Ada Lovelace, an English mathematician who is credited with being the world's first programmer, wrote that a machine cannot be said to have human-like intelligence if it can only operate as programmed by humans.

According to Lovelace, for a machine to be considered intelligent, it must be able to generate original ideas.

In 2001, this idea came to fruition as The Lovelace Test.

If the original code produces results that even the designer can't explain, the machine passes the test.

The Lovelace test is more of a thought experiment than a science experiment.

but let's start here

At first glance, it might seem impossible for a machine to compose its own sophisticated music like this.

Using random number generators, chaotic functions, and fuzzy logic, it would be possible to develop very complex algorithms to generate sequences of notes in such a way that they are impossible to track.

It's true that countless pieces of music that have never been heard will be created, but only a handful will be able to stand up to our appreciation.

Because computers don't have the discriminating ability to distinguish between music that humans find beautiful and music that isn't.

But what if we change our mindset a little and look at the natural process of creation as a model?

In fact, there is at least one known process that leads to unique, important, and even beautiful results, and that is the process of evolution.

Evolutionary algorithms, or genetic algorithms, mimic biological evolution and are a promising way for machines to produce unique and valuable results.

Using evolution, how can machines make original music?

Instead of living organisms, we start with an initial population of musical phrases, mimicking breeding and mutation, and starting with basic algorithms that shuffle parts, stitch them together, and replace them with random notes.

Now we have a new generation of phrases from which we can select using a fitness function.

Just as biological fitness is determined by the external pressure environment, so is musical fitness based on external melodies chosen by musicians and music fans as the most beautiful melodies.

The algorithm then compares that musical phrase with the beautiful melody, and only keeps the phrases that are similar.

After weeding out the dissimilar phrases, the algorithm mutates and recombines again, picking the most similar, or adaptable, melody, and then repeating that new generation over the next generation.

The process of getting here is so random and complicated that the result should pass the Lovelace test.

And because the human aesthetic is woven into the process, it should theoretically be possible to compose music that we find beautiful.

But is this what we intuitively think is true creativity?

Is it good if the work is original and beautiful? Or does creativity have to have an intention and an awareness of the work?

Creativity in this case seems to come from the programmer, even if he or she doesn't understand the process.

What is human creativity anyway?

Creativity is more than the neuron connections based on biological algorithms and creativity beyond the neuron connections based on biological algorithms and the serendipitous experiences that shape our lives?

order and chaos machines and humans

These are the central themes of our work on machine creativity, and are currently the driving force behind music, sculpture, painting and poetry.

Whether or not this activity can be called creative is still an open question.

But as long as the work brings tears, awe, and chills down your spine, the identity of the author may not matter so much.

This is called a plu robot

The plu robot is modeled after a newt called the Iberian togeimori.

The Prue robot, as you can see, can walk, and as you'll see later, it can swim.

Why design such a robot?

In fact, this robot was designed as a neuroscience research tool.

In fact, we designed it in collaboration with neurobiologists to understand animal movement, specifically how the spinal cord controls movement.

But as I studied biorobotics, I became more and more fascinated by animal movement.

Dolphins swim, cats run and jump, and we humans do amazing things when we jog and play tennis.

In fact, our nervous system solves very complex control problems.

It has about 200 muscles that it controls perfectly.

My goal is to understand this kind of behavior

Movement in animals involves four main parts of the body.

The first is the torso, and in fact, don't underestimate the fact that biomechanical mechanics greatly simplify animal movement.

Next is the spinal cord, which is responsible for a variety of reflexes and creates sensory-motor control loops between neural activity and mechanical movement within the spinal cord.

The third part is the central pattern generator.

This is an interesting circuit in the spinal cord of vertebrates that self-generates highly harmonic, rhythmic patterns of behavior, but receives only very simple input signals.

This input signal is a modulating signal coming down from the upper part of the brain, the motor cortex, the cerebellum, the basal ganglia, and modulating the signals in the spinal cord as we move.

But what's interesting is that the lower-level organ, the spinal cord, works in concert with the torso to take care of a lot of the movement problems.

As you probably know, even if you cut off a bird's head, it will continue to run for a while, showing that the lower half of the body, the spinal cord and the trunk, accomplishes most of the locomotion.

The way we look at this mechanism is very complicated, because first of all, it's very difficult to record activity in the spinal cord.

Implanting electrodes in the motor cortex is much easier than in the spinal cord, which is protected by the spine.

Humans are particularly troublesome

The second reason it's difficult is that movement is a very complex and dynamic interaction of these four parts.

So it's very difficult to figure out the role of each of these elements in turn.

That's where biological robots like the Prue robot and mathematical models can help us understand.

So what is a biological robot?

Biorobotics is one of the most active areas of robotics research, taking inspiration from animals to create service robots, search-and-rescue robots, and field robots that work in the field.

The big goal here is to take inspiration from animals to navigate complex surfaces -- stairs, mountains, forests -- places that robots still struggle with, but animals find easier.

Robots can also be great scientific tools.

There are some very interesting projects with robots as scientific tools for neuroscience, biomechanics and fluid dynamics.

That's exactly what Prue Robot is going for.

What we're doing in the lab is working with neurobiologists like Jean-Marie Cabergen, who lives in Bordeaux, France, to build a model of the spinal cord and test it robotically.

Start with the simple things

It's a good idea to start with animals like lampreys, which are very primitive fish, and work your way up to more complex movements in stages, such as newts, cats, humans, and other mammals.

So the robot has become an interesting tool for demonstrating our model.

Prue Robot is a dream come true for me.

Since my PhD, I've been trying to replicate the movement of lampreys and newts on computers for about 20 years.

But I've always recognized that simulations are only approximations.

Computers are very difficult to simulate physical phenomena in places like water, mud and complex ground.

So why not try a real robot under real conditions?

Of these animals, my favorite is the newt.

Because they're amphibians, which are the key animals from an evolutionary point of view.

It perfectly links the swimming of eels and fishes with the swimming of eels and fishes and the quadrupedal locomotion seen in mammals such as cats and humans.

In fact, modern newts are very similar to the first terrestrial vertebrates. They are living fossils that tell us about our ancestors, the ancestors of all terrestrial quadrupeds.

Newts swim like eels, undulating their muscles from head to tail in spectacular undulating waves.

Place the newt on the ground to switch to trot mode

It's really good at cyclically coordinating its limbs, which means it's making your body undulate in a steady wave.

What's really surprising and wonderful is that this movement is only between the spinal cord and the torso.

Even if you remove the newt's brain -- and, horribly -- even cut off the head, if you apply electrical stimulation to the spinal cord, low-level stimulation will induce a walking mode.

If you increase the stimulation a little, it will accelerate.

When it hits a certain limit, it automatically switches to swimming mode.

that's great

Changing the stimulus toggles between two completely different modes of movement, as if you'd stepped on a pedal that sent a modulated signal down the spinal cord.

Similar observations have been made in cats

By stimulating the cat's spinal cord, it can switch between walking, trotting, and running modes.

Birds can also switch. They walk with weak stimuli, and flap their wings with strong stimuli.

It shows that the spinal cord is a really intricate motor control organ.

We've taken a closer look at the movements of newts, and we've let Professor Martin Fischer at the University of Jena in Germany use a really nice X-ray video camera.

Thanks to this wonderful device, we were able to record bone movements in great detail.

I did this

We've figured out which bones have important functions, and we've recorded their movements in three dimensions.

The data we've collected is a comprehensive database both on land and in water -- a comprehensive database of real animal movements.

Now, our job as roboticists is to recreate this in robots.

In order to reproduce the movement as faithfully as possible, we optimized the whole process to find the proper structure, from the position of the motors to the way they are connected.

And that's how the Prue robot came to life.

See how similar the movements are to real animals

You can see a direct comparison between the gaits of real animals and Prue robots.

The state of walking can be reproduced with every move

If you put it back and play it slowly, you'll understand better.

You can even swim

(Laughter) So let's go into the water and recreate the swimming.

We rejoiced, because it was very difficult.

physical interactions are very complex

Our robots are much larger than small animals, so we did something called dynamic frequency scaling to ensure that we had equivalent physical interactions.

Finally, as you can see, we were able to replicate it beautifully, and we were really happy.

let's talk about the spinal cord

Together with Jean-Marie Kabergen, we modeled spinal neural circuits.

Interestingly, newts have very primitive neural circuitry, and interestingly newts have very primitive neural circuitry, which is very similar to what we've found in the lamprey, a primitive eel-like fish.

We know where this neural oscillator is, but what we've done is create a mathematical model of the interlocking mechanism that allows it to behave in completely different ways in land water.

I put an oscillator on a robot and tried it out.

It is like this

What you see here is the previous version of the Prue robot, completely controlled by the spinal cord model program that was installed on the robot.

We just send two signals with our remote control, and this is like a signal coming down from the upper part of the brain.

Interestingly, these signals alone can completely control speed, direction and type of movement.

For example, if you give it a weak stimulus, it will walk, and if you give it a stronger stimulus, at some point it will suddenly switch to swimming mode.

You can also change direction very smartly, by just stimulating one side of the spinal cord more than the other.

So wonderfully, nature leaves much of the control to the spinal cord, so the upper part of the brain doesn't have to worry about controlling individual muscles.

The brain is only responsible for high-level modulation, and the spinal cord is responsible for coordinating all the muscles.

Now let's talk about cat movement and the importance of biomechanics.

This is another project that explored the biomechanics of cats, and I wanted to see how morphology could help with locomotion.

It turns out that cats -- basically their limbs -- have three important properties.

First of all, a cat's limbs are structured like pantographs.

A pantograph is a mechanical structure that keeps its top and bottom surfaces parallel at all times.

It's a simple geometric system that coordinates the movements of the parts inside it.

The second property of cat limbs is that they are very lightweight.

Most of the muscles are in the torso, which is good for lowering the inertia of the limbs and allowing them to move quickly.

A third important property of cat limbs is that they are very elastic, which makes them easier to react to shocks and external forces.

I took this into Cheetah Cub

Cheetah cub come to the stage

He's Peter Eckhart and he's doing his doctoral thesis on this robot, and as you can see, it's a cute little robot.

It looks like a little toy, but it was used as a scientific tool to study the nature of the cat's legs.

It's very docile, it's lightweight, it's resilient, you can push it against it, it won't break.

jump a little

This resilience is very important

You can see the nature of the pantograph in the three parts of the legs.

What's interesting is that this very dynamic movement is achieved entirely open-loop -- no sensors, no complex feedback circuits.

And this is interesting because the mechanical structure alone stabilizes this rapid movement, and a really good mechanical structure basically simplifies the movement.

So in the next video, you can see what happens when we mess things up a bit. For example, when we practice a robot going down a step, the robot doesn't stumble, which was a surprise to us.

this is a little mess

With no sensors and no fast feedback circuits, I thought the robot would quickly fall over.

But the motion is mechanically stabilized and the robot doesn't fall over.

Of course, if you have bigger steps or obstacles, you'll need a complete control loop, a reflex action, and so on.

The important thing here is that the mechanical response is sufficient for small disturbances.

This is an important message across everything from biomechanics and robotics to neuroscience: we should never underestimate the role of the body itself in movement.

So what does that have to do with human movement?

Clearly, human locomotion is more complex than cats and newts, but the neural circuitry itself is almost identical to that of other vertebrates.

In particular, the spinal cord is responsible for important control of human movement.

So an injury to the spinal cord results in significant disability.

Paraplegia or quadriplegia can occur

That's because the brain loses communication with the spinal cord.

In other words, the modulating signal is so low that it can no longer start working.

The goal of neural replacement devices is to reactivate communication by electrical or chemical stimulation.

Several teams around the world are working on it, including the EPFL (Swiss Federal Institute of Technology in Lausanne).

I'm collaborating with Gregoire Coctin and Silvestro Micher.

To do it the right way, it's important to understand how the spinal cord works, how it interacts with the body, how the brain communicates with the spinal cord.

I hope that the robots and models presented today will play a key role in achieving this important goal.

Thank you

(Applause) Bruno Giussani: Auke, in your lab, I saw a robot that swims in polluted water and measures the degree of contamination.

But you said in your talk that this robot could be used for search and rescue, and in fact it has a camera attached to its nose.

Auke Eispeert: Absolutely. It's a by-product project where we're going to use robots for search and rescue surveys. Right now, robots are watching you.

My dream is that when you're in a crisis -- in a collapsing building or a flooded building -- in a place that's dangerous even to a rescue team or a rescue dog, you can send a robot to crawl, swim, walk, look inside with an on-board camera, find survivors, and be able to communicate with survivors.

Bruno: I hope the survivors don't get scared when they see this figure.

Auke: Maybe I should change my appearance a little bit, because I'm terrified that I'll be eaten, and I might die of a heart attack.

But if you change the look and make something more solid, I'm sure you'll end up with a useful tool.

Bruno: Thank you very much, including the team.

Something that has plagued mankind since ancient times

The Greeks fought by chewing aromatic resins, and the Chinese relied on egg shells.

It was even considered legal grounds for divorce in the ancient Jewish Talmud.

This terrible affliction is known as halitosis or halitosis.

But what causes bad breath, and why does it terrify the world?

Now think of some of the worst smells: garbage, faeces, or rotten meat.

All of these odors come from the activity of microbes, especially bacteria, and it's horrifying to hear that these same bacteria live in the moist environment of your mouth.

don't panic

Having bacteria in your body isn't just normal, it's actually essential for everything from digestion to disease prevention.

But like any living organism, we need to eat bacteria.

The bacteria in your mouth feed on mucus, food debris, and dead tissue cells.

In order to absorb nutrients through cell membranes, they have to break organic matter down into smaller molecules.

For example, they break down proteins into their building blocks, amino acids, and then break them down into smaller compounds.

By-products of these reactions include filthy-smelling hydrogen sulfide and cadaverine, which are released into the air and drift toward unsuspecting noses.

The fact that we're sensitive to these odors and perceive them as foul odors may be due to evolutionary mechanisms that warn us of spoiled food and disease.

Smell is one of our most familiar and primal senses, and it has a huge impact on the attractiveness of a prospective mate.

In one survey, 59% of men and 70% of women said they wouldn't go on a date with someone who had bad breath, which may explain why Americans alone spend nearly $1 billion on various bad breath products.

Fortunately, many cases of bad breath are easy to treat.

The worst odorous by-products come from Gram-negative bacteria, which live between your gums and teeth and at the back of your tongue.

Brushing and flossing, using an antibacterial mouthwash at bedtime, gently cleaning the back of your tongue with a plastic spatula, and even eating a healthy breakfast can all help get rid of many of the bacteria and their food sources.

In some cases, these methods may not be sufficient, due to dental problems, nasal conditions, and rare diseases such as liver disease and poorly controlled diabetes.

Lifestyle habits like smoking and excessive alcohol consumption also give off a very distinct odor.

Regardless of the reason, bad odors almost always originate in the mouth, not the stomach or other parts of the body.

But one of the biggest challenges is, in the first place, how do you know what your breath smells like, and you have no idea what causes bad breath.

We may get so used to our bad breath that we don't even notice it.

Neither hand over mouth nor wrist licking is perfect.

One study found that even when people do this, they tend to judge subjectively based on how bad they think they are.

But as socially difficult as it may be, there's one easy way to find out what your bad breath is: take a deep breath and ask a friend.

Legendary archer William Tell is, according to the story, ordered to undergo a cruel ordeal by an evil magistrate.

To escape my son's execution, I must shoot the apple on his head.

I succeeded in successfully shooting it, but let's change the story in two ways.

In the first case, a rogue hired by the magistrate steals his prized bow, and he ends up borrowing an inferior bow from a peasant.

The borrowed bow isn't perfectly calibrated, and all the arrows you fire in practice will end up in the bottom part of the target.

Fortunately, I was able to adjust the bow in time for the actual performance.

In the second, William loses confidence in his arm and his hands start to shake long before the show.

In practice, it sticks near the apple, but it hits in different places.

You can hit an apple, but your hands are shaking, so there's no guarantee that you'll hit the middle.

I must calm my trembling hands and make sure I hit the target to save my son's life.

At the core of these two stories are words that are often used interchangeably: accuracy and precision.

In fact, the two are often very different when it comes to scientific inquiry.

Accuracy is how close you get to the correct result.

Accuracy can be improved by using tools that are properly calibrated and by training the user.

Accuracy, on the other hand, means consistently getting the same results in the same way.

To improve accuracy, use fine-tuned instruments and reduce the amount of guesswork.

The story of the stolen bow was more accurate but less accurate.

I made the exact same mistake each time I shot an arrow.

The shaky-hand story was accurate but lacked precision.

The arrows hit around the correct target, but there was no guarantee that they would hit right in the middle.

Lacking either accuracy or precision will not be a problem in everyday life.

But engineers and researchers often need to be precise, and they have to produce microscopically accurate results with a high degree of accuracy every time.

Factories and laboratories use better quality equipment and more precise procedures to improve accuracy.

It can be an expensive investment, so management must decide on a project-by-project basis how much uncertainty of outcome is acceptable.

The pursuit of precision allows us to do things that were previously impossible, even targeting Mars as far away as we can.

You might be surprised to hear that NASA doesn't know exactly where the probes it sends to other planets will land.

Predicting where you're going to land requires extensive calculations, and the measurements used in the calculations can vary.

How does the density of Mars' atmosphere change with ground level?

At what angle will it enter the atmosphere?

What is your entry speed?

The computer simulates thousands of landing scenarios, imagining all possible combinations of variables.

After all possibilities are considered, the computer produces a number called the landing ellipse, which indicates the margin of error in the range of possible landings.

The landing ellipse of the 1976 Mars rover Viking lander was 100 by 280 km, about the size of New Jersey.

Thus, NASA was forced to avoid places that seemed interesting but difficult to land on due to technical limitations.

Since then, new information about the Martian atmosphere, advances in spacecraft technology, and improvements in simulation techniques have dramatically reduced the uncertainty.

In 2012, the Curiosity lander's landing ellipse was only 6 x 19 kilometers, less than 200 times smaller than the Viking.

Now we can target specific, previously unreachable, scientifically high-profile landing sites within Gale Crater.

Ultimately, people strive for accuracy, but the more accurate you are, the more reliable your results will be.

If you keep these two things in mind, you should be able to hit the stars every time you aim for them.

It's so natural that it's even become a proverb

"You can't put a boiled egg back"

But I can actually get it back to some extent

The effect of thermal energy on egg molecules can be reversed by mechanical energy.

Eggs are mostly water and protein

Proteins initially tangle into complex shapes, held together by weak chemical bonds.

When heated, these bonds are broken, and the proteins don't stack or swirl, but unwind and move freely.

This process is called denaturation

The newly liberated protein collides with neighboring molecules and begins to form new bonds, and when further heat is applied, it ends up in a complex tangle that gels into a solid mass, the finished boiled egg.

This tangle seems permanent, but it's actually not.

According to a theory of chemistry called the law of microscopic reversibility, anything that happens, like egg protein coagulation, can theoretically be reversed by reversing the steps.

But if you heat it up more, it tangles the proteins even more, and if you cool it down, it just freezes them.

it's not a lie

it works

First, scientists dissolve a hard-boiled egg white in water with a chemical called urea, a small molecule of urea that acts as a lubricant and wraps around long strands of protein, making each protein slippery.

Then you spin the solution in the glass tube -- at a breakneck speed of about 5,000 revolutions per minute -- and the solution spreads out like a thin film.

and this is important

Solutions near the walls spin faster than those near the center.

The difference in speed creates shear stress -- a force that causes the protein to slide back and forth, causing the protein to repeatedly stretch and contract until it finally springs back to its original shape.

By the time the centrifuge stops spinning, the egg white has returned to its pre-boiled state.

This technology can be used with any protein.

Larger, more complex proteins are harder to free, so chemists attach a bead of resin to one end to apply extra force and help the protein unwind faster.

This method of rehydrating the egg doesn't work for the whole egg in the shell, because the solution spreads out into the cylinder.

But this method has a wider application than uncooked breakfast.

Many drugs made of protein are very expensive to produce, and one of the reasons is that they tangle into clumps like cooked egg whites.

This spinning technique has the potential to be an easier, cheaper and faster way to unwind proteins than other methods, and new drugs can be created and delivered to more people faster.

But before you put all the food back together, there's something you should know.

Boiled eggs are actually a special cooking method because they change the shape of proteins and the way they bond, but not their chemical properties.

Many recipes undergo the famous Maillard reaction, a chemical reaction that transforms sugars and proteins into delicious caramel crunches, but it's much harder to undo.

So, while boiled eggs can be undone, unfortunately, fried eggs can't be undone at this time.

Nothing older than the universe exists

One of your questions that I want to talk about is where do we come from?

How did the universe come to be? Are we the only beings in the universe?

Does extraterrestrial life exist?

What awaits the future of mankind

Until the 1920s, everyone thought that the universe was basically a static entity that didn't change over time.

But it was discovered that the universe is expanding

Distant galaxies are moving away from us, which means they were much closer in the past.

The reasoning is that all the universes existed on top of each other about 15 billion years ago. This is the big bang, the beginning of the universe.

So what happened before the big bang?

If there was nothing, what created the universe?

Why was the universe born in this way from the big bang?

I used to think that cosmology could be divided into two parts, the first being laws.

So there are things like Maxwell's equations and general relativity, and given the conditions throughout the universe at a particular point in time, the evolution of the universe is determined by those laws.

Second, there are no unknowns about the initial state of the universe.

We've made a lot of progress on the former, and now we have a knowledge of the evolutionary laws of the universe, a near-perfect knowledge except in very specific circumstances.

But until recently, we've had very little knowledge of the initial state of the universe.

But the dual idea of ​​the evolutionary law and the initial state is based on the fact that time and space are separable and separate entities.

Under very specific circumstances, general theory and quantum theory allow time to behave like a dimension of space.

This means that the boundaries of time and space are removed, and that the initial state can be determined by evolutionary laws.

The universe can self-generate and create itself.

We can also know the possibility that it was created in another state.

It was all thanks to observations from the WMAP satellite, which focused on the cosmic microwave background, which is an indication of the early state of the universe.

I think we have unlocked the mystery of creation.

Maybe we should patent the universe and collect royalties from everything that exists.

Now let's talk about the second question, are we alone or is there other life in the universe?

We believe that life originated naturally on Earth, so it should be possible for life to originate on the right planets.There are many such planets in the galaxy, but we don't know how life originated.

Observational evidence is two-fold concerning the possibility of the origin of life.

The first is the discovery of algae fossils, 3.5 billion years old.

The Earth was born 4.6 billion years ago, and is thought to have been too hot for the first 500 million years.

Therefore, life appeared in the 500 million years since it became possible to survive on Earth, which is a very short period of time compared to 10 billion years, which is 10 billion years for a terrestrial planet.

Therefore, the possibility of the origin of life is very high.

If this probability is low, most of the 10 billion years will have passed just waiting for life to emerge.

But on the other hand, aliens don't seem to visit us.

UFO reports are taken with a grain of salt Why can only eccentrics and eccentrics see UFOs?

If the reports are covered up by a government conspiracy, and if the scientific knowledge brought by the aliens is not made public, then I would have to say that it is a very inefficient policy, and despite the large-scale search by the SETI project.

I still haven't been able to catch the quiz show broadcast by aliens

Alien civilization probably doesn't exist Civilization that has achieved the same level of development as us probably doesn't exist within a radius of several hundred light years.

Issuing an insurance policy to compensate for alien abductions should be a good bet.

Now we have to think about the third big question: the future of humanity.

If we are the only intelligent beings in the galaxy, we must ensure that we survive and continue to survive.

But we seem to be entering one of the most dangerous times in history, the population and the use of planet Earth's finite resources.

Exponentially increasing technological developments can change the environment for the better or for the worse.

But our genetic code retains the selfish, aggressive instincts that once favored our survival, in escaping the disasters that will unfold in the next few hundred years.

It won't be enough Thousands of years, even if we don't think about millions of years

Our chances of long-term survival depend not on staying on this planet, but on spreading out into space, by answering these big questions.

We can see that we have come a long way in the last few hundred years.

But if we're going to keep progressing for the next few hundred years, our future lies in space, and that's why manned

No, I'm in favor of personed spaceflight. I've spent my whole life trying to understand the universe.

I've been trying to find answers to these questions and I've been very lucky

disability is not a serious handicap

On the contrary, I think it has allowed me to spend more time in the quest for knowledge than other people, and my ultimate goal is to perfect my theory of the universe.

We are making good progress Thank you for your attention

Chris Anderson: Dr. Anderson, if I were to ask you whether we are the lone beings in this galaxy, or if we limit ourselves to civilizations on the same or higher intellectual scale than we are, which one is more likely?

It takes seven minutes for Dr. to answer.

Stephen Hawking: I think we're probably the only civilization within this range of a few hundred light years, otherwise we should already be able to pick up radio waves.

It's self-defeating. CA: Dr. Hawking, thank you for your answer.

As a useful warning, I'd like to come to this week's conference.

Doctor, I would like to express my sincere gratitude for the great efforts made to share your question with us.

Thank you. (Applause)

When I started learning to meditate, the instructions were simple: "Be mindful of your breath. When your mind wanders, come back to your breath."

i thought it was that easy

However, when I actually practiced zazen at a meditation training camp, even though it was the middle of winter, I was drenched in sweat wearing only a T-shirt.

When I found time, I took a nap because I was pretty tired.

I didn't really have the physical strength

Despite the simple instructions, I didn't get the point.

Why is it so hard to keep your attention?

Some studies have shown that even if you try very hard to focus on something, even if you listen to, say, this talk, at some point about half of the people will either feel overwhelmed or want to look at Twitter.

Why?

In fact, it's times like these that you're battling one of the most primitive learning processes known today, the process that research shows is the most fundamental, and that's ingrained into your nervous system.

This is a reward-based learning process called "positive reinforcement" and "negative reinforcement," and here's how it basically works.

For example, when you see something that looks appetizing, your brain tells you, "Calories! Eat and survive!"

And put it in your mouth and be satisfied with the taste and deliciousness

Sugar, in particular, sends signals from your body to your brain that say, "Remember what you just ate and where you found it."

We learn to store this in our brains as "contextual memory" and repeat the process the next time.

see food eat and feel good repeat

Trigger → Action → Reward

It's easy

Eventually the ingenious brain will come up with, "Hey hey

Not just remembering where food is

Next time you're feeling down, why not try something to make you feel better? "and

We do what our brain tells us to do, and we remember the results. When you're sad or angry, eating chocolate or ice cream can distract you.

This is the same process, just with a different trigger.

Rather than hunger signals from the stomach, an emotional signal, or "sadness," triggers appetite.

For example, when we were teenagers, we thought it was cool to see people who were "geeks" at school but acted bad and smoked outside.

I tried to imitate myself

There was a time when tobacco advertising models were really cool.

Look cool Smoke to look cool Makes me feel good So repeat

This is also "trigger → action → reward"

Every time you do this, repeat the same process to learn and this becomes a habit.

Thus, intense stress can trigger a craving for a cigarette or a craving for something sweet.

On the other hand, the same processes in the brain turn learning to survive into addiction, literally suicidal.

Obesity and smoking, for example, are two of the world's most avoidable causes of morbidity and mortality.

back to breathing

Instead of trying to resist and force your brain to focus on something, why not try using a reward-based learning process?

I have a trick

As you breathe, just pay attention to what your body is experiencing.

I'll give you an example

In my lab, we've studied whether mindfulness training can help people quit smoking.

In the same way that I tried to force myself to focus on my breathing, another method was to force myself to give up the habit of smoking.

Most of the participants had tried and failed in this way, failing an average of six times.

But in this training, instead of forcing something on the participants, we encouraged them to be curious.

In fact, I even recommended smoking.

It's true, "Go ahead, take a sip, and be interested and see how it makes you feel."

So what's the result?

I would like to introduce the comments of one participant

"Mindfulness smoking smelled like stinky cheese and tasted medicinal, oops!"

She joined our program because she originally knew that smoking was bad for her.

But when she became interested in what it felt like to smoke, she discovered that cigarettes suck.

(Laughter) So knowledge turned into wisdom in her.

I got past the stage where I just knew that smoking was bad for me, and it really hit me in the bones, so I broke the magic of smoking.

I became disillusioned with my act of smoking.

At this point, the prefrontal cortex, which is the last part of the brain's evolutionary process to come into being, intellectually understands that we shouldn't smoke.

So the prefrontal cortex works hard to help you change your behavior, which is to say, quit smoking, and stay away from the second, third, fourth cookie.

"cognitive control"

Humans use cognition to control behavior.

But unfortunately, this prefrontal cortex isn't very useful because it becomes inactive under extreme stress.

I'm sure you all experience this on a daily basis.

It's easy to yell at your spouse or kids, even though you know it's pointless when you're stressed and tired.

I can't control myself

When the prefrontal cortex fails, we fall back into old habits, which is why disillusionment with our own actions is so important.

By looking at the consequences of following our habits, we can become aware of our bad habits on a bone-distressing level, so that we don't force ourselves to hold back or hold back.

Because interest in the act itself diminishes in the first place.

This is the essence of mindfulness: by looking objectively at the consequences of our bad habits and by being truly disgusted, we can naturally let go of old bad habits.

It's not like you can magically quit smoking in an instant.

Over time, little by little, as we become more aware of the consequences of our actions, we naturally let go of old habits and form new ones.

But there's a contradiction. Mindfulness is all about paying attention, trying to be sensitive to everything that's going on in your body and mind in every passing moment.

Willingness to focus on one's own experiences rather than rushing to shun bad desires—

So the curiosity that underlies our willingness to pay attention to this experience has a gratifying quality.

curiosity

you feel good

What happens when people are curious?

You begin to realize that your desires are nothing more than bodily sensations: tension, anxiety, fidgety, etc. These bodily sensations come and go.

It's a small experience that happens within us, and each time we can control it, so that we don't get caught up in the huge, terrible desires that torment us.

In other words, curiosity allows us to step out of our long-standing fearful reflex habits and to accept ourselves for who we are.

You become a scientist inside of you, and you start waiting for the next data point.

It may sound like too easy a way to change behavior.

One study found that mindfulness training was twice as effective in quitting smoking as standard therapy.

It actually works

And when we looked at the brains of meditative masters, we found that a part of the neural network, the self-referential processing function, the default mode network (DMN), was activated.

An existing hypothesis is that we are tricked by this because a region of the DMN, called the posterior cingulate cortex, is activated not necessarily when a person has a strong desire, but when he or she is preoccupied with a desire.

Conversely, if you step away from the urge and simply observe the changes that are happening to you and step out of the process, the excitement in the posterior cingulate cortex subsides.

Now, we're currently piloting an online course and app that teaches mindfulness, which will work on the brain mechanisms I just talked about to help you break out of unhealthy habits, such as smoking, stress-induced overeating, and other addictive habits, by tapping into the technology that, ironically, drives people to escapist.

Remember that "contextual memory" I talked about earlier?

This tool is ready to use in the context that matters most to that person.

In other words, it can help people tap into the brain's innate ability to be alert and aware when the temptation to smoke or the urge to binge occurs.

Even if you don't smoke or eat badly, if you find yourself tempted to check your email to kill time, or start doing something unrelated at work, or feel the urge to answer an email while you're driving, try to harness your brain's innate nature. Just be curious and observe what's going on in your body and mind in that moment.

This is your chance. Do you want to spend the rest of your life in this endless, tiring vicious cycle?

It is a fork in the road to cut off

When you get an email, instead of reacting to it reflexively, change the way you approach it. Be aware of the urge, pay attention to it, and feel the joy of letting go. Repeat this.

thank you

(applause)

How much do you think a bouquet of tulips will cost?

a few bucks? $100?

Will you make a million dollars?

I can't talk to you

So what about the ownership of this house and pet supplies site?

In some eras, things like tulips and real estate pets.com stock fetched more than they were worth.

In each case, the price continued to rise, and then crashed.

Economists call this the bubble economy.

What will happen when it becomes a bubble economy?

First, for clarity, let's take the tulip as an example.

In the 17th century, the Netherlands entered its golden age.

Amsterdam in the 1630s flourished as a major port and commercial center.

Dutch ships profited in Europe by importing large amounts of spices from Asia.

As a result, Amsterdam was home to many wealthy and experienced merchants and traders who took pride in their splendor by furnishing their mansions with flower gardens.

The most popular flower among them was the tulip.

Tulips were brought to Europe by trading ships from the Orient.

This made it an exotic flower, and it was also difficult to cultivate, as it can take years for a single flower to bloom.

A virus epidemic in the 1630s made the petals more and more beautiful with fiery variegation of different shades.

Because variegated tulips were rarer than common ones, the price of these flowers began to rise and their popularity soared.

Tulip fever quickly spread across the country, and this is where tulip mania began.

The trend of rising prices combined with the ethos of paying more than it was worth created a frenzy.

A recent example is the dot-com bubble of the 1990s.

This new stock, this hot web, is the tulip of the 17th century.

everybody wanted their share

As more people want the tulips, the price goes up.

At one point, a single tulip bulb was worth ten times the annual salary of a skilled worker.

In the stock market, stock prices are driven by their supply and investor demand.

When a company's prospects are bright and more profitable, its stock price rises.

As investors buy more of the stock, demand increases and the price rises further.

As this loop repeats itself, investors get caught up in this frenzy and eventually create a bubble economy that far exceeds its intrinsic value.

The end of the frenzy and the bursting of the bubble happens when, all at once, people realize that stock prices and tulip prices are far above their true value.

both times this happened

suddenly no longer in demand

Then the price drops sharply and snaps!

The bubble bursts and the market collapses

Today, scientists are working day and night to predict what causes bubbles and how to avoid them.

Tulipmania is an effective picture of how bubbles form and helps us understand recent examples, such as the real estate bubble of the late 2000s.

The economy goes through cycles of booms and busts.

So until another craze breaks out and that bubble bursts, let's adore a bouquet of tulips and be thankful that we don't have to spend a fortune on it.

what's that sound?

The answer will vary from person to person. Some say the popping of joints is a pleasant sound, while others say it's an irritating habit and an unpleasant sound.

But what exactly is this sound?

So, why do you get that popping sound when you bend a joint in a certain way?

Scientists have offered a number of explanations, from rapid ligament stretching to real bone creaking.

But the most common explanation is that when a joint is stretched, the popping sound it makes is because the bubble is inside the joint.

Knuckles are the easiest joints to pop, but many people pop joints in the spine, such as the neck and back, and some people pop joints in the hips, wrists, and shoulders.

All of these joints are synovial joints, the most flexible joints in the body.

The space between the two bones is filled with a viscous fluid - synovial fluid that contains long, lubricating molecules like hyaluronic acid and lubricin.

Synovial fluid is almost like the yolk of an egg and acts primarily as a cushion for the bones, helping them slide over each other.

It contains phagocytic cells, which help clear out the bone and cartilage debris that accumulates in the joints.

But the key to cracking your knuckles is that synovial fluid, like any other fluid in your body, contains many dissolved gas molecules.

People who crack their knuckles know that to make plosives they need to extend their joints more than they normally would, for example by bending their fingers back.

In the process, the bone separates a little.

The amount of synovial fluid remains the same while the space between the bones increases.

As a result, there are areas of lower pressure, and the dissolved gases in the synovial fluid come out, like the carbon dioxide bubbles that come out when you twist open the lid of a soda bottle.

Inside the joint, the released gas bubbles with a popping sound.

but the foam doesn't last long

The surrounding liquid compresses the gas and the bubble collapses.

The gas from the bubbles re-disperses into the synovial fluid, slowly dissolving into the fluid over a period of about 20 minutes, which is why it takes a while to pop the same joint again.

Some scientists believe there are two types of plosives.

One is the sound of bubbles forming and the other is the sound of bubbles bursting.

Cracking your joints temporarily expands them, which is why people who are enthusiastic about cracking their fingers, their necks, their backs say their joints become more flexible.

But maybe you've been told by a concerned relative or a colleague who is disgusted by the sound that cracking your joints causes arthritis.

A doctor named Donald Unger told me the same thing.

And he decided to prove his mother's warnings wrong.

After 36,500 pops, both hands remained arthritic free.

It was this selfless passion for science that earned Dr. Unger the Ig Nobel Prize, a parody of the Nobel Prize that recognizes quirky but strangely interesting scientific achievements.

He writes that his results will inspire other parental beliefs, such as the importance of eating spinach.

No one has yet investigated that belief

As for snapping fingers, one study suggests that stretching all joints and rupturing air bubbles causes swelling in the hands and weakens grip strength.

But perhaps the biggest proven danger is annoying those around you.

As far as we know, medieval England was never invaded by ice zombies or ruled by dragons, but it was a tumultuous time of conflict between two aristocratic families that spanned generations, intricately intertwined personal interests and wavering loyalties.

If that sounds familiar, it's because this historical conflict known as the Wars of the Roses is the subject of "Game of Thrones."

The actual battle began with the death of Edward III in 1377.

King Edward's eldest son had already died, so his 10-year-old grandson, Richard II, succeeded to the throne before his three uncles.

This inter-generational succession to the throne has led to a struggle for the throne among their descendants, notably the Lancasters, descendants of Edward's third son, and the House of York, a descendant of Edward's fourth son.

The names of the wars that followed are derived from the symbols of the two families: the white roses of York, the red roses of Lancaster.

First, Henry IV of Lancaster took the throne in 1399, dethroning his cousin Richard II.

Despite occasional revolts, the Lancastrians' reign was peaceful until 1422, when Henry V died during a military campaign that year and his baby son Henry VI ascended the throne.

King Henry was weak-willed and persuaded by his entourage to marry Margaret of Anjou of France.

Queen Margaret was beautiful and ambitious, and would ruthlessly persecute anyone who jeopardized her position.She especially disliked Richard, Duke of York.

The Duke of York was the king's closest adviser, but was gradually estranged in favor of the Queen's favorite Earl of Suffolk and Earl of Somerset.

The Duke of York was ostracized from court and relegated to Ireland for his criticism of poor strategy in the war against France.

Meanwhile, a series of military failures and the corruption of Margaret and her entourage created public dissatisfaction. Taking advantage of this turmoil, the Duke of York raised an army, captured the Earl of Somerset, and reformed the court.

Things didn't go well at first, but when King Henry had a nervous breakdown, he seized his chance when he was appointed Lord Protector.

But in less than a year, King Henry suddenly recovered and was forced by the Queen to overthrow the Duke of York's reforms.

The Duke of York fled and raised his army again.

Even if he couldn't claim the throne right away, he wanted to return as Lord Protector, and he and his sons wanted to claim the throne.

But instead of winning the crown, the Duke of York lost a battle with the Queen's Guard and was hanged.

The young son of the Duke of York succeeded him as Edward IV.

Edward won a big victory over House Lancaster.

King Henry was captured and the Queen exiled with her son, Edward of Westminster, who was said to be cruel.

But the new king made a fatal misgovernment, annulling his political marriage to a French princess and secretly marrying a widow of an aristocrat of a different class.

This displeased his senior vassal, the Earl of Warwick.

The Earl of Warwick allied himself with the House of Lancaster, turned against his brother George, who was jealous of Edward, and restored Henry to the throne.

Edward was restored to the throne, the Prince of Lancaster was killed in action, and King Henry in captivity soon died.

The rest of Edward IV's reign was peaceful, but the death of the king in 1483 brought another bloody battle.

A 12-year-old prince succeeded to the throne, but Edward's brother, Richard III, ruled that the two nephews were illegitimate and not legitimate heirs.

He took office as regent and captured the princes in the Tower of London.

I don't know what happened, but soon the two princes disappeared, and King Richard's position was now at peace.

But just two years later, on the other side of the English Channel, the downfall of kings would begin.

Henry Tudor, a direct descendant of the first Duke of Lancaster, had fled to France after his father's death in the last rebellion.

With Richard III's accession to the throne, and the fact that the Yorkists were divided, Henry won their support.

Raising an army in France, he crossed the English Channel in 1485 and quickly defeated Richard's army.

And with the marriage of Elizabeth of York, sister of the two vanished princes, as Henry VII, the two families reconciled, ending nearly a hundred years of war.

We tend to think of historical battles as having clear winners and losers.

The War of the Roses, as depicted in later dramas, teaches us that victory is uncertain, that alliances are not rock solid, and that even kingship is as fragile as the seasons.

If someone asked you who is the richest person in history, who would you say?

Billionaire bankers, big business tycoons, Bill Gates, John D. Rockefeller?

What about the King of Africa, Musa Keita I?

Mansa Musa, aka "King of Kings," who ruled the Mali Empire in the 14th century, is one of the richest men in human history due to his amassed wealth.

But his vast fortune is only part of his rich legend.

When Mansa Musa ascended the throne in 1312, much of Europe was suffering from famine and civil war.

But many African kingdoms and the Islamic world thrived, and Mansa Musa played a major role in bringing the fruits of that prosperity to his realm.

Strategically annexing the city of Timbuktu and regaining influence as far as Gao, he controlled an important trade route from the Mediterranean to the coast of West Africa.

The territory of the Mali Empire was rich in natural resources such as gold and salt.

Manza Musa's wealth was first seen by the world in 1324 when he made a pilgrimage to Mecca.

Instead of making the pilgrimage on a tight budget, he led a caravan that stretched out beyond the eye.

The budget for this trip depends on oral tradition and several different records, so it's hard to know exactly.

But many agree that it was an expedition of enormous scale.

According to the Chroniclers, the caravan's attendants consisted of tens of thousands of soldiers, civilians and slaves, 500 messengers carrying gold goods and clothed in fine silk, and numerous camels and horses carrying large amounts of gold bars on their backs.

Stopping in cities such as Cairo, Mansa Musa spent large sums of money giving to the poor, buying souvenirs, and sometimes building mosques along the way.

His spending destabilized the local economy and caused massive inflation.

The journey is said to have taken more than a year, and by the time Manza Musa returned, tales of his astonishing wealth had spread across the Mediterranean ports.

The Mali Empire and its king were elevated to near-legendary status, cemented in place by being depicted on a 1375 map of Catalonia.

On one of the most important world maps of medieval Europe, he was depicted as a king with a scepter and a shining gold nugget.

Mansa Musa literally left his empire and himself on the map.

But material wealth wasn't his only concern.

As a devout Muslim, he was particularly interested in Timbuktu, a place that had been a religious and academic center before he annexed it.

After returning from his pilgrimage, he built the magnificent Dzingariberi Mosque there, with the help of Andalusian architects.

He built a bigger university, which made the city even more prestige, attracting scholars and students from all over the Islamic world.

Under Mansa Musa's reign, the empire was urbanized, with hundreds of bustling streets populated with schools and mosques.

The king's rich legacy has been passed down through generations, with mausoleums, libraries and mosques remaining to this day as evidence of the golden age of Mali's history.

A common misconception is that if you have to be very careful and tidy, or keep your hands clean, or plan your weekend in detail, you've got OCD.

OCD, short for obsessive-compulsive disorder, is a serious mental illness that's often misunderstood by society and psychiatrists alike.

Let's clear up that baseless misunderstanding

Misconception #1: Ritual, repetitive behavior is OCD

As the name suggests, obsessive-compulsive disorder has two dimensions: the thoughts, images, and urges that enter your mind, known as obsessions, and the compulsive behaviors that people perform to alleviate the anxiety that obsessives cause.

Types of behaviors that are often associated with OCD include "washing hands a lot" and "checking things over and over" -- things we sometimes do that indicate obsessive-compulsive tendencies.

But real OCD is much rarer and debilitating.

People with OCD have little control over their obsessions, and compulsive compulsive behaviors can take a long time, interfere with work, school, and social life, and can be very distressing.

These diagnostic criteria are designed to separate people who suffer from OCD from those who are a little more methodical or hygiene-conscious.

Misconception #2: Frequent hand washing is a major symptom of OCD

"Washing your hands" is a common image of OCD in pop culture, but obsessions and compulsions take many forms.

An obsession can be a fear of pollution or disease, a fear of harming others, a preoccupation with a number pattern, a morality, or a gender identity.

Compulsive compulsive behaviors can also range from being overly clean and re-checking to being very strict about the placement of objects and walking only on set routes.

Misconception #3: People with OCD are unaware of their irrational behavior

In fact, many people with OCD are well aware of the relationship between their obsessions and compulsive behaviors.

The inability to avoid these thoughts and behaviors, even though we realize they're irrational, is one of the reasons why OCD is so painful.

People with OCD report that irrational thoughts make them feel anxious and that their irrepressible reaction to anxiety makes them feel like they're going insane.

So what causes OCD?

unfortunately i don't know

But I do know some important hints.

OCD is thought to be a neurobiological disorder

So, studies show that the brains of people with OCD are hardwired to behave in a certain way.

Studies show that three parts of the brain are involved in various ways in social behavior and complex cognitive processes, including voluntary movements and emotional and motivational responses.

Another hint is that OCD is linked to low levels of serotonin, a neurotransmitter that regulates the transmission of stimuli between brain structures and vital activity, controlling mood, aggression, impulse regulation, sleep, appetite, body temperature and pain.

But are serotonin and these brain regions responsible for OCD, or are they symptoms of an as yet unexplained underlying cause of the disease?

Perhaps the answer won't become clear until we understand the brain better.

But the good news is that there are a variety of effective treatments for OCD, including medications that raise serotonin levels by preventing brain cells from reabsorbing serotonin, behavioral therapy that gradually reduces anxiety in patients, and in some cases, electroconvulsive therapy and, if other treatments don't work, surgery.

It hurts so much when you know you're being deceived by your own brain and you can't refuse to do what your brain tells you to do.

But with knowledge and understanding, we can seek help, and future research on the brain may finally lead us to the answers we seek.

In 1997, in a match between France and Brazil, a young Brazilian player named Roberto Carlos was preparing to take a 35-meter free kick.

There was no straight line to the finish line, so Carlos decided on a seemingly impossible challenge.

When he kicked the ball, it flew to the player's right, but just before it crossed the line, it swerved to the left and was sucked into the goal.

According to Newton's first law of motion, an object will move in the same direction and speed unless acted upon by another force.

When Carlos kicked the ball, he gave it direction and speed, but what force changed the ball's course and produced one of the greatest goals in football history?

The secret lies in the rotation

Carlos kicked the ball to the bottom right and kicked it high to the right, but at the same time he was spinning the ball.

The ball starts flying in what appears to be a straight path, but the air flowing on either side slows it down.

On one side, the air flow and ball motion were in the opposite direction, increasing the pressure.On the other side, the air flow and ball motion were the same, creating an area of ​​lower pressure.

This difference caused the ball to curve in the direction of lower air pressure.

This phenomenon is called the Magnus effect

This type of kick, also known as the banana kick, is one of the most tried and tested elements that add color to a great game.

But it's difficult to bend the ball precisely and wrap it around a defender's wall and return it to the goal.

If it is too high, it will go over the goal bar.

Too low and you'll hit the ground before you can turn.

If you miss too much outside, you will not reach the goal

If you kick too much inward, the defender will stop you.

If the ball is too slow, it will bend too quickly or not at all.

If the ball is too fast, it won't be able to turn in time

The same laws of physics make it possible to score a direct goal from a corner kick that seems impossible.

The Magnus effect was first discovered by Sir Isaac Newton, who noticed it while playing tennis in 1670.

This rule also applies to golf balls, frisbees, and baseballs.

the same thing happens in both cases

The rotation of the ball creates a difference in air pressure in the surrounding air flow, causing the ball to bend in the direction of rotation.

then it's a problem

If you kick the ball hard enough, does it theoretically come back to you like a boomerang?

unfortunately the answer is no

If the ball doesn't break on impact or hit an obstacle, the air slows it down, causing it to bend more and more, forming smaller and smaller circles in a spiral trajectory, until it stops.

To get this swirl, you need to spin the ball 15 times faster than Carlos' immortal kick.

I hope it'll go well

Imagine an island like this, with 100 perfectly logical people imprisoned by a dictator.

But there is one mysterious rule that you can escape from.

Any prisoner is allowed to go to the guard at night

If the prisoner has green eyes, he will be released.

If you don't, you'll be thrown into the crater of a volcano.

In fact, all 100 prisoners have green eyes, but they were all born and raised on this island, and because of the dictatorship, they don't know their own eye color.

There's nothing to reflect light, the water is in an opaque container, and most importantly, we're not allowed to talk to each other.

But we can see each other at roll call every morning.

But no one takes a risk until they are absolutely sure of success.

Thanks to pressure from human rights groups, the dictator reluctantly accepted your visit and allowed you to speak to the prisoners under the following conditions: Speak only once and give no new information.

How can we save the prisoners without angering the dictator?

After careful consideration, you called out to everyone, "At least one of them has green eyes."

The dictator is skeptical, but reassures himself that nothing should change.

You left the island, and life there doesn't seem to change.

But on the morning of your visit, 100 days later, not a single prisoner was left, each having escaped the island the night before.

So how did you outsmart the dictator?

It would be easier to understand if the number of prisoners was arbitrary.

Let's simplify the story by saying it was just Adria and Bill.

Two people who see each other's green eyes think that maybe only one of them is green.

Neither escaped the first night

But the next morning, they were both still on the island, so we got some new information.

Adrià realizes that if Bill and the other person he was with hadn't had green eyes, Bill would have thought he had green eyes and would have run away the first night.

At the same time, Bill realizes the same thing about Adria.

The fact that the other person was left made me realize that I also had green eyes.

By the morning of the second day, both had escaped.

Now consider the third prisoner.

Adria, Bill, and Carl each notice that the other two have green eyes, but the others, likewise, aren't sure if they realize there are two green eyes, or if it's just one.

I'll still wait the first night, and I'm still not sure about the next morning.

Carl thinks, "If my eyes weren't green, Adria and Bill would see each other and two nights they would both run away."

But if by the morning of the third day both were still there, we know that Karl also has green eyes.

Adria and Bill come to the same conclusion, and they all escape on the third night.

Using this inductive reasoning, it doesn't matter how many prisoners there are.

The key here is the concept of shared knowledge, introduced by the philosopher David Lewis.

Your statement itself doesn't contain any new information, but it's to inform everyone at once.

So, in addition to at least one having green eyes, each prisoner was able to follow every green-eyed person, and each one knew that.

No prisoner knows if he has green eyes, so he has to wait as many nights as there are prisoners on the island to find out.

Of course, you could cut the time down to 98 days by saying, "At least 99 people have green eyes."

A semicolon may appear to be suffering from self-losing.

It looks like a comma challenging a period.

Maybe that's why we churn out semicolons like confetti.

We are confused about the correct usage of semicolons.

The half-and-half nature of the semicolon is actually a useful one.

stronger than a comma and less deterministic than a period

It can fill the gap between the two, and that's why it has some special and important roles.

First, a semicolon can clarify an idea in a sentence marked with a colon.

"Semicolon: At first unapproachable, but then found to be beneficial, and in the end, you find yourself falling in love with this wonderful punctuation mark."

Even though commas separate parts of a sentence, it's easy to lose track of what's related to what.

But then the semicolon comes to the rescue.

For example, in a list of items, a comma can be more powerful than a comma because it can cut the sentence into pieces and put them together in chunks.

A semicolon splits, but it also concatenates

Another role of the semicolon is to connect independent clauses.

Independent clauses stand alone as sentences, but when joined together with semicolons, you can see that they're related in some way, and they make sense.

"The semicolon was once a big mystery to me.

I didn't know where to hit."

there is no grammatical error

the two sentences are independent

But think about a string of sentences, all of the same length, separated by periods.

Things quickly become monotonous

In cases like this, the semicolon smooths out and adds variation to the sentence by connecting related clauses.

But even though the semicolon has its advantages, it doesn't mean you can put it everywhere.

There are two main rules for using semicolons.

First, except when used in lists, semicolons only connect some related clauses.

For example, you can't use it in cases like this: "The semicolon was a big mystery to me. I really want a sandwich."

The two sentences are completely different, so a period is the most appropriate here.

The job of the semicolon is to put two independent clauses together so that they're mutually beneficial because they refer to the same thing.

Second, semicolons are rarely used before coordinating conjunctions, which are words like and, but, for, nor, or, so, yet.

it's a comma turf

But using a semicolon as a conjunction can shorten or add variety to a sentence.

After all, this underestimated punctuation mark has the power to bring clarity, strength, and style to writing.

Bringing and sustaining economic growth is a major challenge of modern society.

Of course, there are other challenges, such as health care, disease burden, pandemics, environmental problems, and escalating terrorism.

But if we don't try to revitalize the economy as much as possible, it will take time to solve the problems I just mentioned.

And more importantly, unless we reinvigorate our economies, and until we create long-term economic growth, we will not be able to tackle the seemingly unsolvable problems that continue to pervade the world, such as health care, education, and economic development.

The fundamental question is, how do we get economic growth when developed economies like the West are struggling to get their economies back on track after the financial crisis?

The economy continues to stagnate, and the three main drivers of economic growth - capital, labor and productivity - remain weak.

Especially in developed countries, where debt and losses are accumulating, labor quality and quantity are declining, and productivity is stagnant.

In the same way, how can we bring economic growth to emerging countries?90% of the world's population lives in emerging countries, and 70% of the population is young people under the age of 25.

For these countries, economic growth of at least seven percent a year is essential to reduce poverty and double per capita income within the current generation.

And yet, today, emerging market countries with populations of over 50 million people are struggling to reach the numerical target of 7 percent.

To make matters worse, India, Russia, South Africa, Brazil and even China are not even reaching 7 percent and are trending downward in most countries.

Economic growth is an important issue

When the economy enters a period of growth, a virtuous cycle occurs in the country and society, and people move up the social ladder, gaining more opportunities and living standards.

When you enter a period of stagnation, a country shrinks and declines. It's not just about the annual economic numbers, it's about the meaning of life and how you spend your life.

Economic growth has a huge impact on individuals.

As growth wanes, the risks to human progress grow, political risks and social instability escalate, and societies become clouded, brutish and shrinking.

Background should also be considered

Emerging markets don't have to grow at the same rate as developed countries

Some of you may think this statement is dangerous.

Some people, as they see what's happening around the world, become so disillusioned that they believe that the root cause is economic growth.

Some fear that the world's population will explode.

According to United Nations statistics, by 2100 the world's population is expected to plateau to 11 billion, and there are concerns about what will happen to arable land, drinking water, and natural resources such as energy and metals.

There are also concerns about the negative impact on the environment.

I'm also worried about how greedy and corrupt people can become when global corporations are all about profit.

But I'm here today to tell you that economic growth is at the heart of changing living standards for people around the world.

And more importantly, capitalism doesn't just bring economic growth.

The simple definition of capitalism is that the factors of production, like commerce and industry, capital and labor, are in the hands of the private sector rather than the state.

The key is to understand that what should be criticized is not economic growth itself, but what happened to capitalism.

We need to pursue growth under a better economic system so that we can generate the economic growth we need over the long term.

Economic growth requires capitalism, but it has to work properly.

As I said earlier, private actors were the core of the capitalist system.

But this was a simplistic view of the dichotomy.

capitalism is good anti-capitalist is bad

From practical experience, capitalism is more of a spectrum.

Some countries, like China, are state capitalist, while others, like the United States, are market capitalist.

When we try to criticize the capitalist system, we tend to look at countries like China, which are not market capitalists in the first place.

But what we're really worried about now is America's embodiment, a more pure form of capitalism.

And this is really important, because increasingly, this form of capitalism is being criticized, saying, "Capitalism fosters corruption, and worse, it fosters income inequality, where the few profit at the expense of the many."

The two very big challenges that need to be addressed are to rebuild capitalism and enable economic growth, and at the same time to solve social ailments.

To envision that, we need to ask ourselves: How does modern capitalism work?

Quite simply, capitalism is arranged by profit-oriented people, selfish people who get what they want.

Only when the benefits are maximized do we decide that it's important to support social contracts other than our own.

Of course, in this system, the government imposes taxes and uses some of the revenues to fund social security, so we can understand that the government's role is not just to regulate, but to mediate social goods.

Nonetheless, this structure, the two-tiered structure, provides a basis for thinking about how we can improve the structure of capitalism.

There are two sides to this issue.

First and foremost, to know what is beneficial to right-leaning policies and to think about ways to improve capitalism.

Specifically, right-leaning policies tend to favor things like conditional transfers, rewarding them with cash if they do things they think will encourage economic growth.

For example, parents can get cash for sending their children to school, or parents can get cash for getting their children vaccinated.

Whether or not we should give cash to people who do what they take for granted, all this debate aside, cash for this behavior is actually working very well, for example in trials in Mexico and Brazil in New York.

But there are benefits to left-leaning policies, and there's a big change going on.

With China's success, the argument that the government should not narrow its discretion, but rather expand its role and duties as a mediator of the factors of production, is becoming more popular.

There's also a debate about the role of the private sector: how can we move away from the pursuit of profit and become more involved in providing social contributions?

Like a corporate social responsibility program, even if it's small, it's going in the right direction.

Of course, left-leaning policies tend to blur the lines between governments, NGOs, and private companies.

Two good examples of this are the United States in the 19th century, when the infrastructure was being introduced, it was really about public-private partnerships.

In recent years, even with the advent of the Internet, it has shown the world that public and private sectors can work together to improve society.

My message is this: dogmatic and unnecessarily ideological attitudes cannot sustain global economic growth or solve problems.

We will need to take a broader view of what works, to bring about sustainable long-term economic growth, to clean up the problems and social ills that continue to plague the world.

Ultimately, we need to recognize that ideology is the enemy of growth.

thank you

(Applause) Bruno: Dambisa, I have a question. In response to your last sentence, I can also say that economic growth is also an ideology, probably the dominant ideology of our time.

How would you answer if asked?

I think it's a valid question, and we're discussing this right now.

There's been a lot of research on the topic of what happiness is, as well as on measures of improving living standards and success.

So we should think broadly about what we can do to improve living standards and reduce poverty around the world.

So you called for a return to economic growth, but the only way to go this long way without sacrificing our finite planet would be to decouple economic growth from the resource use that it was based on.

Do you think this is possible?

I'm more optimistic about human capabilities and creativity.

When people use finite, scarce and depleting resources and start oppressing each other, as you know, people become pessimistic and anxious about the world.

But the Club of Rome had previously argued that the world's resources would soon be depleted, and that this warning had justification.

But just as we were able to desalinate seawater with our ingenuity, we can reinvest in energy for better results.

In that respect, I'm optimistic about people's capabilities.

What struck me was the proposal for restoring economic growth and going in a different direction, but it seemed to me that this was a proposal to go back to more proto-capitalism, to put a price tag on good deeds to drive people, and to build a bigger role for industries around social issues.

is this your suggestion?

I think we should take a broader view

Of course, the traditional model of economic growth didn't do what we wanted it to do.

It's no coincidence that America, the world's largest economy, has democracy, and liberal democracy is at the heart of its political stance, and American free market capitalism is free market capitalism as an economic stance within that.

China, the world's second largest economy,

It's a completely different model of state capitalism that doesn't prioritize democracy.

These two countries are very different politically and economically, but the Gini coefficient shows that they have similar income inequality.

We need to discuss this. We have no idea which economic model we should apply. I think we need more discussion and humility about what we know and what we don't know.

COP21 will be held in Paris

If you could say one word to the heads of state and delegates in attendance, what would you say?

Again, we should have a broader perspective.

As you've noticed, the debate surrounding environmental issues has been brought up many times, at the Copenhagen conference, at the Stockholm conference in 1972, and it's still under discussion. And I think it's because we haven't reached a fundamental consensus -- in short, because there's a gap between the needs of the developed and emerging markets.

Emerging markets need continued economic growth to dispel political instability.

Developed countries recognize that they have important responsibilities, not only to manage their carbon footprint and the drivers of the world's environmental problems, but also to lead research and development.

That's why you have to show up at the bargaining table.

It is inherently impossible for developed countries to take issue with the policies of emerging markets without looking after themselves, because on the one hand, both the supply and demand of developed markets largely drives emerging market behavior.

Bruno: Thank you for your kind words. Dambisa: Nice to meet you.

(applause)

we hear about calories all the time

How many calories are in this cookie?

How many calories does 100 jumps, long distance runs, and brisk walks burn?

By the way, what is a calorie? How many calories do you need?

Calories are a way of keeping track of your body's energy balance.

A good balance is when the energy intake and expenditure are about the same.

If you consistently consume more energy than your body can burn, over time the excess will be stored as fat in your cells, resulting in weight gain.

If you burn more energy than you replenish, you will lose weight.

So we have to be able to measure the energy we take in and the energy we use, and we use the unit calorie.

Kcal (= macro calorie) used for food is defined as the amount of energy required to raise the temperature of 1 kg of water by 1°C.

All foods have a caloric content, which represents the energy stored in chemical bonds.

A slice of pizza has an average of 272 calories, a slice of bread has 78 calories, and an apple has 52 calories.

Digestion releases energy (chemical bonds) and stores it in other molecules that can be broken down when the body needs it.

Energy is used for three purposes: 10% for digestion, 20% for physical activity, and the largest 70% for supporting the basic functions of organs and tissues.

The third use is your basal metabolic rate, which corresponds to the number of calories you need just to survive without eating or moving around.

Add in some physical exercise and digestive activity, and you have an official guideline for how many calories the average person needs per day: about 2,000 calories for women and about 2,500 calories for men.

This approximation is based on several factors, including average weight, activity level and muscle mass.

So is about 2,000 kcal the ideal intake for everyone?

not necessarily

Energy-intensive activities, such as cycling in the Tour de France, can burn up to 9,000 calories each day.

You need a little more calories than you normally would during pregnancy, while older people typically have a lower basal metabolic rate and burn energy more slowly, so fewer calories are needed.

There are other things you should know before counting calories.

The calorie content on a Nutrition Facts label is the amount of energy a food contains, not the actual calorie intake.

Fibrous foods such as celery and whole wheat require more energy to digest, so 100 calories of celery yields less energy than 100 calories of potato chips.

It goes without saying that some types of food are rich in nutrients such as protein and vitamins, while others are low.

Eating too much nutrient-poor food leads to not only obesity, but malnutrition.

Also, the same food doesn't always provide the same amount of calories for different people.

The amount of enzymes, the bacteria in your gut, and even the length of your gut can all make a difference in the amount of energy you get from the same food.

So calories are a useful measure of energy, but to accurately calculate how many calories an individual needs, we need to consider the amount of exercise, the type of food we eat, and even our ability to process energy.

It would be nice to see all of this on the Nutrition Facts label.

When we talk about "English," we usually think of it as a single language. But what do the different dialects spoken in dozens of countries around the world have in common, and what do they have in common with Chaucer's writings?

And what do some languages ​​have to do with the mysterious words of the epic Beowulf?

English, like many languages, can be explained by the fact that it has evolved through generations of speakers and changed significantly over time.

This shift allows us to trace modern languages ​​back to their ancient origins.

Modern English has many similar words to Latin-derived Romance languages, such as French and Spanish, but many of these words weren't originally in English.

It was brought in after the Norman conquest of England in 1066.

When the French-speaking Normans conquered England and became the ruling class, they brought their spoken language with them, bringing with them the English originally spoken in England with a large vocabulary of French and Latin.

This is what we call Old English today.

Beowulf's words

It doesn't sound very familiar, but if you know German, you might understand better.

Because Old English belongs to the Germanic family of languages ​​brought to the British Isles by the Angles, Saxons and Jutes in the 5th and 6th centuries.

The Germanic language they spoke became known as Anglo-Saxon.

Viking invaders from the 8th to the 11th centuries added Old Norse words to their vocabulary.

It can be difficult to see the origins of modern English beyond words borrowed from French, Latin, Old Norse, and other languages.

But comparative linguistics helps us understand by focusing on grammatical structures, patterns of sound change, and specific core vocabulary.

For example, from the 6th century onwards, German words beginning with "p" systematically changed to "pf" sounds, while their Old English equivalents remained "p."

The "sk" sound in another sibling language, Swedish, became the "sh" sound in English.

There are still some English words that have the "sk" sound, such as skirt and skull, but they were brought over from Old Norse after the change from the "sk" sound to the "sh" sound occurred.

These examples show that English, Swedish, German and other languages, like the various Romance languages ​​descended from Latin, descend from a common ancestor called Proto-Germanic, spoken around 500 BC.

This historic language has never been written, so it can only be reconstructed by comparing the descendants of the language, which fortunately changed according to certain rules.

Using similar techniques, we can go one step further back to the origins of Proto-Germanic, a language called Proto-Indo-European, spoken in the Black Sea steppes some 6,000 years ago.

This is the reconstructed ancestry of the Indo-European language family, which includes almost all languages ​​historically spoken in Europe and South and West Asia.

With a little more work, we can find similar systematic similarities and correspondences between different Indo-European languages.

If you compare English and Latin, the English ``t'' corresponds to the Latin ``d'', and if the Latin word begins with a ``p'', the English word has a ``f''.

English's more distant relatives include Hindi, Persian, and Celtic languages ​​spoken in what is now Britain.

Proto-Indo-European itself comes from an even older language, but unfortunately that's as far as the historical and anthropological evidence can go.

There are many mysteries that are just around the corner, such as whether there is a relationship between the Indo-European languages ​​and other major languages, and the characteristics of the languages ​​spoken in Europe before the Indo-Europeans arrived.

But it's amazing to me that three billion people around the world, many of whom don't understand each other, speak the same language, created by 6,000 years of history.

Someone told me to "Stand up straight"

Have you ever been scolded for hunching over dinner with your family?

It's not wrong to point out things like that.

Posture, the way you position your body when you sit or stand, is the basis of all body movement and determines how well your body handles the loads associated with movement.

These loads include carrying heavy objects and sitting in odd positions.

One of the big loads we experience every day is gravity.

If you don't have optimal posture, your muscles have to work harder to keep your balance straight.

stiffen and lose flexibility

You may atrophy

If this dysfunctional adaptation continues, it impairs the muscle's ability to respond to load.

Poor posture puts more strain on your joints and ligaments, increases your chances of injury, and reduces the function of organs like your lungs.

Poor posture isn't the only cause, but researchers have linked bad posture to scoliosis, tension headaches, and back pain.

Posture also affects your emotional state and your sensitivity to pain.

Yes, there are many reasons to practice good posture.

But maintaining good posture is getting harder these days.

Sitting in awkward positions for long periods of time can lead to poor posture over time, and people tend to look down when using a computer or mobile device.

Many studies show that posture in general is getting worse.

So what does good posture look like?

The 33 vertebrae should be in a straight line when the spine is viewed from the front or back.

When viewed from the side, the spine has three curves: the neck, the shoulders, and the back.

You weren't born with this S-shaped spine.

A baby's spine has one curve, like a C.

The other curves are usually formed between 12 and 18 months of age as muscles develop.

These curves help absorb loads when standing, walking, and jumping.

If your spine is aligned correctly, when you stand up, you should have a straight line running from the front of your shoulders through the back of your buttocks and the front of your knees to a few centimeters in front of your ankles.

This keeps the center of gravity directly above the base of support, allowing for efficient movement and minimizing fatigue from muscle strain.

If you're sitting, it's ideal to be upright instead of slouching.

Armpits tight and shoulders relaxed

Bend your knees and place your feet firmly on the floor

But what if your posture wasn't so good?

Try changing your environment

Adjust the screen so that it is at or slightly below eye level

All parts of the body, like elbows and wrists, are in the right place to support them, and if you need help with ergonomics.

When you sleep, support your neck with a pillow, lie on your side, and put the pillow between your legs.

Wear low-heeled, well-fitting shoes and use a headset when on the phone

Good posture is not enough

Keeping your muscles and joints moving is also very important.

In fact, sitting in a good position for long periods of time is actually worse for you than being in a bad position.

When you move, move smart

When carrying objects, keep them close to your body

The backpack should touch your back and be symmetrical.

If you sit for long periods of time, get up occasionally and move around to exercise your muscles.

Muscles are used to maintain the strength needed to support the body efficiently, and so are joints, bones, the brain and the heart.

If you're still really worried, talk to your physical therapist, because of course standing upright is so important.

As a kid growing up in Lima, my grandfather would often tell me stories about the Spanish conquest of Peru.

Inca emperor Atahualpa was captured and killed

The conquistadors led by Pizarro became rich, and when word of their conquest and glory reached Spain, more and more Spaniards, hungry for gold and glory, rushed in.

They visited an Inca town and asked, "Aren't there more civilizations to conquer? Where's the gold?"

The resentful Incas taught, "Go to the Amazon.

I can get as much money as I want

In fact, the town of Paititi — El Dorado in Spanish — is made entirely of gold.”

The Spaniards went deep into the jungle, but few returned, and they brought back tales of powerful shamans, warriors who shoot poisoned arrows, towering trees that obscured the sun, bird-eating spiders, serpents that swallowed people whole, and boiling rivers.

That story was engraved in my boyhood memory.

time has passed

Now, I'm doing a PhD at Southern Methodist University researching the potential of geothermal energy in Peru, and when I remembered that legend, I started to wonder.

Is there really such a thing as a boiling river?

I've asked many colleagues -- universities, governments, oil and gas mining companies -- and they all say, "No way."

That's right

Boiling rivers exist all over the world, but they're usually found in volcanic regions.

Because generating that much geothermal energy requires a powerful heat source.

The red dots on the map represent volcanoes, but neither the Amazon nor most of Peru have volcanoes.

So there's no hope for boiling rivers.

When I tell them this story at the family dinner table, my aunt says, "Oh, no, Andres, I've been there and swam."

(Laughter) And then my uncle joins us.

"No it's not a lie

You can swim only after heavy rain, and you're protected by a magical shaman.

Your aunt is friends with his wife."

(laughs) (Spanish) Seriously? As a scientist, I was skeptical, but I found myself hiking through the jungle, guided by my aunt, 700 kilometers from the nearest volcano.

but then

I heard something, a low rumble that grew louder as it went on.

It was like the constant, faint sound of waves, and as we got closer, steam leaked through the trees.

And what I saw was this scene

I immediately got out my thermometer and measured it, and the average river temperature was 86 degrees.

It's not boiling to 100 degrees Celsius, but it's pretty close.

The river was hot and swift

A shaman's disciple took me upriver to the most sacred part of the river.

The strange thing is that the water in the river is initially cold.

This place is home to Yakumama, the water mother — a giant snake spirit that produces hot and cold water.

Here was a hot spring, under the mother mouth of the serpent spirit, mingling with the cold stream of water that brought the legend to life.

I woke up the next morning -- (Laughter) and ordered some tea.

Then he hands me a mug and a tea bag and points to the river.

Surprisingly, the water in the river was clear and had a nice taste, which is a bit strange in a geothermal system.

What surprised me was that the place had been known to locals for a long time, and I wasn't the first outsider to see it.

became part of their daily life

they drink the water

take the vapor into your body

I cook with it, I do my laundry, I even make medicine with it.

I met a shaman, and he looked like part of a river or part of a jungle.

He questioned my intentions and listened carefully.

And to my relief -- I was a little apprehensive, to be honest -- a smile spread across his face and he started laughing.

(Laughter) Sherman gave me permission to study that river, with one condition: take a sample of the water, analyze it in the lab, and then put it back into the earth, anywhere in the world, so the water can come back.

I've been there every year since my first visit in 2011, and the field work there is both exciting and demanding, and sometimes dangerous.

It's a story that was featured in a National Geographic magazine feature.

I once got stuck on a rock the size of a piece of writing paper, dressed in beach pants and sandals, sandwiched between an 80-degree river and a hot spring.

Take me there, the Amazon is a rainforest.

A heavy rain came and I couldn't see anything

Due to the temperature difference, the whole area is pure white

It was an amazing experience

After years of research, I'm about to publish my geophysical and geochemical studies.

I'm sharing some of those discoveries for the first time here at TED.

First of all, this is not a legend.

What a surprise!

(Laughter) When I started doing this research, satellite imagery was so low resolution that it was useless.

I didn't have a proper map.

Thanks to the Google Earth development team, it's now this sharp.

The river's local name, "Shanai Timpiska," means "boiled by the heat of the sun," indicating that I'm not the first person to wonder why a river boils.

So why is this river boiling?

(Bubbles) This video took three years to shoot.

Hot springs are gushing out from cracks

Just as hot blood flows through the arteries and veins of our bodies, hot water flows through cracks and fractures in the earth.

Where the earth's arteries come to the surface, we see geothermal manifestations in many forms: fumaroles, hot springs and, you see, boiling rivers.

But what's really amazing is the scale of this place.

Just remember the next time you cross the road

This river is wider than a two-lane road for the most part.

There's hot water running for 6.24 kilometers.

really big

There's a hydrothermal pool that's bigger than this TED stage, and that waterfall is six meters high, and the water is almost 100 degrees Celsius.

We measured the temperature along the river, which was the hardest part of the field trip.

The result is already "Amazing!" There is no other way to say

I'm sorry.

The temperature of the water is showing a wonderful transition like this.

rivers start with cold water

Then it heats up, cools down, heats up, cools down, heats up again, and then follows this nice decay curve until it hits the cold river on the right.

I know you're not an expert in geothermal, so let me explain it in everyday language. Do you like coffee?

You like it, right?

Ordinary hot coffee is 54°C Extra hot is 60°C

In coffee shop terms, the temperature of this river would be

it's hot here

This is the extra hot, and as you can see, there are parts of the river that are hotter than the extra hot.

This is the average temperature

We measured it during the dry season to see the temperature of the geothermal heat itself.

There's a particular temperature that's not listed here, and it's 47 degrees Celsius, the temperature at which you start to burn, and I know this from personal experience.

Do not enter water hotter than this

I have to be careful

really dangerous

I've seen many different animals that fell into this river, and what happens to them is pretty much the same.

The eyes are the first thing that gets killed when you fall in the river.

The eyes are sensitive to heat and quickly turn milky white.

washed away in water

It struggles to come out, but due to the high temperature, it will continue to boil with the bones still attached.

It gradually loses strength, and eventually hot water comes in from the mouth and it is completely boiled.

(Laughter) Was it a little sadistic?

No way

Let it soak for a while and it will look like this

It is a technique that this temperature can make

I've seen something similar in Yellowstone and in volcanic regions around the world.

The problem is -- the data show that this boiling river has nothing to do with volcanic activity.

It doesn't get its heat from magma or a volcano, it's more than 700 kilometers away from a volcano.

How does a boiling river like this exist?

I've asked a lot of geothermal experts and volcanologists, and I've never heard of a non-volcanic geothermal system of this magnitude.

from a global perspective

unique and unique

What's going on?

Where does this heat come from?

More research is needed to pinpoint the problem and better understand this geothermal system, but what I can tell you now, looking at the data, is that it looks like it's due to a large hydrothermal system.

Let me explain, the deeper you go, the higher the temperature.

We call this the geothermal gradient.

Water may originate in glaciers in the distant Andes, then flow deep underground, where it is heated by geothermal gradients before coming to the surface and becoming boiling rivers, all due to the unique topography of this place.

In and around this river -- this is a collaboration between Spencer Wells of National Geographic and John Eisen of the University of California, Davis -- we analyzed the DNA of extremophiles living in and around this river and found a species unique to this boiling river.

After all these studies, discoveries and legends, the question remains: What is the significance of this boiling river?

What significance is there in the clouds that always hover over this patch of jungle?

What is the significance of a line of legend that you heard as a child?

It's a sacred place for shamans and the local community.

It's a very unique geothermal phenomenon to me as a geothermal scientist.

But it's just one resource that illegal loggers and ranchers can exploit.

It's just one piece of unprotected land that the Peruvian government can develop.

My goal is to make sure that whoever comes to manage this land understands the uniqueness and importance of the boiling river.

because that's what's important

And the bottom line is that it's up to us to decide what matters.

we are ourselves we have the power

We are the ones who draw the line between what is sacred and what is nothing.

In an age where everything is mapped and measured and explored -- in this age of information -- I want you to know that discoveries aren't just made in the dark abysses of the unknown, they're made out of the white noise of overwhelming data.

There is still much left to explore

we are in a wonderful world

so let's go

with curiosity

We live in a world where shamans sing to the forest spirits, rivers boil, and legends come true.

thank you

(applause)

Throughout human history, a three-letter word has directed poets to manuscripts, philosophers to squares, and aspirants to oracles: "Who am I?"

From "Know thou" in the ancient Greek proverb inscribed in the temple of Apollo, the representative song of the rock band The Who "Who Are You?" 』

And then philosophers, psychologists, researchers, scientists, artists, theologians, even politicians have all struggled with identity issues.

Their theories differ wildly and no meaningful agreement has been reached.

Why is it so hard for smart, creative people to get the right answer?

One difficulty I can say with certainty lies in the complex concept of identity persistence.

First of all, which self is the target?

me today?

Me five years ago?

50 years from now?

And even though I exist "now"

What about this week?

today?

this time?

this moment?

In addition, there are many aspects of "self".

What about the physical body?

What about thoughts and feelings?

about deeds?

Navigating these vague and abstract ideas is a big task, and perhaps the best way to illustrate this complexity was the Greek historian Plutarch, who used the parable of the ship.

What do you mean by "self"?

In this story, the mythical figure Theseus, the founder of the Athenian royal family, defeats the villainous Minotaur of Crete, unaided, and returns by ship.

To honor this heroic feat, for a thousand years the Athenians meticulously tended his ship in its harbor, reenacting his voyage each year.

When parts of the ship rotted or broke, we replaced them with identical parts made of the same material, and at some point the original parts were gone.

Plutarch used the story of Theseus' ship as an example of the philosophical paradox of identity persistence.

If all the parts of an object have been replaced, can we say that the same object continues to exist?

Let's imagine there are two ships, the ship that Theseus moored in Athens, let's call this Ship A, and the ship that the Athenians sailed on a thousand years later, let's call this Ship B.

This is a very simple question - are A and B equal?

For a thousand years, there was only one ship of Theseus, and the changes were gradual, so one might think that this ship was the ship of Theseus at any point in time.

Although they don't have a single part in common, these two ships are numerically identical, that is, they are one and the same, so A equals B.

But some might say, Theseus never set foot on Ship B. His presence on board this ship is qualitatively an essential part of Theseus' ship.

This ship wouldn't exist without him.

So these two ships may be numerically identical, but they are not qualitatively identical.

so A is not equal to B

But what if we change the problem like this?

What if each part of the original ship was thrown out and someone put it all together to build a completely original ship?

Once that's done, there are apparently two ships physically present, one moored in the harbor of Athens and one in someone's backyard.

Both parties will have the right to bear the name "Ship of Theseus," but only one will be the real thing.

Which one is real, and more importantly, what does this have to do with you?

Like the ship of Theseus, you are a collection of ever-changing parts, your physical body, your mind, your emotions, your environment, even your habits.

And that's one of the things that makes the "Who am I?" question so complicated.

And to answer this, we must, like many of our great predecessors, plunge into the boundless ocean of philosophical paradoxes.

Or you could say, "I'm a legendary hero in an epic, on a fine ship."

that would be correct too

What do Darwin, Jordan and Yoda have in common?

Many historical and fictional characters like them are bald, and some even go bald themselves.

For centuries, a shiny, domed head has been a symbol of intelligence, yet many bald people hope their hair will grow back.

Scientists have long wondered, "Why do some people lose hair, and how can we get it back?"

People with frizzy hair have 100,000 to 150,000 hairs on their scalps, and scientists have discovered two things about frizzy bushes.

First, visible hair is mostly keratin, a residual protein from dead cells that's been pushed upwards as new cells are generated under the surface.

Second, what drives hair growth is a complex network of organs called hair follicles that form before we are even born, and grow in a perpetual cycle.

This cycle is divided into three stages

The first stage is called anagen, which is the stage that up to 90 percent of hair follicles are going through right now, when hair grows at a rate of one centimeter per month.

Growth lasts 2-7 years depending on genetics

After this growth phase, signals are sent within the scalp that lead some follicles to a new phase known as catagen, or regression, where the follicle shrinks to a fraction of its original size.

The catagen phase lasts two to three weeks, cutting off the blood supply to the hair follicle and creating a club, which means it's about to fall out.

Finally, hair enters a resting phase called telogen, which lasts for 10 to 12 weeks and affects 5% to 15% of the hair follicles on the scalp.

During the resting phase, up to 200 club hairs are shed per day, which is quite normal.

A new hair cycle begins

But it's not the entire head that becomes fuzzy, and in fact, as the body changes, the area where it grows becomes more and more localized over time.

95% of bald men are believed to have male pattern baldness

Alopecia is hereditary, and the hair follicles in people with this condition are highly sensitive to the effects of dihydrotestosterone, a type of male sex hormone formed from testosterone.

Dihydrotestosterone shrinks overly sensitive hair follicles, making hair shorter and thinner.

But hair loss doesn't happen suddenly.

Hair loss occurs gradually in stages known as the Hamilton-Norwood classification, which describes the degree of hair loss.

First, the hair recedes along the temples, and the hair on the top of the head begins to recede in circular motions.

At higher ranks in this classification, these areas of baldness coalesce and spread out even more, eventually leaving only a few circles of hair around the top and back of the head.

Genetics aren't the only thing that drives hair loss

Long-term stress sends a shock signal to the hair follicle, causing it to enter the resting phase prematurely.

Some women experience this after giving birth

They can also lose the ability of the hair follicle to enter the anagen phase.

People who have undergone chemotherapy experience the same thing temporarily.

Alopecia appears to be permanent, but scientific research shows the opposite.

The roots that grow the hair under the scalp are actually still alive.

Taking advantage of this, scientists have developed drugs that shorten the resting phase and force the hair follicle to transition into anagen.

There are also drugs that fight male pattern baldness by blocking the conversion of testosterone to dihydrotestosterone, so sensitive hair follicles are not affected.

Stem cells also play a role in coordinating the growth cycle, so scientists are investigating whether stem cell activity can be manipulated to influence hair follicles to regenerate hair.

In the meantime, while scientists are working on ways to regrow hair, remember that you're not alone in starting hair loss or worrying about alopecia.

It might have been a bad choice to go as an intern at a research institute in the remote mountains.

I shouldn't have tried pulling the skull-patterned lever, it's not the time to mourn.

Besides you, there's a janitor, a research assistant, and an old professor.

There's only one safe way to cross the long old suspension bridge over the great canyon.

You can cross it in one minute, but it takes the research assistant two minutes.

The janitor is a little slower, taking five minutes, and the professor has a full ten minutes, holding on to the rope and walking step by step.

The professor estimates that the zombies will catch up in 17 minutes, so there won't be much time until everyone's crossed and the rope cut.

And unfortunately, only two people can cross the bridge at a time.

To make matters worse, it's so dark that visibility is poor, and the old lantern you have on hand can only illuminate a limited area.

Is there a way to get everyone out in time?

Only two people can cross the bridge at a time, and they must walk together, with lanterns lighting their feet, and it doesn't matter if it's dark when they're waiting at either end of the canyon.

The most important thing is that everyone has crossed safely before the zombies come.

Otherwise, zombies will cross the bridge while someone is still on the bridge.

and don't cheat

No trapeze crossing, no bridges as rafts, no zombie friends.

Stop the video here and think

To the answer 3 To the answer 2 To the answer 1 At first glance, no matter how you do it, it seems that 1 or 2 minutes are not enough, but there is a proper way

The key here is to minimize the time spent by the two slowest people crossing together.

I have to go back twice with the lantern, so I'd like to leave this to the two quick-footed people.

First, you and your assistant will cross the lantern, but then you'll slow down a bit to match your assistant.

Two minutes later, they've crossed, and you, the fastest, will return with the lantern.

It's only been three minutes

so far so good

here is the difficult part

A professor and a janitor cross together with a lantern

Here, the janitor walks with the old professor lamenting that zombies made him see at night, so it takes the two of them 10 minutes.

After they've crossed, there's four minutes left, and you haven't crossed yet.

But the assistant who was waiting on the opposite bank was the second fastest.

She takes a lantern from the professor and runs back.

We have two minutes left here.

And when they get there, we can cut the ropes and destroy the bridge.

I have no choice but to stay in the library next summer.

Kenema in Sierra Leone Arua in Nigeria Have you ever heard of such place names?

It's the most unusual place for me

In the hospitals there, nurses, doctors and scientists have quietly fought for years against one of the most deadly enemies of mankind: the Lassa virus.

The Lassa virus is very similar to the Ebola virus.

It causes a high fever and is sometimes fatal.

But they're protecting us all by risking their lives every day to protect the people in their communities.

But the thing that surprised me the most when I visited there many years ago was that they started every morning with a song, a very hard life on the front lines.

all come together and express their joy

Show your vitality

Over the years, it's been really fun to visit each other and get together to sing and write songs, because we're not just there for the pursuit of science, but we're connected for humanity.

I think you can imagine that as the situation changes, it becomes very important and essential.

In March 2014, all that changed when Guinea declared an Ebola outbreak.

This was West Africa's first outbreak near the border of Sierra Leone and Liberia.

we are afraid

In fact, for a while I thought that Lassa and Ebola were more contagious than people thought, and that one day they might reach Kenema.

So a member of my team acted quickly and joined Dr. Humar Khan's team, so I had a highly sensitive viral RNA detector ready to detect Ebola if it crossed the border and reached Sierra Leone.

We had already used a device like this against the Lassa virus, so we knew how to do it, and the team was really good.

All we had to do was give them the tools and the place to test for Ebola.

But unfortunately that day has come

On May 23, 2014, when a woman was admitted to the hospital's maternity ward and the team tested for viral RNA, they confirmed the first case of Ebola in Sierra Leone.

their work was excellent

We immediately assessed this case and initiated contact tracing to ensure that the patient was treated safely and understood.

This might have stopped the spread of the infection early on.

But by that date, the outbreak had already been going on for months.

Hundreds of cases outstripping previous outbreaks

When we got to Sierra Leone, it was no longer just one case, but like a tsunami.

We worked with the international community, the Ministry of Health and the government of Kenema to tackle this epidemic, and the next week we had 31 cases, and then 92, then 147 cases -- all the cases that flowed into Kenema because Sierra Leone has limited facilities to treat the disease.

We spent 24 hours doing everything we could to save patients, get their attention, and then do one simple thing.

Of course, the patient's blood sample that was taken to detect Ebola could have been discarded.

Instead, they inactivated the virus with chemicals, packed the blood samples into boxes, and sent them across the ocean to other laboratories.

I sent it to Boston where my team is.

And then I worked day and night, working shifts every day, and quickly analyzed 99 Ebola virus genomes.

The viral genome is that blueprint.

everyone has a gym

It represents the nature of everything that makes us, and it contains a vast amount of information.

The result of such work is simple yet very powerful.

By observing and comparing these 99 viruses, compared to the three genomes previously published in Guinea, we were able to figure out that an outbreak began in Guinea months earlier, first infecting humans, then spreading through humans.

This is very important for figuring out how to intervene, but then it's contact tracing.

We found that the virus mutated as it spread among humans.

It's very important to look at each of these mutations, because diagnostic instruments, vaccines, therapeutics, all of these things are basically based on genome sequences.

Global health professionals need to take action against this and recalibrate all their achievements.

At that time, the way I worked as a scientist was to first accumulate data, then stay in a laboratory for months and months, carefully and carefully analyze the data, repeat several exchanges in order to publish a research paper, and finally, when the paper was published, I would release the data.

This is the current state of the scientific research landscape.

But you couldn't have done that, could you?

My friends were on the front lines, and one thing that was very clear was that I needed help, and I needed a lot of help.

So the first thing we did was, after the genome sequence was read, we immediately published it on our website.

I simply sent the data to the world as it was, and said, "Please lend me your strength."

and help came

In no time at all, I was contacted by people from all over the world who were shocked to see the data being published.

Suddenly one of the world's best virus tracking teams is on our side.

We started collaborating virtually, with phone calls and emails, minute-by-minute tracking of the virus, and figuring out how to stop it from spreading.

There are many ways to create a community in such an emergency.

Especially when the outbreak began to spread globally, everyone was willing to research, get involved, and help.

I wanted everyone to be involved.

The ability of these people around the world is truly amazing, and the Internet connects us all.

Imagine everyone saying, "Let's do this," rather than seeing each other as a threat and avoiding each other.

They say, "Let's work together to solve this."

The problem was that the data we were all using was very limited and inadequate, just what we searched for on the internet.

When that happens, so many possibilities, so many opportunities, are lost.

In the early days of the Kenema epidemic, we had 106 medical records, and we decided to make them available to the world.

And in our laboratory, by training a computer from those 106 cases, we were able to prove that it was possible to predict the prognosis of Ebola patients with almost 100 percent accuracy.

We created an app to provide that to medical personnel working in the field.

But 106 cases just isn't enough to prove that the app works well enough.

We were waiting for more data to come before release.

But I didn't get any data.

Everyone researched and thought and waited, but everyone was stuck in silos and didn't use the power of cooperation.

But this kind of thing can't happen

Don't you think so? you would think so too

our lives are at stake

So many lives have actually been lost, medical workers, and five of my dear colleagues: Bal Fonny, Alex Mogboi, Dr. Humar Khan, Alice Koboma, and Mohamed Fuller.

They were five of the dozens of medical workers who died in and around Kenema, at a time when we were silently working in isolation while the world waited.

Ebola, like any other threat to humanity, is fueled by suspicion, strife and discord.

Viruses gain power when we build walls and fight each other.

But unlike other natural threats, the fight against Ebola concerns us all equally.

we are fighting together

If one person gets Ebola, it can quickly spread to someone else.

Now our lives are just as fragile, we have the same vitality, we have the same fears and hopes.

One of the graduate students I supervised read a book about Sierra Leone and learned that the word "Kenema," which is the name of the city where the hospital where we work is located, is actually the Mende language of Sierra Leone, meaning "clear as a river, transparent to all."

It made a lot of sense to me, because even before we knew it, we've always tried to respect the people of Kenema, to share information, to work together in an open environment.

it's important

Because when an outbreak strikes, we need to share information openly with ourselves and everyone around us to fight it together.

This is by no means the first Ebola outbreak, nor will it be the last. There are still many other microbes lurking around, like the Lassa virus.

And the next time there's an epidemic, it could be in a big city with millions of people.

It may be an airborne virus

The virus may be spread intentionally.

This is a very scary thing, of course, but at the same time, what this experience has taught us is that we have the technology and the resilience to overcome it, to win the battle against the virus and gain the upper hand.

But it will be possible as long as we work together, and let's do it with joy.

Dr. Khan, who died fighting the epidemic, and those who lost their lives on the front lines, they fought alongside us all this time, and we will continue to stand with them in this battle.

Let's light up the world with the cooperation of billions of warm hearts and compassion so that the world will not be swayed by the destruction of a single virus.

thank you

(applause)

This may look like just a neat pile of numbers, but it's actually a mathematician's crown jewel.

Indian mathematicians called this the Steps of Mount Sumeru

Khayyam Triangle in Iran

In China, it was called the Yang Hui Triangle.

In the West, it's known as Pascal's Triangle after the French mathematician Blaise Pascal.

So why has it fascinated mathematicians so much?

Because it's a treasure trove of patterns and secrets.

First and foremost, there are generative patterns.

We start with a 1 and an invisible 0 that surrounds it on both sides.

Add the two together to produce the following line

and repeat this

And if we keep going like this, Pascal's triangle goes on infinitely.

Each row of this corresponds to a coefficient of the binomial expansion of the form (x+y)^n where n is the number of columns, counting from 0.

When expanded with n=2, it becomes (x^2) + 2xy + (y^2)

The coefficients, or the numbers that precede the variables, are the same as the numbers in that column of Pascal's triangle.

n=3 is similar and expands like this

This triangle is a handy way to find all the coefficients like this.

But that's not all

For example, if you add the numbers in each row, you get successive powers of two.

If we apply the decimal expansion of each number on any given line,

For example, in the second row (1x1) + (2x10) + (1x100)

This is 121, so it's 11 squared.

If you do the same on line 6

The total is 1,771,561 which is 11^6

There are also geometric applications

Let's take a look at this diagonal line

The first two columns are just a series of 1's, but the next are positive integers, also known as natural numbers.

But the next number on the diagonal is called a triangular number, because when you add up any number of dots, you get an equilateral triangle with this number.

The next diagonal is called a tetrahedral number, because it stacks into a tetrahedron just like before.

What if we now shade the odd numbers?

When the triangles are small, it's not a big deal, but when you get to thousands of rows, you get a fractal called the Sierpinski triangle.

This triangle is not only a gift of mathematics,

And above all, it's very useful in calculating probabilities and combinatorial domains.

For example, let's say you want five children, and you want to know the odds of having an ideal family of three girls and two boys.

In terms of the binomial expansion, it's the fifth power of girls plus boys.

So let's look at column five, the first number is five girls, the last number is five boys.

find the third number

10 out of all possibilities

10/32 or 31.25%

Or if you randomly choose five of your 12 friends to be basketball players, how many different groups of five can you think of?

In combination, 12 C 5, you can use this equation, or look at the 12th column of the triangle, the 6th element, and you'll have your answer.

Pascal's triangle pattern is a testament to the beauty of mathematics.

And still, there's a never-ending stream of new secrets.

For example, recently, this kind of polynomial expansion method was discovered.

What will we find next?

it's up to you

A 20,000-kilometer dragon of earth and stone winds its way through rural China, and its history is as long and varied as its walls.

The Great Wall of China began as a series of walls made of rammed earth, built by the individual feudal states of the Spring and Autumn Period (Seven Warring States) as a defense against attacks by northern peoples and other nations.

The Tibetan Plateau and the Pacific Ocean became natural barriers when the first emperor unified the nation in 221 BC, but the mountainous regions to the north remained vulnerable to raids by the Mongols, Turkic nation states, and the Xiongnu.

To defend against their attacks, the emperor extended, spliced, and strengthened the small walls built by his predecessors.

As the construction stretched from Lintao in the west to Liaodong in the east, it became known as the Great Wall as a whole.

In accomplishing this feat, Qin Shi Huang summoned the strength of soldiers and commoners, but it was not always voluntary.

Of the hundreds of thousands of recorded builders during the Qin dynasty, many were forcibly conscripted farmers, and some were criminals serving prison terms.

During the Han Dynasty, the wall was even longer, stretching some 6,000 kilometers from Dunhuang to Bohai.

Under Emperor Wu of the Han dynasty, forced labor continued and the Great Wall became notorious as a place of torture.

Poems and lore of the period say workers were buried in mass graves near the Great Wall, and sometimes in the Great Wall itself.

No bodies have been found inside the Great Wall, but the graves show that many workers died from accidents, starvation, and overwork.

The Great Wall was formidable, but it wasn't invincible.

Genghis Khan and his son Kublai Khan successfully breached the Great Wall during the Mongol invasion in the 13th century.

After the Ming Dynasty ruled in 1368, further strengthening of the Great Wall began, using bricks and stones fired in nearby kilns.

Averaged 7 meters high and 6 meters wide, the Great Wall is 8,851 kilometers long and was dotted with watchtowers.

Once an intruder was spotted, fire and smoke signals were sent from tower to tower until reinforcements arrived.

Small holes cut along the wall allowed archers to attack intruders, and large holes were used to drop stones and other objects.

But this new and improved wall wasn't enough.

In 1644, the Manchus of the north overthrew the Ming dynasty, established the Qing dynasty, and merged with the Mongols. Thus, twice, China was conquered by the people who were trying to get rid of it with the wall.

With the borders of the empire now extending beyond the Great Wall, the fortresses have lost their purpose.

And without regular reinforcements, the Great Wall was under-repaired, the clay eroded, and the bricks and stones were stolen as building materials.

But that role didn't end

It is rumored that during World War II China used parts of the Great Wall against Japanese invasions, and that others are still being used for military training.

But the Great Wall's main role today is cultural.

It was declared a UNESCO World Heritage Site in 1987 as one of the longest man-made structures.

Built to keep China out, the Great Wall of China now welcomes millions of visitors.

In fact, the influx of tourists has damaged the wall, so the Chinese government has started conservation efforts.

It is sometimes said to be the only human-made structure visible from space.

unfortunately that is not correct

In low Earth orbit, you can see bridges, highways, airports, all structures, but the Great Wall of China is only faintly recognizable.

cannot be seen from the moon

But that aside, research into the Great Wall on the surface is still called for. New sections that branch off from the main body are still discovered every few years, and this remarkable feat of mankind continues to escalate.

Please recall one very vivid memory

Did you do it?

Good. So what was your lunch three weeks ago?

My second memory is probably not as strong, but why?

Why are some things you can remember and others you can't?

And why do memories eventually fade?

Let's see how memories are formed in the first place.

When you experience something, say, when you make a phone call, that experience is converted into electrical signals in your neurons, and they're zipped along a network of neurons.

Information first arrives in short-term memory, where it can be accessed for seconds to minutes.

Then, through areas like the hippocampus, that information is sent to long-term memory and eventually to storage areas throughout the brain.

Neurons throughout the brain communicate through specific sites called synapses, which use specialized neurotransmitters.

When two neurons relay information repeatedly, something amazing happens: the efficiency of information transfer between them increases.

This process, called long-term potentiation, is thought to be the mechanism of long-term memory storage. But how does memory loss occur?

one factor is age

As we age, our synapses become weaker and less efficient, affecting how easily we can retrieve memories.

Scientists have put forward several theories as to why this decline is happening. One theory is that the brain actually shrinks -- that is, the hippocampus loses 5 percent of its neurons every 10 years, and 20 percent by age 80 -- and that production of chemicals like acetylcholine, essential transmitters for learning and memory, declines.

These changes are likely to affect retrieval of stored information.

Age also affects our ability to create memories.

Memories are most strongly encoded when we're paying attention, when we're deeply involved and when the information is meaningful to us.

Mental and physical health problems tend to increase with age, which interferes with our ability to pay attention and thus memory.

Another major contributor to memory problems is chronic stress.

When you're constantly shouldering too many responsibilities at work and in your personal life, your body becomes overly aroused.

This response evolved from a physiological mechanism designed to ensure survival in a crisis.

Stress-related chemicals provide energy and heighten alertness

But when you're chronically stressed, your body becomes overwhelmed with these chemicals, and as a result, brain cells are lost and unable to make new ones, affecting your ability to retain new information.

depression is another cause

Depressed people are 40% more likely to have memory problems

Low levels of serotonin, a neurotransmitter involved in wakefulness, make it harder for depressed people to pay attention to new information.

Another symptom of depression, lingering on sad events from the past, can make it difficult to pay attention to the present, affecting your ability to store short-term memory.

Isolation is associated with depression, which is another cause of memory loss.

A study from the Harvard School of Public Health found that older people with higher levels of social integration experience slower memory decline over six years.

We don't know the exact reason for this, but experts speculate that interpersonal interactions seem to be movements of the entire brain.

Just like muscle strength, if you don't use your brain, you can lose your abilities.

But don't despair!

There are several steps you can take to take care of your brain and protect your memory.

Keep your body active

increasing blood flow to the brain helps

and eat properly

The brain needs proper nutrition to keep it functioning properly.

Finally, exercise your brain.

Challenging the brain to difficult tasks, such as learning a new language, is one of the best defenses for keeping our memories intact.

Hello

My name is Matthew Williams and I am a champion.

I have won medals in three sports at the national level in Canada, and in basketball, I have participated in world-class games, and I was honored to represent Canada at the world level.

(Applause) I train five days a week for basketball and speed skating, and I have top-notch coaches and mental performance consultants to help me be the best I can be in the game.

By the way, this is all about Special Olympics.

Listen to it Me and my results Do you change your eyes?

The world doesn't necessarily see people like me as champions.

Until recently, people like me were marginalized and withheld.

Much has changed since Special Olympics began in 1968, but in too many cases, people with intellectual disabilities are invisible to the wider world.

Everyone doesn't think it's wrong to use discriminatory terms in front of me.

They use the word "retarded" pejoratively.

I don't think about how much it hurts me and my friends.

Please don't think I'm here as an object of pity.

I'm here because there's still a serious problem with how the public views people with intellectual disabilities, and in all too many cases, it's that they're blind.

Did you know that there was a world competition this year?

I was one of 6,500 athletes with intellectual disabilities who came from 165 countries to compete in LA.

More than 62,000 people watched the opening ceremony, which was broadcast live on sports TV stations TSN and ESPN.

You didn't know about such a competition, did you?

What do you think when you see someone like me?

It's a challenge for all of you, can you see us as equals?

Special Olympics transforms the self-identity of athletes with intellectual disabilities and the values ​​of all who watch them.

For those who don't know, Special Olympics is for athletes with intellectual disabilities.

It's not the Paralympics or the Olympics.

High-level sports competitions are held throughout the year for people with intellectual disabilities, changing the lives and values ​​of those involved.

It changed my life and the lives of so many other people.

And the public perception of people with intellectual disabilities has changed.

I was born with epilepsy and an intellectual disability.

I played hockey from a young age until I was 12.

As I grew up, it became more and more difficult to keep up with everyone, and it was frustrating and irritating.

I was completely away from sports for a while.I didn't have many friends and I felt left out and sad.

In the olden days, people with intellectual disabilities were hidden from society.

No one thought that they could participate in sports, let alone be valued members of society.

In the 1960s, Dr. Frank Hayden, a scientist at the University of Toronto, studied the effects of regular exercise on the motor skills of children with intellectual disabilities.

Using a rigorously scientific method of research, Dr. Hayden and other researchers concluded that "low motor performance in children with intellectual disabilities is simply due to a lack of opportunities to participate in physical activity."

Few people believed that an exercise program or participating in a sporting event would be beneficial for people with intellectual disabilities.

But pioneers—Dr. Hayden and Special Olympics founder Eunice Kennedy Shriver—didn't give up, and athletes have proven them right more than 4.5 million times.

(Applause) Before I went to Special Olympics, I was nervous because I was young, shy, lacked confidence, and didn't have many friends.

But when I went there, everyone encouraged and supported me, and I was able to be myself without worrying about what other people thought.

Now, I'm a basketball and speed skater. I've competed in state and national competitions, and this year I made it to the Summer World Championships in Los Angeles.

(Applause) I'm one of more than 4.5 million athletes in the world, and I've heard so many similar stories.

Being a Special Olympics athlete gives us back our pride and dignity.

Special Olympics also meets important health needs for athletes

Studies show that men with intellectual disabilities live on average 13 years less than healthy people, and women 20 years less.

But at Special Olympics, you can stay fit by exercising and competing.

And coaches will teach you about nutrition and health.

Special Olympics offers free health checkups for athletes who have difficulty communicating with or access to medical care.

At the 2015 summer world championships, my team Canada played basketball against a Nigerian basketball team.

The day before the game, the Nigerian team underwent an on-site medical check-up, and seven of the 10 members received free hearing aids, which enabled them to hear clearly for the first time in their lives.

(Applause) There's been an incredible change in the players.

I felt more alive, enjoyed the game, and played with more confidence because I was able to communicate with my coach in person.

Emotions were running high, too, because I could hear the ball, and then the whistle, the cheering of the fans in the stands, which everyone should hear.

Special Olympics athletes not only compete

Life outside the stadium will change too

A survey released this year found that nearly half of American adults don't know anyone with an intellectual disability, and 44 percent of Americans have very low receptive and significantly negative views of people with disabilities.

In addition, the abundance of discriminatory language used is evidence that people with intellectual disabilities are still invisible to so many people.

People use it as a casual expression or as a derogatory term.

The word "retarded" was tweeted more than 9 million times last year, but it's a word that hurts me and my 4.5 million fellow athletes around the world tremendously.

I don't think that's an insult, but you're wrong.

My colleague and global messenger, John Franklin Stevens, wrote an open letter to the political pundits who used that racist language to put people down: "Someday, please come to the Special Olympics.

Please try and see if you can go home without being moved."

(Applause) This year, at the 2015 Summer World Games, people were lining up for hours to see the final day of the weightlifting competition.

With everyone standing, my teammate, Jackie Barrett, aka "The Newfoundland Elk," deadlifted 297kg and squatted 277kg -- (Applause) And smashed all the Special Olympics records.

Jackie is the Newfoundland weightlifting record holder, not just for the Special Olympics, but for all weightlifters.

He became a big star in LA, and ESPN tweeted his new record live, and they were blown away by Jackie's performance.

Fifty years ago, few people thought that people with intellectual disabilities could do that.

This year, 60,000 people filled the famous L.A. Memorial Coliseum to watch the opening ceremonies of the world championships and to cheer on athletes from 165 countries around the world.

Far from being hidden, we were cheered and celebrated.

Special Olympics teaches athletes to be confident and proud

It teaches the world that people with intellectual disabilities deserve respect and acceptance.

(Applause) I now have a competitive track record, a dream, a great coach, respect and dignity, healthier than ever, and a personal trainer.

(Applause) I'm no longer hidden and bullied. I'm here giving a TED talk.

(Applause) Special Olympics has changed the world, but we still have a long way to go.

Next time you see someone with an intellectual disability, I want you to see their abilities.

If you see someone using discriminatory language, please tell me how bad it is

And I want you to think about getting involved in the Special Olympics.

(Applause) I'll just say one last thing.

Nelson Mandela said, "Sport has the power to change the world."

Special Olympics is truly changing the world, giving 4.5 million athletes a chance to be reborn, have a place to be confident, make friends, not be judged, feel like a champion, and actually become a champion.

thank you

(applause)

You and nine others have been captured by a highly intelligent alien boss.

This alien thinks humans look appetizing, but he thinks it's unethical to eat cooperative, logical creatures.

But I don't know how humans are, so I decided to test you guys.

So, through a translator, the sentinel alien said, "Now, facing forward, line up in order of height so that you can see everyone in front of you."

Never look back or leave the line

Randomly put a white or black hat on each person, but don't tell them how many of each color they have.

When I give the signal, try to guess the color of the hat you're wearing, starting at the back of the line.

But don't use words other than black and white, don't signal with tone or volume, I'll eat you all in no time.

If at least nine people get it right, let's release them all.

Talk for five minutes Plan synergy After that, line up in a row Put your hat on and start

Is there a strategy that is sure to help everyone?

Let's stop the video here and think about it.

To answer 3 To answer 2 To answer 1 What's important here is the person at the back of the line, who knows the color of everyone's hat and can use either black or white to signal.

So what is the meaning of this word so that we can know the color of each person's hat?

It's not the total number of each hat color.

Because there are more than two possibilities, but what if the number is odd or even?

So the answer is that the first person says, say, "black" if the number of black hats is odd, and "white" if the number is even.

Suppose the hat were distributed like this.

The tallest person sees three black hats, so he says "black" to let everyone know that the number of black hats is odd.

You might get your color wrong, but that's okay. You were allowed to make one mistake.

The next person sees an odd number of black hats, knows his hat is white, and gets the correct answer.

The third person sees an even number of black hats, so he knows his hat is one of the black hats that the first person saw.

The fourth person listens and looks for an even number of black hats, because one is behind him.

But he sees only one black hat, so he decides that he's also black.

People fifth through ninth look for an odd number of black hats, and they know their hat is white because it actually looks like it.

Well, I'm finally the last one

If the ninth person sees an odd number of black hats, there is only one meaning.

This strategy works for any array.

The first person has a 50% chance of getting his hat color wrong, but by conveying the parity information, he ensures that everyone else gets it right.

First, each member decides whether the number of hats of a particular color in front of them and in front of them is an odd or even number.

If it doesn't match the number you counted, the color of your hat is that particular color.

And each time, the next person in line switches the even-parity that they'll see.

Now it's sunny and I'm free

Then the aliens either go hungry or find some other not-so-logical creature and take it away.

When you're faced with a big challenge, the potential for failure is everywhere.

But what I think people say is, "If only it were that easy..."

what is confidence

Believing in one's own worth and abilities, the so-called self-esteem, is what drives us to bravely face challenges head-on, along with the optimism that comes when we believe that we can do it.

confidence

Confidence turns our thoughts into action

But where does confidence come from

There are several factors that affect confidence

Part 1: Innate Personality, Genes, and Things That Affect Neurochemical Balances in the Brain

Part 2: People's Attitudes Toward You

This includes your social pressure

Part 3: The part that you can control yourself, such as the choices you make and the risks you take, as well as how you think about and deal with challenges and setbacks.

You can't completely separate the three, but the choices you make will certainly have a big impact on the process of building confidence.

And the fact is, anyone can learn a few tricks to build their confidence.

Tip #1: Emergency Treatment

Here's a trick to boost your self-confidence in no time.

Before you start something difficult, imagine yourself doing it well.It's like listening to music with a deep bass.It's easy.It makes you feel powerful.

Take Power Bose and cheer yourself up to cheer yourself up

Tip #2: Trust Yourself to Improve

If you're looking for real confidence that's not fake, check out how you see your abilities and talents.

Ability Is talent something you are born with? Or something that can be developed like a muscle?

Which one you believe will change how you act when you encounter setbacks.

If you think of it as inborn, in other words, if you say you can't change your talent, you might give up.

But if you think that it's acquired and that you can improve your abilities, challenges become opportunities to learn and grow.

Neuroscience Proven Growth

With study and practice, neuronal connections grow stronger.

People who often think of themselves as acquired have been found to be more successful, to perform better academically, and to handle challenges better.

Tip #3: Practice setbacks

Everyone has setbacks once

there is no one without

J.K. Rowling was rejected by 12 publishers before she finally got around to publishing "Harry Potter."

The Wright Brothers built on a history of failed attempts at flying, including their own failures, and the plane finally succeeded.

Numerous studies have shown that people who don't give up after a series of failures have a more constructive attitude toward challenges and setbacks.

Learn to develop alternative strategies from setbacks, seek advice from others, and don't give up easily

Come on, think of something you want to try Don't forget that it's not easy Even if you accept failure over and over again Don't be hard on yourself

Encourage yourself Stand up Challenge!

Whatever the result, knowledge and understanding deepen, that excitement

that's confidence

During the Middle Ages, alchemists attempted the seemingly impossible.

They tried to turn cheap lead into glittery gold.

Historically, they've been portrayed as old weirdos, but what if they knew alchemy was possible?

In fact, in modern times, gold can be made on Earth by modern inventions that alchemists have been unable to achieve for centuries.

But to understand how this precious metal was first implanted on Earth, we have to look up at the stars.

gold came from extraterrestrial

Rather than being born in the earth's rugged crust, gold is created in space and comes to earth through catastrophic stellar explosions called supernovae.

Stars are mostly made of the simplest and lightest element, hydrogen.

A lot of matter creates an enormous gravitational pull, and the compression causes nuclear fusion reactions in the core of the star.

This process releases energy from the hydrogen and makes the star shine.

Over millions of years, nuclear fusion transforms hydrogen into heavier elements -- helium, carbon, oxygen, etc. -- and with further acceleration, the elements become iron and nickel.

But when the fusion reaction doesn't release enough energy, the pressure from the core starts to drop.

The outer shell collapses toward the center, and the recoil of this sudden absorption of energy causes a supernova explosion.

When a star collapses, the pressure is so high that protons and electrons, which make up atoms, become trapped in the nucleus and produce neutrons.

Neutrons don't have a repelling charge, so they're easily incorporated into iron-group elements.

By capturing multiple neutrons, it is possible to create heavier atoms that cannot be created under normal circumstances, from silver to gold to lead and even uranium.

The change from hydrogen to helium takes millions of years, while the production of the heaviest elements in a supernova explosion occurs in just a few seconds.

So what happens to gold after this explosion?

The expanse of the supernova shock wave blasts elemental debris through the interstellar medium, causing a swirl dance of gas and dust to condense into new stars and planets.

Earth's gold must have been delivered like this before it was kneaded into veins by the action of geothermal heat.

We mine this precious material billions of years later, and the rarity of gold makes it an expensive process.

In fact, all the gold we've mined so far is only three times the size of an Olympic swimming pool, but it weighs a lot more, because gold is about 20 times more dense than water.

So can we make this substance that everyone wants?

the answer is yes

We can use particle accelerators to mimic the complex nuclear reactions that create gold in stars.

But this machine can only make one gold atom at a time.

So it would take an inordinate amount of time and costs far more than the current value of gold to make even one gram.

so it's not a very good way

When we reach a point where we think we've exhausted all the gold reserves on earth, there will be other places to look.

There's an estimated 20 million tonnes of dissolved gold in the oceans, but the concentrations are too low and too expensive to recover with current technology.

Maybe one day we'll have a gold rush that will extract mineral wealth from other planets in our solar system.

Maybe

In the near future, a supernova may explode and bring us all this wealth, and hopefully not all life on Earth will be wiped out by then.

A handful of species on Earth have a seemingly puzzling trait: menstrual cycles.

we are the chosen minority

Only mammals, such as monkeys, apes, bats, humans, and hedgehogs, have menstruation.

And despite the extra nutritional depletion and strain that menstruation puts on the body, humans cycle more often than other animals.

So what's the point of this rare biological process?

the answer starts with pregnancy

This process uses the body's nutrients to create a favorable environment for the fetus, creating a safe place to nurture the developing fetus.

Pregnancy is sacred in this respect, but it's not the only one.

Because pregnancy puts mother and child at polar opposites.

Like all living things, the human body evolved to facilitate the spread of genes.

For the mother, this means giving all her offspring the same genes.

But mother and fetus don't have exactly the same genes.

The fetus also inherits genes from its father, which suck more nutrients from its mother than it deserves in order to survive itself.

In the aftermath of this evolutionary conflict, mother and unborn child play a biological tug-of-war in the womb.

One of the factors contributing to this internal conflict is the placenta, which connects to the mother's blood supply and nourishes the fetus during its development.

In most mammals, the placenta is enclosed within the maternal cell wall.

This wall is where the mother controls the fetus's nutritional supply.

But in humans and some other species, the placenta enters the mother's circulatory system and is directly connected to the flowing blood.

The fetus pumps hormones through the placenta into the mother's arteries to keep them supplied with nutrient-rich blood.

Thus, the fetus makes hormones that it has unlimited access to, increasing the mother's blood sugar, dilating arteries, and raising blood pressure.

Most mammalian mothers are able to dislodge or resorb the embryo as needed, but in humans, once the fetus is connected to the blood and then breaks the connection, it bleeds profusely.

If the fetus develops immaturely or dies, the mother's life is endangered.

The fetus continues to need nutrients to grow, which can lead to severe fatigue, high blood pressure, diabetes, pre-eclampsia, and more.

Because of these risks, pregnancy is always a big, and sometimes dangerous, gamble.

It's only natural to try to carefully determine if the mother's body is an embryo worth the bet.

Menstruation applies here

Pregnancy begins in a process called implantation, when the embryo attaches itself to the endometrium, the lining of the uterus.

The endometrium evolved to be difficult to implant, so only healthy embryos can survive.

But in doing so, the endometrium creates an evolutionary feedback loop that selects the healthiest, most vibrant embryo.

The embryo is complex, and at the most exquisite timing, it interacts with hormones and transforms the uterine lining to allow for implantation.

What happens to the embryos that aren't selected here?

It's possible that it still manages to implant, and it's also possible that some of it can get into the uterine lining.

Because the embryo dies slowly, the mother's body is more susceptible to infections and may continue to send hormonal signals that disrupt maternal tissues.

So the body avoids this problem by eliminating all possible risks.

So if ovulation doesn't lead to a healthy pregnancy, the uterus removes the lining of the uterus along with the unfertilized egg and the dying—or dead—embryo.

That protective process becomes physiology, the menstrual cycle.

This biology, strange as it may seem, is what keeps us alive.

A rush for a test?

Trying to work overtime?

Stress is what we feel when we are challenged or overwhelmed.

But it's not just a matter of feeling, stress is a natural bodily response that runs throughout the body.

In the short term, stress can be beneficial, but when it happens too often and for too long, the primitive fight-or-flight stress response not only alters the brain, but also damages organs and cells throughout the body.

The adrenal glands secrete stress hormones such as cortisol, epinephrine norepinephrine, also known as adrenaline.

Because these hormones circulate in the blood, they can easily reach blood vessels and the heart.

Adrenaline makes the heart beat faster and raises blood pressure, which in turn causes high blood pressure.

Cortisol causes dysfunction of the endothelium, the lining of blood vessels.

Scientists now know that this is the first symptom of atherosclerosis, cholesterol plaques that form in the arteries.

Not only that, but these changes make you more likely to have a heart attack or stroke.

When the brain feels stress, it activates the autonomic nervous system.

Through a network of neural connections, the brain communicates stress to the gut nervous system.

Not only does it make your stomach sick, but this brain-gut connection interferes with the natural peristaltic movement of your gut to move food through your gut, eventually leading to irritable bowel syndrome, which makes your esophagus and stomach sensitive to acid, giving you the sensation of heartburn.

Through the gut nervous system, stress changes the type and function of gut bacteria, threatening not just digestive function, but overall health.

When it comes to digestion, does long-term stress affect your waist?

of course

cortisol increases appetite

It tells your body to fill up its energy stores with high-calorie foods and carbohydrates, and you crave sweets.

High levels of cortisol turn excess calories into visceral fat

This type of fat doesn't just make your pants button tighter,

It's an organ that actively secretes immune system chemicals called hormones and cytokines, which increases the risk of chronic diseases, such as heart disease and insulin resistance.

At the same time, stress hormones affect immune cells in many ways.

Initially, stress hormones help us respond to invaders and heal wounds, but chronic stress impairs immune cell function, increases susceptibility to pathogens, and slows recovery.

Want to live longer?

Then we need to avoid chronic stress.

Because stress is associated with shortening of telomeres, the tips of chromosomes that measure cell age.

Telomeres, located at the tips of chromosomes that help replicate DNA without damaging the genetic code each time a cell divides, shorten with each cell division.

If the telomeres become too short, the cell cannot divide and dies.

And that's not all, the negative health effects of chronic stress are even more diverse: acne, hair loss, sexual dysfunction, headaches, muscle stiffness, lack of concentration, fatigue, irritability, and more.

So what should we do?

life is full of stress

But it's the response to stress that affects the brain and the body as a whole.

If you can take control of this situation and see it as an overcomeable challenge, you'll do better in the short term and be healthier in the long term than if you see it as a fear you can't win.

How is it that so many aliens in movies and on TV speak perfect English so effortlessly?

Simply put, no one wants to see a crew of spaceships spend years compiling a dictionary of alien languages.

But to make things consistent, Star Trek and other sci-fi creators have introduced the concept of the Universal Translator, a handheld device that can instantly translate between any language.

So could a universal translator exist in the real world?

There are plenty of programs out there that claim to be able to do that -- they can translate words, sentences, entire books, from one language to almost any other language, modern English, ancient Sanskrit, whatever.

If translation is just looking up words in a dictionary, then these programs are beyond human power.

But in reality it's more complicated

Rule-based translators use a lexical database containing every word in the dictionary and all of the grammatically correct forms that words can take, and a set of rules to recognize the basic linguistic elements of the input language.

"Those children eat muffins" is a seemingly simple sentence, but the program first analyzes the syntax, the grammatical structure, and figures out that "those children" is the subject, and the rest is the predicate, which contains the verb "eat" and the direct object "muffin."

Then you have to identify with the morphology of the English language, breaking down the language down to the smallest meaningful unit, like the word "muffin" and the plural suffix "s," separate.

Finally, we need an understanding of semantics, to determine what each part of the sentence actually means.

To translate this sentence correctly, the program looks at the vocabulary and rules of the language for each translated element.

here's the subtle

In some languages, the word order is syntactically permissible, but in other languages, it becomes "muffins eat children."

Morphology can be a problem

Slovenian distinguishes between "two children" and "three or more children," and uses a dual suffix that many other languages ​​don't. Russian doesn't have a definite article, so it can be confusing whether your children are eating a particular muffin or a muffin in general.

Finally, programs can sometimes miss details about semantics, even if they're not wrong. For example, it's not possible to pick out whether children "eat normally" or "gobble up" muffins.

Another method is statistical machine translation, which involves analyzing a database of books, articles, documents that have already been translated by humans.

By looking for matches between the original and the translation that are thought to be unlikely to occur by chance, the program identifies corresponding expressions and patterns that can later be used in the translation.

But the quality of this type of translation depends on the size of the initial database and the availability of samples of the target languages ​​and styles.

Computers struggle with exceptions and anomalies and nuanced differences, which humans instinctively know, which is why some researchers attribute our language comprehension to the biology of the human brain.

In fact, the most famous fictional universal translator, the Babel fish from The Hitchhiker's Guide to the Galaxy, was not a machine, but a tiny creature that telepathically translated the brain waves and neural signals of sentient beings.

So far, the old school language learning still does better than any computer program out there.

Language learning is not easy, and the fact that there are so many languages ​​in the world, and the increasing interaction between people who speak them, will only make progress in automatic translation.

Perhaps by the time we meet life in space, we'll be able to communicate through tiny devices, or maybe we'll be compiling that dictionary after all.

I'm descended from the tallest people on earth, yes, I'm Dutch.

It wasn't always

In fact, people around the world are getting taller.

Over the past 150 years, people in the developed world have grown an average of 10 centimeters taller.

Scientists seem to have a lot of different theories about what causes it, but almost all theories say it has something to do with nutrition: increased intake of dairy and meat.

Over the last 50 years, global meat consumption has more than quadrupled from 71 million tons to 310 million tons.

The same could be said for milk and eggs.

In any society, as incomes rise, so does protein consumption.

You know, globally, we're getting richer.

As the middle class grows, the world's population will reach 9.7 billion by 2050, up from 7 billion today, which means that by 2050, we'll need at least 70 percent more protein than we currently provide.

The latest United Nations projections suggest that by the end of this century, we'll have 11 billion people, meaning we'll need more protein than ever before.

This is a major challenge, and that's why the GSI team at Anglia Ruskin University recently warned that unless we continue to change our policies and food production systems globally, our society must actually collapse within 30 years.

The ocean is currently the major source of animal protein

Over 2.6 billion people rely on it every day

At the same time, global fish production is two-and-a-half times more than can be sustainably supplied, meaning that humans are catching more fish than the oceans can recover.

A recent report by the WWF found that in the last 40 years alone, the world's marine life has nearly halved.

Another report found that over 90 percent of the large predatory fish, swordfish and bluefin tuna, have disappeared since the 1950s.

There are many good practices in sustainable fisheries that are more practical and well managed on a global scale.

But in the end, these efforts are only going to keep current catches constant.

Even with the best managed fisheries, we are unlikely to catch more from the ocean than we do now.

We must stop overfishing from the sea.

pressure should be relieved

And we're just at a tipping point where if we force any more overproduction, we might completely collapse.

The current system cannot feed the world's ever-growing population.

So how can we improve?

A world in just 35 years -- what would it be like if 2.7 billion more of us shared the same amount of food resources?

everyone becomes a vegetarian

It sounds like a very good idea, but it's not realistic, and it would be incredibly difficult to mandate it globally.

People eat animal protein whether they like it or not.

If we keep doing what we've always done, we won't be able to meet demand.

The WWF recently reported that 800 million people suffer from malnutrition and food insecurity due to a growing global population and inadequate access to resources such as water, energy and land.

You can easily imagine a world suffering from global turmoil, riots, and even more malnutrition.

People are starving, we're running out of natural resources dangerously.

For too many reasons, we have to change the global food production system.

We have to do better - there is a way out

The answer lies in aquaculture, growing fish, seaweed, shellfish and crustaceans.

The great sea hero Jacques Cousteau once said, "It's time to use the sea like a farmer, not like a hunter.

That's what civilized societies are: farming, not hunting and gathering."

Fish is the only food we still get

Why do we often hear phrases like, "Life is too short to eat farmed fish" or "Only wild fish!"

We know practically nothing about fish, do we?

You have no way of knowing what you've been eating, or what kind of contamination you've encountered.

If it's a large predatory fish, it might have just come through the coast of Fukushima.

we don't know

Very few people realize that the traceability of seafood can only be traced back to the person who caught it.

Let's take a step back and talk about why fish is the best choice.

Fish is healthy, it protects against heart disease, it provides important amino acids and essential fatty acids like omega-3s, and it's very different from any other type of meat.

Besides being good for your body, it's also exciting that there's more variety.

Think about it - most animal husbandry is pretty monotonous.

A cow is a cow, a sheep is a sheep, a pig is a pig, and a poultry is a turkey, a duck, a chicken.

About 500 species of fish are currently farmed.

It's not reflected on Western supermarket shelves, but that's aside.

Fish can be farmed in a very healthy way, good for us, good for the planet, good for the fish.

(Laughter) Let me explain. My brilliant partner and wife, Amy Novograntz, and I got into aquaculture a few years ago.

Because I was inspired by Sylvia Earle, who won the TED Prize in 2009.

Amy and I met at Mission Blue I in Galapagos

Amy was the director of the TED Prize, and I was participating as an entrepreneur from the Netherlands, a concerned citizen who loves diving and the ocean.

Mission Blue changed my life

We fell in love, we got married, and when we left the Galapagos, we were so inspired that we wanted to do something for ocean conservation, something that would last, something that would really make a difference, and something that Amy and I could do together.

I never thought it would lead to fish farming.

A few months after we got off the ship, I had the opportunity to attend a conference at Conservation International, where the president of WorldFish was speaking about aquaculture, and in a room full of environmentalists, he wanted us to rethink aquaculture, to realize what was going on, to get involved, because aquaculture could be what the ocean and so many people need.

When I heard the statistics, I was stunned. I knew very little about the fishing industry, and I was looking forward to helping make it better.

In terms of statistics, the amount of fish consumed globally today, both wild and farmed, is twice as many tonnes as the total amount of beef produced on the planet last year.

Together, all kinds of fishing boats, small and large, collectively produce about 65 million tons of wild seafood for human consumption around the world.

For the first time in history, aquaculture actually produced more seafood than wild-caught this year.

But this time the demand will only increase.

Within 35 years, we will need to meet an additional 85 million tonnes of demand, almost 1.5 times more than the world's oceans.

that's a huge number

It's better to assume that nothing will come out of the sea anymore.

if not from a fishery that nurtures

Now let's talk about aquaculture. Aquaculture takes resources.

Humans need to eat to grow and live, and so do animals.

To produce one kilogram of meat, a cow would need about eight kilograms of feed and about 16,000 liters of water.

Experts say it's impossible to produce enough beef to feed all the inhabitants of the planet.

we don't have enough food or water

We can't continue clearing the rainforest for that.

Fresh Water - The Earth's Supply Is Limited

We humans need something more efficient to survive on this planet.

Now let's compare that to farming.

A kilogram of fish can be raised on a kilogram of food, or even less, depending on the species.

Could I ask the reason?

Well, because first of all, fish float.

You don't have to stand against gravity all day like humans do.

Most fish are cold-blooded, so they don't need to be warmed up.

fish get cold

(Laughter) I know it's surprising, but you only need a little bit of water.

Fish are the most resource efficient animal protein for humans, apart from insects.

What we've learned from that is-

For example, about 65 million tonnes are harvested each year for human consumption, but another 30 million tonnes are harvested for food. Sardines, anchovies, and other species are processed into fishmeal and fish oil for the aquaculture industry.

it's crazy

65% of fisheries worldwide are poorly managed

Some of our deepest problems are connected to that.

destroying the sea

The problem of slave labor for fishermen is also connected here.

A recent article from Stanford University said that if 50 percent of the world's aquaculture industry stopped using fishmeal, the oceans would be fine.

think about that for a minute

We know there are many more problems in the ocean, including pollution, acidification of the water, destruction of coral reefs.

It clearly shows the impact of fisheries, and how everything is interconnected.

Fisheries, aquaculture, deforestation, climate change, food security, etc.

In search of alternatives, the industry has changed dramatically, returning to using plant-based alternatives such as soybeans, poultry manure from poultry farms, and blood meal from slaughterhouses.

I can understand why this choice was made, but I don't think it's the right approach.

it's not sustainable and it's not healthy

Ever seen a chicken at the bottom of the ocean?

But it is not

If you feed salmon only soybeans, it will really explode.

Salmon is carnivorous and cannot digest soybeans.

Aquaculture is by far the best breeding for humans.

but it has a bad reputation

The use of outrageous amounts of chemicals, the transmission of viruses and diseases to wild fish, the destruction and pollution of ecosystems, the genetic impact of breeding escaped fish with wild species, and of course, as I said, unsustainable feed ingredients.

How nice it was when the food on your plate was just delicious, whatever it was

if you know

I can't go back

it's not fun

We really need a credible, transparent food system that produces healthy food.

But the good news is that decades of development and research have allowed us to do much better with new technologies and knowledge.

We can now grow fish without these problems.

I thought about agriculture before the green revolution: we aquaculture and the blue revolution

The new technology is that we can produce a completely natural fish food with a minimal footprint, made from microorganisms, insects, seaweed and microalgae.

Healthy for humans, healthy for fish, healthy for the planet.

Microorganisms and such could be a perfect substitute for high-end fishmeal, and on a large scale.

Insects -- firstly because they're completely recycled, because they feed on leftover food, and secondly -- when you think about fly fishing, it's pretty logical to use insects as food for fish.

You don't need a lot of land, you don't have to clear the rainforest.

Microbes and insects actually make more water.

The revolution has already begun, but more scale is needed.

We can grow more species than ever before, and create happy fish that are managed and in their natural state.

I think that closed systems that work more efficiently than, say, growing insects, produce little or no waste, use very little energy, use little water, use natural foods, and produce healthy, happy, delicious fish with a minimal footprint.

Or a system that mimics a natural ecosystem and raises about 10 species of fish together.

Minimal food and minimal footprint

Think, for example, of seaweed growing on the waste products of fish.

There are so many wonderful technologies coming out all over the world.

Another way to fight disease is to not rely on antibiotics or chemicals. A system that senses when fish are hungry and automatically feeds them, saving food and reducing pollution.

The software collects data from the farm and allows us to make improvements to the right practices.

Amazing things are happening all over the world

Don't get me wrong -- these are competitively priced enough to compete with current aquaculture practices.

No more excuses for not doing the right thing

Someone has to connect the dots and pat these developments on the buttocks

That's what we've been doing for the last few years, and if we don't all do it together, we're going to start from the ground up.

Now is the time to make a difference in the seafood industry and move towards sustainability.

The industry is still in its infancy and there is still room for growth.

It's a big challenge, but it's not as difficult as you might think.

quite possible

The pressure on the sea must be relieved

I want to eat good, healthy food

What we eat must be living creatures that have lived happy and healthy lives.

I need food I can trust, because I want to live long.

It's not just for San Francisco or people in Northern Europe -- it's for everyone.

Even in the poorest countries, it's not just about money.

People prefer fresh, healthy, and authentic food to unknown food from somewhere far away.

we want the same

The day will come when people will realize -- no, they will want fish properly raised and healthy on their table -- and nothing else.

This will accelerate with your power

Please ask when ordering seafood

Where does the fish come from?

Who are the producers? What did the fish grow on?

Information like where the fish came from and how it was produced should be readily available.

Consumers need to put pressure on the aquaculture industry to do the right thing.

Ask carefully when you place your order, and show that you care about what you eat and what you're served.

someday they will listen

we will all benefit

thank you

(applause)

Imagine an airplane flying 1 millimeter above the ground, repeatedly orbiting the earth in 25 seconds, counting the grass on the ground one by one.

Let's shrink it down to the size of the palm of your hand, and it's about the size of a modern hard disk, but it could hold more information than your local library contains.

So how is so much information stored in this small space?

At the center of a hard disk is a stack of rapidly spinning disks, with a magnetic recording head flying over each surface.

Each disk is coated with a film of magnetized, microscopic metal, and the data is not recorded in a way that humans can see and recognize.

Formed by agglomeration of ultrafine particles - recorded as magnetic patterns

In each group, also called a bit, all the particles are magnetized in the same direction, which has two states, corresponding to either 0 or 1.

Writing data to disk is done by converting a series of bits into an electric current and sending it through an electromagnet.

An electromagnet creates a magnetic field strong enough to change the direction of magnetization in a metal particle An electromagnet creates a magnetic field strong enough to change the direction of magnetization in a metal particle

Once the information is written to the disc, it can be retrieved as usable data by a read magnetic head in the drive, much like the stylus in a gramophone reads the grooves of a record to produce music.

But how can we represent all kinds of information with just 0s and 1s?

It's expressed by using many 0's and 1's together.

For example, one character is represented by one byte, or eight bits, and the average photo size is a few megabytes, one megabyte equals eight million bits.

Since each bit is written into the physical space of the disk, there's a constant quest to increase the areal density of the disk, that is, how to pack more bits per square inch.

The areal density of modern hard disks is about 600 gigabits per square inch, which is 300 million times higher than the first hard disk manufactured by IBM in 1957.

This dramatic increase in storage capacity isn't just about making everything smaller, it's the accumulation of several inventions.

A technique called thin-film lithography allowed engineers to miniaturize read-write magnetic heads.

Despite its small size, the accuracy of its readings has been further enhanced by applying new inventions about the magnetic and quantum properties of matter.

Mathematical algorithms have also increased bit density even further, which removes noise from magnetic interference and determines the most likely set of bit values ​​from a set of read signals.

Controlled thermal expansion of the head, made possible by placing a heating device under the magnetic writing head, allowed the head to move at a height of less than 5 nanometers above the disk, which is about the width of a double strand of DNA.

Over the past few decades, computer memory and processing power have grown exponentially, following Moore's Law, which was proposed in 1975 and predicted a doubling in integration density every two years.

But when we got to about 100 gigabits per square inch, a new problem arose in the miniaturization or integration of magnetic particles: the superparamagnetic effect.

If the volume of the magnetic particles is too small, thermal energy can easily perturb the magnetization state, causing unintentional bit flips and data loss.

Scientists were able to overcome this limitation and get areal densities approaching one terabit per square inch by a very simple method of switching the direction of storage from the direction of head movement to perpendicular to it.

Recently, thermal magnetic recording has pushed the potential limits even further.

This method uses a much more thermally stable storage medium that can be written to by heating specific locations with a laser, temporarily lowering the magnetoresistance.

These drives are currently in the prototype stage, but scientists are already quietly preparing the next technology: bit-patterned media, where the bits are separated and arranged in nano-sized structures, potentially increasing areal densities to 20 terabits per square inch or more.

It's thanks to generations of engineers, condensed matter physicists and quantum physicists that this device of incredible power and precision spins in the palm of your hand.

muscle

Our body has over 600 muscles

It accounts for 1/3 to 1/2 of the body's body weight and, together with connective tissue, holds the body together, supports it, and aids movement.

Even if strength training isn't your hobby, you should always be aware of your muscles because how you treat them every day determines whether they grow or wither.

you're standing in front of the door trying to open the door in front of you

Your brain and muscles are primed for this action.

First, the brain sends a signal to motor neurons in the arm.

When a signal is received, neurons fire, causing muscles to contract and relax, pulling on arm bones and causing the desired movement.

The greater the movement required, the more signals the brain sends and the more motor units (muscle fibers and motor neurons) work together to achieve the goal.

But what if the door was made of solid iron?

When arm muscles alone cannot generate enough force to open a door, the brain calls on other muscles to help.

Put your feet up, tighten your belly, brace your back, and create enough force to pry the door open.

The nervous system took advantage of the power it had and used other muscles to accomplish its goals.

And during this movement, muscle fibers undergo cell-by-cell changes.

Muscle fibers are microscopically damaged by stress, which is not a bad thing in this case.

In response, damaged cells release inflammatory molecules called cytokines, which prompt the immune system to repair the damage.

This is the magic of muscle growth.

The greater the damage to the muscle tissue, the more repair it will need.

This cycle of damage and repair causes muscles to grow bigger and stronger, and eventually able to meet more demanding demands.

Our bodies are already accustomed to our daily activities, so everyday life doesn't stress us enough to encourage new muscle growth.

So, in order for new muscle to build through a process called hypertrophy, we have to put more stress on our muscle cells than ever before.

In fact, without some form of constant resistance, the muscles will undergo a process called muscle atrophy, in which they become thinner and thinner.

Conversely, you can create the conditions for effective muscle growth by applying a high strain, also known as an eccentric contraction, especially while the muscle is stretched.

But muscles don't grow just by putting strain on them.

Without proper nutrients, hormones and rest, the body cannot repair damaged muscle fibers.

Dietary protein maintains muscle mass by supplying building blocks for new muscle tissue in the form of amino acids.

Adequate protein intake, combined with hormones produced by the body, such as insulin-like growth factor and testosterone, put the body in a position to repair and grow muscle tissue.

This important repair work is done at rest, especially at night while you sleep.

Gender and age also play a role in repair mechanisms, which is why young men with more testosterone are more likely to build muscle than others.

Genetics also play a role in muscle growth.

In particular, people who have a strong immune response to muscle damage and are able to repair muscle fibers quickly have the potential to grow more muscle.

The body is designed to meet the demands it is given.

When you hit the load, eat well, rest, and repeat, you create conditions that allow your muscles to grow stronger and bigger.

Muscle growth is like life: meaningful growth requires challenge and stress.

Are you restless and unable to sleep Are you moody and irritable Are you forgetful? Do you feel overwhelmed or lonely?

don't worry it's something we all experience

you're probably stressed

Stress is not necessarily bad

It's especially useful in situations where you need a lot of energy and focus, like during a competitive sport or when you have to speak in public.

But when stress is prolonged, and when you're exposed to stress day in and day out, changes occur in your brain.

Chronic stress, like being overworked or having an argument with a family member, affects the size of your brain, its structure, how it functions, down to the genetic level.

Stress first occurs in the hypothalamus-pituitary-adrenal cortex (HPA) system, and a series of interactions take place between the kidneys and the endocrine system in the brain that control the body's response to stress.

When the brain senses a stressful situation, the HPA system quickly activates, releasing the hormone cortisol to prepare the body for sudden movements.

But high cortisol levels over an extended period of time wreak havoc in the brain.

Chronic stress, for example, increases activity levels in the amygdala, which increases neural connections in the amygdala, which is the part of the brain responsible for fear.

High cortisol levels dampen electrical signals in the hippocampus, an area of ​​the brain involved in learning, memory, and stress regulation.

The hippocampus also plays a role in suppressing the activity of the HPA system, so when the activity of the hippocampus weakens, the ability to regulate stress also weakens.

That's not all

cortisol can actually shrink the brain

Excess cortisol causes loss of synaptic connections between neurons and atrophy of the prefrontal cortex, the area of ​​the brain responsible for concentration, decision making, judgment and social interaction.

Excess cortisol also prevents the hippocampus from making new brain cells.

So chronic stress can make learning and memory difficult, lay the groundwork for more serious mental illnesses like depression, and may even lead to Alzheimer's disease.

The effects of stress can also affect your brain's DNA.

In one experiment, it was shown that how much a mother nurtures a newborn mouse determines how the offspring will later respond to stress.

Children raised by their mothers were more resilient to stress because the brains of these types of children have more cortisol receptors, which capture cortisol and dampen the stress response.

Children of abandoned mothers had the opposite result: they were more susceptible to stress throughout their lives.

This is thought to be an epigenetic change, which means that these changes do not affect the genetic code itself, but affect gene expression.

If you switch mothers, the opposite happens.

I'm getting amazing results

The epigenetic changes brought about by one mother mouse were passed on to her offspring for many generations.

In other words, the consequences of these effects are heritable.

It's not all bad news

There are a number of ways cortisol can reverse stressed brain conditions.

Exercise and meditation are our most powerful weapons, because they help us breathe deeply and become more aware and focused on our surroundings.

Both exercise and meditation reduce stress and increase hippocampal capacity, which in turn improves memory.

So don't give in to the daily pressures.

Take control of your stress before it takes over

Connect your brain to a machine, and enjoy the ultimate pleasure for the rest of your life.

If there is such an option, would you like to experience it?

This is a question posed by the philosopher Robert Nozick in his thought experiment called the "experience machine."

It's an experiment to think about a world like this. Scientists have developed a machine that produces a virtual world that guarantees a world of pure pleasure and no pain.

The problem is-

You can't go back to reality, but you'll hardly notice the difference.

You can't tell the difference between what you experience with the machine and what's real.

A life that should have ups and downs will remain floating

It is wonderful

Sounds tempting, but maybe not so ideal

In fact, this experiment was meant to refute the philosophical view of hedonism.

According to hedonists, maximizing total pleasure is the most important thing in life, and the reason is that pleasure is the greatest good you can get in life.

What the hedonist wants above all else is a life that brings him the greatest possible pleasure and is completely pain-free.

When you subtract the pain from the infinite pleasure, the total pleasure is maximized, and that's exactly what you get from the Experience Machine.

If hedonism is your choice, you will have no hesitation in being connected to this machine.

What if there was more to life than mere pleasure?

Nozick tried to show that with his "experience machine" thought experiment.

He found a reason why we shouldn't be tethered to machines like other researchers who think about this proposition, even though machines guarantee maximum pleasure.

What makes us give up a future that promises supreme pleasure?

think about this

Betsy and Xander are in a romantic relationship.

Betsy is in love with Xander and feels bliss.

Unbeknownst to Betsy, Xander is also in love with her sister, Angelica.

If Betsy finds out, her relationship with Xander and Angelica will fall apart, and she'll be hit hard and may never get back on her feet again.

Betsy is utterly oblivious to Xander's infidelity, and a hedonist would say she's better off staying in love in ignorance and keeping her pleasure totals high.

As long as she remains ignorant of her sister's relationship with him, her life is guaranteed to be as happy as it is now.

Is it worth it for her to know the true situation in which she finds herself?

if you're betsy

want to know the truth?

Then the aggregate pleasure is significantly reduced.

If you choose this, you probably believe that there are things in life that are of greater intrinsic value than pleasure.

Truth, knowledge, relationships without lies, etc.

It corresponds to that

If she remains ignorant of the truth, she's essentially living in a chain of her own "experience machines," a world of happiness that isn't based on reality.

This love triangle is an extreme example, but it reflects the choices we make every day.

Why should we look at reality when choosing something for whom?

Is there an inherent value in real experience, whether it's pleasant or painful?

Does your self-worth increase every time you experience pleasure or pain?

Nozick's experiment may not answer all the questions, but it does make us wonder if our reality, while imperfect, has some intrinsic value beyond the pleasures of machines.

Fifteen years ago, I volunteered in a clinical trial that involved genetic testing.

When I got to the clinic for testing, I was handed a questionnaire.

At the beginning there was a question to fill out about race: White, Black, Asian, Native American.

I wasn't sure how to answer this question

Is this for judging the social background of the trial participants?

In that case, check the "Black" box, which is your social identity.

But what if a researcher were to study the relationship between pedigree and risk for a particular genetic trait?

In that case, what I'd like to know is about my ancestry, which in my case is both European and African.

If I enter my social identity as a black woman, how can I make scientific discoveries about my genes?

Again, for social reasons, I see myself as a black woman with a white father rather than a white woman with a black mother.

Racial identity has nothing to do with my genes.

And even though this question was clearly important for the scientific validity of the study, they just told me, "Don't worry too much about it, just write what you think."

So I checked "Black," but I couldn't trust the results of a study that treated such unscientific information that could influence research.

This experience with the treatment of race in genetic testing got me thinking: In what other areas of medicine is race misused?

I found that race underlies all medical practice.

Physicians diagnose, test, treat, prescribe, even define disease based on race.

The further I looked, the more confused I became.

Sociologists like me have said that race is a social construct.

When we identify people as Blacks, Whites, Asians, Native Americans, Latin Americans, we're talking about social categories, categories that change over time and are created differently around the world.

As a jurist, I've learned how the lawmakers, who are not biologists, have come up with a legal definition of race.

It's not just a social scientist's point of view.

Do you remember when the map of the human genome was unveiled at the White House ceremony in June of 2000?

President Bill Clinton famously declared, "I am convinced that one of the great truths that has emerged from this triumphant quest into the human genome is that genetically humans are 99.9% the same regardless of race."

And maybe the president will add that genetic differences of less than 1 percent don't fall into the racial checkboxes.

Francis Collins, current president of the National Institutes of Health, who led the Human Genome Project, expressed his support for President Clinton.

"I'm glad that the only race that we're talking about today is the human race," he said.

Physicians should practice evidence-based medicine, and more than ever, they are being asked to join the genomic revolution.

The way doctors treat patients by race is already outdated.

So let's take the estimated glomerular filtration rate (GFR) as an example.

Physicians typically determine an important measure of kidney function, called GFR, by race.

As you can see from this clinical study, even though the serum creatinine levels of the patients are exactly the same, different GFR estimates are automatically calculated for different patients, whether they are African American or not.

why?

I've been told that it's based on the assumption that African Americans have more muscle mass than other races.

But does it make sense for doctors to mechanically assume that I have more muscle mass than a female bodybuilder?

Couldn't we get a more accurate, evidence-based measurement if we really looked at a patient's muscle mass?

Doctors say they're just using race as a shortcut.

Even if it's crude, it's a convenient surrogate for more important factors that doctors don't have time to look at, like muscle mass, enzyme levels, genotype.

But race is a bad proxy.

In many cases, race doesn't give us any pertinent information.

just a distraction

And clinical assessment is often racially influenced.

Ethnicity hides from the doctor's eye -- a patient's symptoms, hereditary conditions, his or her medical history, the possibility of a pre-existing condition -- all of which are more grounded than the patient's race.

Ethnicity cannot be used as a substitute for these important diagnostic information without sacrificing the patient's health.

Physicians say that race is just one factor in making a diagnosis, but many clinical tests, such as the GFR, use race categorically and treat black, white, and Asian patients differently because of race alone.

Racial medicine particularly affects patients of color with harmful biases and stereotypes.

Blacks and Latinos are twice as likely to be prescribed no pain medication for long bone fractures as whites, partly because of stereotypes that blacks and Latinos are less likely to feel pain, more likely to overstate pain, and more likely to be drug dependent.

The U.S. Food and Drug Administration (FDA) has even approved a drug for certain races.

It's a drug called BiDil, which is used to treat heart failure in people who identify as African-American.

Cardiologists developed this drug without regard to race or genetics, but for commercial reasons it became convenient to market it to black patients.

The FDA then authorized pharmaceutical companies to conduct clinical trials involving only African-American subjects.

He baselessly speculated that race could be a surrogate for as-yet-understood genetic factors in heart disease and drug response.

But think about the danger of the message that comes with it: Black bodies are grossly substandard, and drugs tested in them aren't guaranteed to work in other races.

In the end, the pharmaceutical company's marketing plan fell through.

One reason is that black patients were naturally wary of using drugs that were only for black people.

An elderly black woman stood up at a community gathering and yelled, "Give me what white people drink!"

(Laughter) You might be surprised by the racially-targeted medicines, but hear me out, too. Many doctors in America still use an improved version of a diagnostic tool developed by a slave-era doctor, a diagnostic tool that goes hand in hand with justifying slavery.

After graduating from the University of Pennsylvania medical school, Dr. Samuel Cartwright

Before the Civil War, he practiced in the American South and was well known as an expert in what was then called "negro medicine."

He advocated a racial concept of disease, that people of different races had different diseases and had different symptoms of common diseases.

Cartwright argued in the 1850s that slavery was beneficial to blacks for medical reasons.

He argued that blacks had lower lung capacity than whites and that forced labor was good for them.

He wrote in a medical journal, "When under the domination of white men, the oxygenated and reddened blood is sent to the brain and the mind is liberated. When there is freedom, oxygenated blood is scarce, and their minds remain ignorant and savage."

To support this theory, Cartwright helped perfect a medical device called a spirometer, which measures respiration to prove his hypothetical dysfunction in the lungs of blacks.

Today, doctors still support Cartwright's claim that, as a race, blacks have lower lung volumes than whites.

Some doctors still use modern spirometers, but they actually have a button labeled "race" that allows the machine to adjust the readings according to the race of the patient.

This is a well-known feature called racial correction.

This racial medicine problem is bigger than misdiagnosing patients.

Focusing on the inherent racial differences in disease diverts attention from the social determinants that drive gross racial health disparities: lack of access to quality healthcare, food deserts in poor neighborhoods, exposure to environmental toxins, high rates of incarceration, and stress from racism.

You see, race is not a biological grouping based on genetic differences that naturally produce these health differences.

Race is a social classification, and it has enormous biological consequences because social inequalities affect health.

Racial medicine makes it look like racially-specific medicines can solve the problem of racial health disparities.

Because it's easier and more profitable to market technological solutions to address health inequalities than to tackle the structural inequalities that cause them.

The reason I'm so desperate to end racial medicine isn't just because it's bad medicine.

I'm on this mission because the way doctors practice their care continues to promote a false and harmful view of humanity.

Despite the many medical advances we have learned from our great predecessors, when it comes to race, we lack imagination.

Can you imagine with me for a moment what would happen if doctors stopped treating their patients by race?

What if we rejected the 18th-century classification system and instead embraced the recognition of the most advanced human genetic diversity and integrity? Humans are biologically incapable of being categorized as a race.

What if, instead of using race as a loose proxy for other, more important factors, doctors actually studied and addressed more important factors?

What if doctors were at the forefront of the movement to end structural inequalities due to racism, not genetic differences?

Racial medicine is bad medicine, lacks scientific evidence, and misinterprets human attributes.

Now more than ever, it is urgent to break with this legacy of the past, to end the social inequalities that divide us so deeply, and to make it clear that we are all human beings.

thank you

(Applause) Thank you.

thank you

Before he revolutionized physics, a young Albert Einstein showed a glimpse of genius by devising a difficult puzzle using this list.

Now, can you stand the brain-sweating conundrum from one of the greatest sages of all time?

I pray the good fight

A rare fish has been stolen from the city's aquarium.

The police followed a lead and came to a street with five very similar houses.

But you can't search every house at once, and if you search the wrong house, the thief will find himself being chased.

It's up to you, the best detective in town, to solve the case.

When you got to the scene, the police told me what they knew.

Part 1 Each landlord is a different nationality, each drinks a different drink and smokes a different kind of cigar.

2. The walls inside each house are painted a different color.

3 Each house keeps different creatures, one of which is a fish.

After a few hours of research, I've got some clues.

It seems like there's a lot of information, but there's a clear, logical path to a solution.

Solving a puzzle is a lot like Sudoku, so it's a good idea to organize your clues in a table like this.

[Pause the next screen and refer to the hints to solve the puzzle]

[Answer in 3 seconds] [2] [1] Start by filling out the table based on hints 8 and 9 [8 The man in the middle house drinks milk] Start by filling out the table by using hints 8 and 9 [9 Norwegians live in the first house]

So the Norwegian lives in the first house, so there is only one house next door, and we know from hint 14 that the walls of that house are blue.

According to Hint 5, people who live in houses with green walls seem to drink coffee.

The inhabitants of the middle house drink milk, and they know that the walls of the second house are blue, so the house with green walls is neither the second nor the third.

And from hint 4, the house with green walls is just to the left of the house with white walls, so it's neither number one nor number five.

We know that the house with the green wall that has the inhabitants drinking coffee is only the fourth house, while the white wall is the fifth house.

The nationality and wall color can be found from hint 1 [British people live in houses with red walls]

Only the third house, both of which are unknown, must be a red-walled house inhabited by an Englishman.

Now all that's left is the yellow wall, the house hasn't been identified yet, but this should be the first house, and it's clear from hint 7 that the people who live in that house smoke dunhill.

Also, from hint 11, we know that the neighbor has horses, but that house can only be second.

Next, the Norwegian drink in the first house.

From hint 3, tea is the Danish drink.

From Tip 12, root beer is the drink of the Blue Master smoker, and coffee and milk are already allocated, so all that's left is water.

From hint 15, the second house next door to the Norwegian knows that [the person who smokes Blends is the neighbor of the water drinker] smokes Blends.

Now there are only five houses that don't know the brand of cigar or the drink, and that must be the house of the person indicated by hint 12.

This leaves us with only the second house where we don't know what to drink, so there must be a Danish who drinks tea there.

Only the fourth house, whose nationality and brand of cigar are unknown, but as hint 13 suggests, it must be inhabited by a German who smokes Prince.

By process of elimination, we can determine that the British smoke Pall Moles and the Swedes live in the fifth house, while hints 6 and 2 tell us that [6 People who smoke Pall Moles have birds] and [2 Swedes have dogs], respectively.

Next to the Dane who smokes Blenz in Tip 10, having a cat next to him is number one.

Now there's only one blank left, so the culprit must be a German who lives in a house with green walls.

You, along with the police, stormed the house and arrested the man holding the fish.

So far, the solution has been straightforward, but puzzles like this often get bogged down in the wrong start.

The trick is to use a process of elimination and trial and error to narrow down the right answer, and the more logic puzzles you solve, the more intuition you'll have to decide when you've gathered enough information to reach a conclusion.

Did young Einstein really create this puzzle?

maybe not

There's no evidence left, and the brand is too new.

But the logic used here isn't that different from solving multivariate equations or explaining the nature of the universe.

What do octopuses and us have in common?

An octopus has no lungs, no spine, and no fixed English plural.

But octopuses can really solve puzzles, learn from observation, and use tools, just like any intelligent animal around them.

Octopuses' amazing intelligence comes from their biology, which is completely different from ours.

The 200 or so species of octopuses are molluscs and belong to the Cephalopods, just as their Greek name implies.

It has a very large brain in its head, and compared to the body-to-brain ratios of other intelligent animals, the octopus is astounding, and its nervous system is as complex as a dog's.

The octopus' 500 million neurons are not concentrated in the brain, but spread out in a network of interconnecting ganglia organized into three basic structures.

Only about 10% of the neurons are in the central brain, and about 30% are in the two large optic lobes.

The remaining 60% are in the tentacles.

This is where it gets interesting.

Vertebrates like humans, which have rigid skeletons to support their bodies, are designed to move through their joints.

Any movement is not possible

You can't bend your knees back and you can't bend your forearms in the middle

Cephalopods have no bones at all, so any part of their tentacles can be bent to their liking.

So tentacles can take any shape, and they can't be compared to anything in the human world.

Consider, for example, the simple task of grabbing and eating an apple.

There is a neural body map in the human brain.

When you see an apple, the motor centers in your brain signal the appropriate muscle activation, and you extend your arm, grab it, bend your elbow, and bring it to your mouth.

In the case of octopuses, the process is completely different.

Rather than a body map, behavior is recorded in the cephalopod brain,

When an octopus sees food, the brain triggers a habitual behavioral response of grabbing rather than activating specific parts of the body.

The signal races through neural circuits, and nerve cells in the tentacle pick up the signal and tell it to act immediately.

As soon as the tentacle reaches the food, a wave of muscle activity runs through the tentacle to the base of the tentacle, and from that base another wave is sent to the tip of the tentacle.

So the octopus knows that the signal will meet halfway between the prey and the base of the tentacle, and bend there.

It can be said that each of the eight tentacles of the octopus has its own will.

Because of this, octopuses are incredibly flexible and creative problem-solvers, depending on the situation. For example, they can open jars to feed, escape from lost paths, explore new environments, change the texture and color of their skin, blend in with their surroundings, or imitate other scary creatures to ward off predators.

Cephalopods may have evolved complex brains long before vertebrates.

This intelligence isn't just useful for octopuses.

The octopus' unique nervous system and independent-thinking tentacles are inspiring new research -- the development of robots made of soft materials for flexible movement.

The study of intelligence development that accompanies this kind of divergent evolution helps us understand intelligence and consciousness holistically.

Maybe there are other intelligent life forms out there, and no one really knows what their lives are like.

In the 3rd millennium BC, Mesopotamian kings recorded their dreams and their interpretations on wax slabs.

A thousand years later, the ancient Egyptians wrote a book of dream divination, describing more than 100 common dreams and their meanings.

Even after that, the journey to find out why we dream didn't end.

Since then, intensive scientific research, technological progress and persistence have yielded some intriguing theories, albeit without definitive answers.

we dream to fulfill our desires

In the early 1900s, Sigmund Freud argued that all dreams, including nightmares, are a collection of subconscious images from everyday life, with symbolic meaning associated with fulfilling latent desires.

According to Freud's theory, the dreams we recall upon waking from sleep are symbolic representations of our primordial thoughts, impulses and desires that lie beneath our unconscious.

Freud believed that by analyzing remembered dreams, the subconscious of the mind could be brought to the subconscious, revealing and resolving mental problems caused by repressed desires.

we dream to remember

Sleep helps us to be more efficient at certain mental tasks, but it's even better if we can dream.

In 2010, researchers found that navigating a complex three-dimensional maze was much better if subjects got some sleep and dreamed about the maze before the second trial.

In fact, people who hadn't dreamed of the maze but slept for a little while had up to 10 times better results than those who stayed awake and only thought about the maze during the trial.

Researchers have theorized that the process of memory consolidation occurs during sleep, and that dreams are signals that this process is occurring.

we dream for oblivion

The structure of the brain has about 1 quintillion neural connections.

Every time you think or act, this connection grows.

According to a neurobiological theory called reverse learning, presented in 1983, during sleep, primarily REM sleep, the neocortex revisits these neural connections and erases unwanted connections.

Without this process of forgetting that leads to dreaming, the brain would be overloaded with useless connections, and the slightest distraction would interfere with necessary thoughts during waking hours.

We dream to keep our brains functioning properly.

The sequential activation theory explains that dreams are part of the brain's process of consolidating and forming long-term memories for proper functioning.

When external stimuli drop below a certain level, such as during sleep, the brain automatically begins to recall memories and generate data that manifests itself as the thoughts and emotions we experience in our dreams.

In other words, dreams are like random screensavers that your brain shows you that don't shut down completely.

we dream as a dry run

We often have dreams in which we are in dangerous or threatening situations.According to the primal instinct dry run hypothesis, the dream content has an important purpose.

Whether it's a night full of terror, whether you're being chased by a bear in the woods or battling a ninja in a dark alley, dreams like this can help you rehearse your fight-or-flight instincts so you can be alert and dependable when the real world calls for it.

But it's not always an unpleasant dream.

For example, dreams of nearby attractive people may provide opportunities for practice based on reproductive instincts.

we dream for healing

Stress-related neurotransmitters in the brain are rarely activated during REM sleep, even during painful dreams, leading some researchers to theorize that one of the purposes of dreams is psychological healing, which alleviates painful experiences.

Reenacting painful events in a less stressful dream may give you a clearer perspective and enhance your ability to deal with things in a mentally healthy way.

Because people with certain mood disorders and post-traumatic stress disorder have trouble sleeping, some scientists believe that sleep deprivation may be a contributing factor to such disorders.

we dream for problem solving

Beyond the framework of reality and conventional thinking, dreams allow us to create open-ended scenarios that help us understand problems and find solutions that we might not have thought of when we were awake.

John Steinbeck called it the "Sleep Board," and researchers have shown that sleep is an efficient way to solve problems.

The famous chemist Augusto Kekulé discovered the structure of the benzene molecule exactly this way, which is why it is often said that the best way to solve a problem is to sleep and think.

There are other more prominent theories.

As technology advances the way we understand the brain, perhaps one day we'll discover the real reason we dream.

Until that day comes, let's keep dreaming

Depression is the leading cause of disability in the world

Nearly 10% of adults in America suffer from depression.

But because this disease is psychological, it can be harder to understand than, say, high cholesterol.

One of the main sources of confusion is the difference between having depression and being depressed.

Everyone gets depressed from time to time

Getting bad grades, losing your job, getting into a fight, or even the rain can make you sad.

sometimes there is no cause

I suddenly feel depressed

Then when the situation changes, the sadness disappears.

clinical depression is different

Medically, depression is a disease, and you just wish it went away, but it doesn't go away.

It lasts at least two weeks in a row, and it seriously impairs a person's ability to work, to play, to love.

Depression has a variety of symptoms: stagnation of mood, loss of interest in activities that you normally enjoy, changes in appetite, feelings of worthlessness or excessive guilt, too much or too little sleep, poor concentration, restlessness or slowness, loss of motivation, and recurring suicidal thoughts.

If you have five of these symptoms, you may be suffering from depression, according to psychiatric guidelines.

More than just behavioral symptoms

Depression also comes with physical symptoms that occur in the brain.

First of all, there are changes that can be seen with the naked eye or radiographs.

This includes shrinkage of the prefrontal cortex and changes in hippocampal volume.

On a smaller scale, depression is associated with a number of things: first, excess or depletion of certain neurotransmitters, especially serotonin, norepinephrine, and dopamine; disruption of the biological clock, which is changes in patterns of REM and non-REM sleep;

But neuroscientists still don't fully understand what causes depression.

Genes and environment seem to be intricately intertwined, but we still don't have the tools to predict exactly when and where expression will occur.

And because the symptoms of depression are so elusive, it's hard to tell who looks fine but is actually suffering.

According to the National Institute of Mental Health, it takes the average person suffering from mental illness 10 years to seek help.

But there are also very effective treatments.

Medication and therapy work synergistically to stimulate the release of chemicals in the brain.

In extreme cases, electroconvulsive therapy, which artificially induces seizures in the patient's brain, can be very helpful.

Other treatments that can help, such as transcranial magnetic stimulation, are being researched.

So if you know someone with depression, gently encourage them to try these treatments.

You might even suggest helping them with specific tasks, like researching local therapists or making a list of questions to ask your doctor.

For people with depression, these first steps can seem insurmountable.

If they feel guilty or ashamed of themselves, tell them that depression is a medical condition similar to asthma or diabetes.

It's not a weakness of mind or a character flaw, it's a symptom that you can't expect to heal on its own, just like you can't fix a broken arm on your own.

If you've never experienced depression yourself, don't compare your experience to when you're feeling down.

By comparing the experience of the other person to the normal, temporary feeling of sadness, you will make the other person feel that it is their fault that they are suffering.

Even just talking openly about depression can help.

For example, studies show that asking about suicidal thoughts can reduce the risk of suicide.

Speaking publicly about mental illness removes social stigma and makes it easier for people to seek help.

The more patients seek help, the more scientists will understand depression, and the better treatments will come out.

i am a neurosurgeon

My colleagues and I have to deal with human tragedies every day.

I realize how life can change in an instant after a serious stroke or a car accident.

What's so frustrating for us neurosurgeons is that unlike other organs, the brain has very little ability to repair itself.

After a major central nervous system injury, patients are often left severely disabled.

This is how I became a functional neurosurgeon.

What is a Functional Neurosurgeon?

It's a doctor who uses unique surgical techniques to improve neurological function.

I'm sure you've heard of one of the most famous of these, called deep brain stimulation, where electrodes are implanted deep in the brain to modulate neurons in order to improve neural function.

It's an amazing technology that has improved the lives of patients with Parkinson's disease, severe tremors and excruciating pain.

But neuromodulation is not neurorepair.

A functional neurosurgeon's dream is to repair the brain.

i think i'm getting closer to this dream

I want to show you that we are very close to this.

With a little help, the brain can heal itself.

this started 15 years ago

At that time, I was working day and night in the emergency room as chief resident.

He frequently treated patients with head injuries.

Imagine a patient with a severe head injury comes in with a swollen brain and increased intracranial pressure.

Intracranial pressure must be reduced to save the patient's life.

To do that, sometimes it's necessary to remove part of the swollen brain.

So instead of throwing away this swollen part of the brain, I decided to study it with my colleague, the biologist Jean-François Brunet.

What do you mean?

I was trying to grow cells from this cell debris.

it's not easy

Growing cells from cell debris is a bit like raising a very young child away from the family.

You have to find the right nutrients, warmth, humidity and a comfortable environment for your cells to grow.

And that's what we did to this cell.

After many attempts, Jean-Francois succeeded.

This is what he saw under the microscope

it was a big surprise for us

Why?

Because the big green cells surrounded the little immature cells, and it looked exactly like a stem cell culture.

You may have learned in your biology class that stem cells are immature cells that can change into any cell in the body.

There are stem cells in the adult brain, but they're extremely rare, and they're located deep in a small region of the brain.

That's why I was surprised to see these stem-cell-like cultures from superficial, swollen brains obtained in the operating room.

Another interesting observation is that normal stem cells are very active, dividing, dividing and dividing very quickly.

And immortal cells that never die

But the nature of this cell was different.

It divided slowly and died after a few weeks in culture.

We were faced with an unknown cell population that resembled stem cells but had a different ecology.

It took me a while to understand where those cells came from.

it came from this cell

These blue and red staining cells are called double-cotin-positive cells.

You also have these cells in your brain.

Equivalent to 4% of the cortex of brain cells

It plays a very important role in the developmental stage.

It helps the brain make folds in the fetus.

But why is it still in the brain as an adult?

i don't know this

We think that they may be repairing the brain because they are found in large numbers near the site of brain injury.

but i'm not sure

But one thing is clear, we've made stem cell cultures from these cells.

We were faced with a new source of cells that could potentially repair the brain.

I had to prove this

So I decided to create an experimental paradigm to prove it.

They take parts of the brain that are less likely to be damaged by cutting them out, and then grow the cells in exactly the same way that Jean François did.

Label them, or color them, so you can track them in your brain.

Finally reimplant it into the same individual

we call this autologous

The first question was, "What would happen if I reimplanted these cells into a normal brain and if I reimplanted them into an injured brain?"

Thanks to Professor Eric Rourier's help, we did an experiment with monkeys.

The first experimental plan was to reimplant the cells into a normal brain, and after a few weeks, I saw those cells completely disappear, as if they had been taken out of that brain and then sent home, but it was already full of cells and they weren't needed, so they disappeared.

The second experimental design reimplanted the injured brain with the exact same cells, in this case the cells remained and became mature neurons.

Here's an image of what we saw under the microscope.

These are reimplanted cells

The proof is this little dot, which is a labeled cell in a test tube when it's in culture.

Of course we can't stop here

Could these cells help monkeys recover after injury?

To find out, we taught monkeys a task that required manual dexterity.

It's the one that takes the bait granules out of the box.

they did very well

When our progress plateaued, we damaged the motor cortex, which corresponds to hand movements.

Now the monkey is paralyzed and can no longer move his hands.

Just like humans, they naturally recovered to some degree, just like after a stroke.

After a patient becomes completely paralyzed, a mechanism called brain plasticity seeks and recovers to some degree, and monkeys are exactly the same.

So we decided that when the monkey's natural recovery plateaued, we would do an autologous transplant.

The left side is when the monkey spontaneously recovered.

Approximately 40-50% operation before damage

not so accurate and not so fast

Look at this re-implanted cell, the same monkey two months after re-implantation.

(Applause) It was a very exciting result for us as well.

Since then, we've learned a lot more about this cell.

It turns out that these cells can be cryopreserved for later use.

We found it applicable to other neuropathological models, such as Parkinson's disease.

But our dream is to transplant these into humans.

I sincerely hope that soon we will be able to tell you that the human brain has given us the tools to repair itself.

thank you

(Applause) Bruno Giussani: Jocelyn, that's great. Right now, probably the majority of people in the audience are thinking, "Someone can use this."

anyway i think so

The question is, what are the biggest obstacles to human clinical trials?

Joslyn Bullock: The biggest obstacle is legal regulation.

Bruno: I understand, because the brain needs a lot of attention.

Joslyn: Yes, but it's time consuming, patient, and usually done by a team of experts.

Bruno: Your plan is that the research has already been completed, and if we get approval to start a clinical trial, and if things go according to plan, how many years do you think it will take before we can have this treatment in hospitals?

Jocelyn: That's a very difficult question.

First, it depends on the licensing status of clinical trials.

Can we get approval for clinical trials right away?

After approval, studies like this must go into clinical trials on small patient groups.

So it takes a lot of time to select patients for treatment and evaluate whether these treatments are beneficial.

After that, we need to move to clinical trials at multiple centers.

Before we can generalize this treatment, we first need to do a good job of proving it's beneficial.

Bruno: Of course safety. Jocelyn: Of course.

Bruno: Thank you for speaking at TED.

Jocelyn: Thank you

(applause)

Which of these has the least carbohydrates?

bread roll

a bowl of rice

One can of carbonated drink

that's a difficult question

They're different in fat, vitamins, and other nutrients, but when it comes to carbohydrates, they're all pretty much the same.

how does it affect your diet

First, carbohydrates, in terms of nutrition, are sugars and molecules that your body breaks down to make sugars.

Carbohydrates can be simple or complex, depending on their structure.

this is a monosaccharide

Glucose, fructose, and galactose are all monosaccharides

Two monosaccharides combine to form disaccharides such as lactose, maltose, and sucrose.

Polysaccharides (broadly defined) are made up of three or more monosaccharides linked together.

An oligosaccharide is a combination of 3 to 10 monosaccharides

Groups of 10 or more of them are called polysaccharides

Digestion breaks down polysaccharides in the body into simple sugars that cells can use for energy.

When you eat carbohydrate-rich foods -- usually containing about a teaspoon of sugar -- your blood sugar rises.

But the digestive tract doesn't respond to all carbohydrates the same way.

Starch and fiber, for example, are both polysaccharides, both plant sources, and both are hundreds or thousands of monosaccharides linked together, but their chemical bonds are different, and those differences have different effects on the body.

The starch that plants store in their roots and seeds as energy is made up of glucose molecules linked by alpha bonds, and most of it is easily broken down by enzymes in the digestive tract.

But dietary fiber, in which monosaccharide molecules are linked by beta bonds, cannot be broken down in the body.

Dietary fiber can also bind to starch, preventing its digestion. Such starches are called resistant starches.

Starch-rich foods, such as crackers and bread, are easily digested and quickly release glucose into the blood, similar to what happens when you consume glucose-rich beverages such as soda.

These are foods with a high GI (glycemic index), which is a measure of how well a food raises blood sugar levels.

Soda and bread have similar GI values, because they both have similar effects on blood sugar.

But when you eat foods high in fiber, such as vegetables, fruits, and whole grains, the fibers with indigestible beta bonds have the effect of slowing the release of glucose into the blood.

So these are foods with a low GI. Eggs, cheese, and meat are considered to have the lowest GI.

As sugar moves from the digestive tract into the blood, the body begins to convert it into energy and move it to tissues where it can be used.

Insulin is a hormone synthesized in the pancreas and is the body's primary means of controlling sugar.

Insulin is released into the blood when you eat and your blood sugar rises.

Stimulates muscle and fat cells to take up glucose and initiate the conversion of sugar into energy

The degree to which one unit of insulin lowers blood sugar is a useful indicator of insulin sensitivity.

The more one unit of insulin lowers your blood sugar, the more sensitive you are to insulin.

A state of reduced insulin sensitivity is called insulin resistance.

At this time, the pancreas secretes insulin, but the cells, especially the muscle cells, gradually become unresponsive, and blood sugar does not fall, and blood insulin continues to rise.

Chronic high carbohydrate intake leads to insulin resistance, and many scientists believe that insulin resistance leads to a serious condition called metabolic syndrome.

This includes a range of symptoms: high blood sugar, increased waist circumference, high blood pressure.

It also increases the risk of developing cardiovascular disease and type 2 diabetes.

Metabolic syndrome is now on the rise worldwide

In the United States, 32 percent of the population has metabolic syndrome.

Now let's get back to your diet.

Whether the food is sweet or not, sugar is sugar, and too many carbs can be a problem.

Pasta Sushi Rolls Pita Burritos Donuts Burgers Sandwiches

Statistics are compelling

Because it's powerful, people, organizations, and countries rely on data when making their most important decisions.

But here's the problem

There's something lurking in any statistic that can turn the results around.

For example, let's say you have to choose between two hospitals for an operation on an elderly relative.

Of the last 1,000 patients at each hospital, 900 survived at hospital A, but only 800 at hospital B.

Then it looks like choosing hospital A would be a good choice.

But before you make that decision, remember that not all patients who come to us are the same.

If you divide the last 1,000 patients from each hospital into those in good health and those in bad health, the picture changes dramatically.

Hospital A has only 100 patients who are in poor health, and 30 of them are alive.

Hospital B had 400 sick patients, and 210 were saved.

So for patients in poor health, it's better to choose hospital B. Survival rate is 52.5 percent.

What if the relative was in good health when they were examined?

Strangely, hospital B is still the better choice, with a survival rate of 98 percent.

So if hospital B has a better survival rate for both groups, why does hospital A have a higher overall survival rate?

What we're stuck in is Simpson's paradox, where the same data can show opposite trends depending on how they're grouped.

This often happens when the data being collected hides a conditional variable, sometimes called a latent variable, which is another hidden factor that has a significant impact on the outcome.

The hidden factor here is the relative health status of the patients that visit.

The symptom paradox is not just a hypothesis.

It's happening in the real world from time to time, and it's happening in important situations.

A British study found that smokers survived 20 years better than nonsmokers.

But when we segmented the subjects by age, we found that the average age of the nonsmokers was significantly older, so they were more likely to die during the study period, because they lived longer to begin with.

Age is the latent variable here, and grouping based on it is essential for accurate data interpretation.

Another example is the analysis of the death penalty in Florida, where the defendants convicted of murder were either black or white, and there was no racial bias in the death sentences.

But when we grouped the victims by race, we saw a different result.

In both cases, black defendants were more likely to be sentenced to death.

Aggregate death sentence rates for white defendants were slightly higher because white victims were more likely to be sentenced to death than black victims, and most murders were of the same race.

So how can we avoid falling into this paradox?

Unfortunately there is no one-size-fits-all answer

Data can be grouped or partitioned in any way, and sometimes aggregates are more accurate than misleading or arbitrarily categorized data.

What we can do is carefully examine the real-world context of the statistics and consider the possible existence of latent variables.

Otherwise, we're vulnerable to those who use data to manipulate others into doing their own thing.

Symmetry is ubiquitous in nature, and we find beauty in symmetry, whether it's the beautiful leaves of a tree or the symmetrical wings of a butterfly, whose intricate patterns are mirrored.

But asymmetries are just as important, and they're surprisingly common, like crabs with large claws on one hand, and certain snails that have a specific direction of curling.

Beans either grow their vines clockwise or they grow counterclockwise.The human body is symmetrical on the outside, but it's different on the inside.

Most vital organs are made asymmetrically.

The heart, stomach, spleen and pancreas are on the left side.

Most of the gallbladder and liver are on the right side

Even the lungs are different left and right

The left is divided into two and the right is divided into three.

The left and right hemispheres of the brain are very similar, but they function differently.

It's important to check for abnormalities in brain asymmetry.

The state in which all the internal organs are in the opposite position is called visceral inversion. Normally, there is no problem functionally.

But incomplete inversion is life-threatening, especially in the heart.

So why is it asymmetrical? Embryos in early development appear bilaterally symmetrical

One theory looks at the recessed tissue in the embryo.

The short hairs that grow at each node are called villi, and they can tip over or spin quickly, but they all move in the same direction.

This synchronized rotational motion pushes fluid coming from the right side of the embryo to the left side.

At the left edge of the node, another cilium senses fluid flow and activates specific genes on the left side of the embryo.

This gene directs the cell to make a specific protein, and after a few hours the left and right sides of the embryo are chemically different.

Outwardly, they still look the same, but the chemical differences between the left and right will eventually turn into an asymmetric organ.

Asymmetry first appears in heart development.

It develops as a straight tube along the center of the embryo, but by the time the embryo reaches three weeks, this tube begins to bend into a C-shape and rotate toward the right side of the body.

It forms a different structure on each side, and ends up with the familiar asymmetrical heart.

Meanwhile, major organs emerge from the central canal and grow toward their final location.

Some organisms, such as pigs, have asymmetric organs even without these embryonic chorions.

Are all cells inherently asymmetrical?

probably so

Bacterial colonies all swirl in the same direction and spread out in a lacy pattern, and when human cells are grown in round-rimmed vessels, they line up in a twisted donut-like pattern.

If you zoom in further, you can see many of the basic building blocks that make up a cell, like nucleic acids, proteins and sugars, and they're inherently asymmetric.

Proteins have complex asymmetries that control the direction of cell migration and the rotation of embryonic villi.

These biomolecules have a property called chirality, which is the property that the molecule and its mirror image do not match.

For example, it refers to the property of not being able to wear a left-handed glove on your right hand, even though your right and left hand look the same.

This molecular asymmetry translates into asymmetric cells, asymmetric embryos, and ultimately asymmetric organs.

So symmetry is beautiful, but asymmetry has a charm of its own, found in the grace of the spiral, the systematic complexity, the glorious imperfection.

I've shown the slideshow I showed here two years ago about 2,000 times since then.

Today I would like to present my first presentation. I have no intention or need to raise the bar. Actually, I am trying to lower the bar...

I've refined this presentation to live up to the expectations of this wonderful venue.

I was reminded of Karen Armstrong, who said in a wonderful presentation that a really well-understood religion isn't about beliefs, it's about actions.

I think we should use the same thinking in optimism.

How can you be optimistic?

Optimism is often conceived as a belief or an intellectual attitude.

Mahatha Gandhi famously said, "To change the world, change yourself first."

The results we optimistically hope for cannot be produced by belief alone, unless beliefs lead to new behaviors.

I'm a big advocate of switching to green light bulbs, switching to hybrid cars, etc. My wife, Tipper, and I have installed 33 solar panels in our house, drilled a geothermal well, and much more.

It's certainly important to change the light bulb, but it's even more important to change the law.

In our day-to-day lives, when we try to change our behavior, we sometimes forget about what it means to act as a citizen, to act in a democracy. To be optimistic about this, we have to become more active citizens in our democracy.

To overcome the climate crisis, we must solve the problems facing democracy.

Yes, we are facing a critical problem.

i've been wanting to tell this story for a long time

A recent incident reminded me of a woman walking past the table I was sitting at, staring at me as she walked past. She was a woman in her 70s, but she seemed kind. I didn't think anything of it at that moment, but in the corner of my eye I saw her coming back from the opposite direction, staring at me again. When I say "nice to meet you"

She said, "Well, if you dyed your hair black..." "You'll look like Al Gore." (Laughter) Many years ago, when I was a member of the House of Representatives, I spent an enormous amount of time trying to meet the challenges of controlling nuclear weapons in the context of the nuclear arms race.

A military historian then told me that military conflicts generally fall into three categories: local conflicts and regional, intra-theater wars. Then there are the rare but very important global conflicts, world wars. strategic clash

Each level of conflict requires a different allocation of resources... different methods... and different forms of organization.

Environmental problems fall into these same three categories, and much of what we think about is localized environmental problems, such as air pollution, water pollution... toxic waste disposal. Not only that, but there are also regional environmental problems. Like acid rain, for example, it can travel from the Midwest to the Northeast in the United States, to Western Europe, to the Arctic, and from the Midwest to the Mississippi to the hypoxic waters of the Gulf of Mexico.

There are many such cases. But this climate crisis represents a third rare but very important global and strategic conflict.

Everything is affected. Therefore, it is necessary to think about the appropriate response. It is necessary for the world, the earth, to become one and aim for renewable energy, environmental protection, efficiency, and the realization of a low-carbon society.

I have to do something. And we can mobilize resources and political will. But political will must be used to mobilize resources.

let me show you some slides here

I thought I would start with the logo. What's missing from this map, of course, is the Arctic ice cap.

Greenland remains. Twenty-eight years ago, this is what the ice cap looked like at the end of summer, around the equinox, at the North Pole.

Last fall, I visited the National Snow and Ice Information Center in Boulder, Colorado, and spoke with researchers here at the Naval Postgraduate Laboratory in Monterey, California.

Here's what happened in the last 28 years

I would like to compare it with the previous record in 2005.

Last fall, something really demoralized the researchers.

If you look geographically at the size of the Arctic ice cap, it may look a little different, but it's the size of the entire United States minus an area the size of Arizona.

The area that disappeared in 2005 is equivalent to the area east of the Mississippi River.

The same is true for the area that disappeared in the fall of 2007. In the winter it returns a little bit, but not as permanent ice, but as a thin layer of ice that melts very easily. This remaining part will also disappear completely during the summer, in as little as five years.

This is a huge burden for Greenland.

Already around the Arctic this is what a famous village in Alaska looks like. This is the island of Newfoundland in eastern Canada. According to NASA's latest research

Moderate to heavy snowmelt in Antarctica is the size of the state of California.

“It was the best of times.” “It was also the worst of times.” This is the beginning of one of the most famous sentences in English literature. From now on, I would like to briefly talk about "Tale of Two Planets". Earth and Venus are exactly the same size. It's essentially the same size, even though the diameter of the Earth is about 400 kilometers larger.

These two planets have about the same amount of carbon.

However, on Earth, most of the carbon has been sucked from the atmosphere into the ground over many years and accumulated in the form of coal, oil, and natural gas. But on Venus, most of it is in the atmosphere. The difference lies in the temperature: Earth is about 15°C, while Venus is 450°C. This has a lot to do with what we're doing now -- get as much carbon into the atmosphere as quickly as possible.

The reason is not because Venus is closer to the Sun.

Venus is three times hotter than Mercury, which is right next to the Sun. The image I'm going to show you here is one of the few old images that I want to use as a quick examination of the climate crime scene.

Scientists around the world have argued that man-made global warming pollution is being emitted into the atmosphere, making this light blue layer thicker and absorbing the infrared rays that are supposed to go out.

You know, at the last Intergovernmental Panel on Climate Change, when scientists were asked, "How confident are you?" they wanted to say, "99 percent."

China objected, so they compromised with a "more than 90% confidence level."

A skeptic here would say, "Hey, wait a minute." If that's true, then the stratosphere and the lower atmosphere will warm up as well.

If it's more absorbed on the way out, you'd think it would be warmer here and colder here. This is the lower atmosphere

This is the stratosphere. the temperature is lower than

CSI: Climate (crime scene verification)

Now for the good news. Sixty-eight percent of Americans believe that global warming is caused by human activity. Sixty-nine percent believe the earth is warming at an alarming rate. Now when we look at the list of challenges we face, global warming still ranks near the bottom.

What is lacking. it's a sense of urgency

If you're satisfied with this factual analysis, but you don't feel the urgency, what is it like?

CurrentTV and the Alliance for Climate Protection, an organization I represent, have launched a global commercial contest to promote this message as a charity.

Here is the winner's work

I'm going to show you all the TV work, but first from NBC, NBC's top journalists asked presidential candidates 956 questions in 2007, two of which were about the climate crisis.

Two Foxes. Also two CNNs. It was 0 on CBS

"From laughter to tears." This is an old cigarette ad.

that's right. this is what we do

This is the consumption of gasoline around the world. and this is america

This is not limited to developed countries

Developing countries are following us, and they're accelerating, and in fact, their cumulative emissions this year are similar to ours in 1965. And they are catching up with us dramatically. By 2025, overall concentrations will be at levels similar to ours in 1985.

Even if these wealthy nations disappeared from the map, we would still be in trouble.

But we have passed on to the developing world the technologies and the mindsets that are actually creating this crisis. This is Bolivia, as it has been for about 30 years.

This is a transition at the height of the fishing industry. 60's

70's, 80's, 90's. I have to stop this. I can

we have the technology

What we need is a unified view of how to meet the challenges of fighting global poverty and reducing emissions in the developed world, and there are very simple solutions to all of them.

People ask, "What's the solution?" this is the answer

Put a price on carbon. So a carbon tax, which should replace the Bismarck-invented employment tax with a neutral tax system, and many things are different today than they were in the 19th century.

In a poor world, we must combine the solutions to poverty with the solutions to the climate crisis.

Without overcoming this climate crisis, any plan to end poverty in Uganda would be meaningless.

But in poor countries, how you deal with it can make a huge difference, and it's a proposition that's being talked about a lot in Europe.

This slide is an image from the magazine Nature. These are plans to connect renewable energy facilities with concentrated photovoltaic power generation with a so-called supergrid infrastructure and supply all the electricity to Europe, mainly from developing countries. High voltage direct current

This is not an empty theory on paper, it can actually be done.

for our economy also need to do

According to the latest data, the old ways no longer work.There are so many things you can invest in. If you invest in tar sands and shale oil, your portfolio is chock full of subprime carbon assets.

and it's based on the old way

Drug addicts look for toe veins when their arm or leg veins fail. Developing tar sands and shale oil is the same thing as this analogy. Here are some investments that I personally think make sense

I would like to first state that I have an interest in these investments.

However, geothermal, concentrated solar power efficiency, and environmental conservation

You may have seen this slide before, but it's different

Where before only two countries did not approve it, now only one does. elections in australia

The Australian election campaign used television, internet and radio commercials to create a sense of urgency among Australians.

And we've trained 250 staff to show this presentation in every city, town, and village in Australia.

Along with many other contributing factors, the new Prime Minister declared that his top priority was to change Australia's attitude towards the Kyoto Protocol, and he kept his promises. Australia has also found that severe drought is also a factor.

This is what Lake Rainier looks like. My friend Heidi Cullins said, "If you name a drought like you name a hurricane," he said, "we're going to call this Southeastern drought Katrina." And it's supposedly heading to Atlanta.

We can't wait for a drought like Australia's to change our country's political stance.

There is more good news. Supporting the Kyoto Protocol in the United States

There are 780 cities. I thought we'd see a city here, but here in Monterey. Good news, right?

And finally, a couple of days ago, we heard that the normalization of personal heroism makes it commonplace and habitual.

What we need is a new generation of heroes. Those of us who live in the United States today, especially, and the rest of the world as well, must understand that history presents us with choices. Just like Jill Taylor, who was preoccupied with an amazing experience, trying to figure out how to save her own life.

we live in an era where it's easy to get distracted

But we are facing a global crisis.

We have to find ways to instill a sense of mission in our generation living today.

I hope I can put this into words well.

This is the heroic generation that brought democracy to this planet.

This is the generation that abolished slavery. And the generation that gave women the right to vote

We can do the same. Don't tell me you don't have that ability

If you were given the equivalent of a week's worth of what you spent on the Iraq war, it would be quite possible to move this conundrum toward a solution.

we have the ability to change

One last word. i am an optimist. Because I believe that when faced with a challenge, we have the ability to put aside our evil thoughts and face the challenges that history has prepared for us.

When asked about the facts about the climate crisis, he said, "Oh, this is terrible. What a burden we have."

I sometimes hear people say Please reconsider that way of thinking. How many generations in the entire history of mankind have been given the opportunity to meet challenges worthy of their best efforts?

It's a challenge that pulls us beyond what we thought possible. I believe that we should approach this challenge with deep joy and gratitude, and 1,000 years from now, philharmonic orchestras, poets and singers will look back on our generation and congratulate them for solving this crisis on their own and laying the foundations for a bright and optimistic future for humanity.

Let's make this future happen. thank you

Chris Anderson: A lot of people at TED are very sorry about the design problem... at the end of the day, because of the bad design of the ballot, for eight years your voice in a position to make these changes went unheard.

I really regret it.

I don't think you know that feeling. (Laughter) Chris: Do you see your party's leading candidates in action and do you think their plans on global warming are compelling?

AL: That's a difficult question to answer, because the fact that Republican candidate John McCain, Democratic presidential primaries Hillary Clinton, and Mr. Obama all have different but ambitious positions on the climate crisis is something to celebrate. All three of them have demonstrated leadership and taken a completely different approach than the current government. And, I think, all three of them have played a big part in making plans and proposals known. But in the election debates, as the questions tell, incidentally, the questions were put together by the League of Pro-Environmental Voters, who also analyzed the questions. Did you notice?

Every single debate was sponsored by "Clean Coal"

“Now is the time to cut more emissions.”

The debates that take place in our democracies have some richness and fulfillment, but they don't lay the groundwork for the bold initiatives that we really need.

I mean, they claim to be right, and they may do the right thing, whoever gets elected. But let me just say this. When I came back from Kyoto in 1997, I thought we had made a leap forward, and I was very happy, but when I took a look at the U.S. Senate, only 1 in 100 voted to ratify the Kyoto Protocol. Candidates' arguments must be in line with what the people are saying.

This challenge is part of the fabric of our entire civilization.

Carbon dioxide is literally the breath that civilization exhales.

And we have now mechanized that process. To change this pattern, we need more scope, scale and speed than we have done in history.

So I started telling people to be optimistic but to be active citizens.

Let's change the light bulb, but let's change the law. and international treaties

We must speak up more. We have to fix this democracy. Our democracy has hardened. and we have to fix it

using the internet

Connect with people and become more active citizens

And have a moratorium to stop building new thermal power plants that cannot capture and store carbon dioxide. It means we have to find renewable resources to replace it quickly.

No one is currently debating on this scale. But I believe it's possible between now and November.

The Climate Alliance will launch a global campaign of action at the grassroots level, a publicity campaign on television, internet radio and newspapers, partnering with everyone from Girl Scouts to hunters and fishermen.

I need your help. i really need it

Chris: Is there anything you would like to do more in the future in terms of your personal role?

Al: I've been praying to find an answer to this question. what can i do

Buckminster Fuller once wrote, "If the future of all human civilization depends on me, what will I do?"

"What kind of person will I become?" The future is in our hands. Again, light bulbs are not enough.

The majority of us here are American citizens. we have democracy

We can change many things, but we must actively change

What is really needed is a higher level of consciousness

But it's… it's not easy to create that awareness. But it's happening

You may have heard of an old African proverb, “If you want to go fast, go alone.” “If you want to go far, go together.” But we have to go fast and far

So we have to make a change in consciousness.

It's a change in responsibility. A new sense of urgency

It's a new understanding of our privilege to be able to tackle this challenge.

Chris: Al Gore, thank you for coming to TED.

Al: Thank you. thank you

On January 26, 2013, a group of al-Qaeda fighters invaded the ancient city of Timbuktu on land located at the southern tip of the Sahara Desert.

So they set fire to a medieval library containing 30,000 volumes, written in Arabic and several African languages, ranging from astronomy to geography, history to medicine, and perhaps the first treatment for male erectile dysfunction.

Little did the West know that wisdom from across the continent was gathered here, the voice of Africa at a time when Africa was considered to have no voice.

The mayor of Bamako, who was a witness to the incident, called the burning of books "a crime against world cultural heritage."

He's right, if he wasn't lying.

In fact, shortly before that, African scholars randomly selected old books and set them aside for terrorists to burn.

The collection is still hidden in Bamako, Mali's capital, and is being damaged by the high humidity.

What was saved by trickery is now in danger again, this time by the climate.

But the books that could rewrite the history of world culture are not in danger only in Africa or in the remotest corners of the world.Africa is not the main battlefield.

A few years ago, I did a search in European libraries and found that at least 60,000 books dated before 1500 had been rendered illegible by water damage, discoloration, mold and chemical exposure.

The actual number is likely to be twice that, but there were also cultural heritage such as Renaissance books, early-modern books, and maps.

What would happen if we had a technology that could restore a legacy that was lost to the unknown?

Imagine, the hundreds of thousands of hidden treasures, or ancient documents, that remain unknown around the world that could completely rewrite the past as we know it.

Imagine the unknown classics we might discover, rewriting original literary sources, history, philosophy, music, or, more provocatively, rewriting cultural identities and building new bridges between people and cultures.

These were the questions that really changed me. I was a medieval scholar and a reader of texts, and I turned to what I call "text science."

"Reader" is such a frustrating word

For me, a passive impression comes to mind: sitting absentmindedly in an armchair, waiting for knowledge to arrive, sent in a neat little package.

How nice to be a participant in the past, searching for hidden documents like an adventurer in an unknown land.

As a scholar, I was just a reader.

I was reading and teaching the same ancient texts, doing what people have been reading and teaching for 100 years: Virgil, Ovid, Chaucer, Petrarca, every academic paper I published added too little sliver of insight to human knowledge.

I wanted to be an archaeologist, a literary discoverer, Indiana Jones without a whip.

(Laughter) I wanted it not only for myself, but also for my students.

And six years ago, I changed the direction of my work.

At the time, I was working on "Chess of Love," and that last long poem of the European Middle Ages was completely untouched.

The only original document was so badly damaged in the bombing of Dresden during World War II that it remained completely untouched, and later generations of scholars have described it as lost.

For five years, I used an ultraviolet lamp to try and recover from traces of text, pushing the limits of the technology available at the time.

Then I, like many people

Using the Internet to research, I learned that the application of multispectral imagery had recovered two lost papers by the famous Greek mathematician Archimedes from a 13th-century palimpsest.

A palimpsest is a manuscript that has been erased and overwritten.

It occurred to me to contact the lead researcher in image processing who reconstructed Archimedes' palimpsest, and I asked Professor Roger Easton to come up with a plan.

Amazingly he replied

With his help, I got a grant from the U.S. government to build an experimental, portable multispectral imaging machine that I used to transform charred, faded, and disorganized ancient manuscripts into new medieval classics.

So how exactly does multispectral imaging work?

The basic idea behind multispectral imaging is that anyone familiar with infrared night vision goggles will immediately recognize that the visible light spectrum we can perceive is only a fraction of the light that is actually present.

The situation is the same for documents that cannot be read by the naked eye.

Our system uses 12 wavelengths of light between the ultraviolet and infrared, which are illuminated by LEDs placed above the document, and light from another multispectral light source is transmitted through the bottom of each page.

A sequence of up to 35 images per page, taken using a high-definition digital camera with a quartz lens.

There are about 5 similar devices in the world

And from these images, we use statistical algorithms to further enhance and clarify the images, using software originally developed for satellite imagery and used by geospatial scientists, the CIA, and others.

The results are spectacular

You may know that this technique was used to analyze the Dead Sea Scrolls, which were already slowly gelling.

Infrared has made it possible to read even the most obscure parts of the Dead Sea Scrolls.

In case you didn't realize it, some other Bibles are at risk.

Here's an example of a page of text that we photographed that may be the most valuable Christian Bible in the world.

The Old Latin Bible is the oldest translation of the Gospels, dating back to the first half of the 4th century.

It's the closest we can get to the Bible at the time of the founding of Christianity, at the time of the Council of Nicaea, during the rule of Constantine I, when the basic teachings of Christianity were codified.

Unfortunately, this manuscript had been severely damaged because it had been damaged over the centuries as it continued to be used to swear in church ceremonies.

In fact, the stain you see in the upper left corner is caused by the fungus Aspergillus, which comes from the unwashed hands of tuberculosis patients.

That image was the first transcription opportunity for this document in 250 years.

Having research facilities that can be moved to where the document collection is is only part of the solution.

Expensive technology, few units, difficult to capture and process images

So there's a lot to restore, but it's out of reach for many researchers who don't belong to the most well-funded laboratories.

That's why I founded The Lazarus Project, a nonprofit effort to provide multispectral imaging equipment to individual researchers and small laboratories at low or no cost.

Over the past five years, our team of image processing scientists, scholars and students has visited seven countries to restore some of the most valuable damaged books in the world.

Spectral images can even recover lost text.

Blurry, but behind the text, a second story is reconstructed: how, when, and by whom the story was created, and sometimes what the author was thinking while writing it.

Take, for example, the draft Declaration of Independence, written by Thomas Jefferson himself, which a colleague of mine restored several years ago in the Library of Congress.

The curator noticed that an entire word in the text had been deleted and overwritten.

The word that had been overwritten was "citizen"

You can probably guess the words below

They are "subjects".

There, ladies and gentlemen, American democracy was developed by Thomas Jefferson.

Look at the map of Martellus from 1491, restored by the Beinecke Library at Yale University.

This is the map that Columbus used before he sailed to the New World, what Asia looked like to him, and where Japan was located.

The problem with this map was that the inks and pigments had aged very badly, and this large map, about 210 centimeters, made the world look like a giant desert.

Few details were known about the world as Columbus knew it and how world culture was transmitted.

The main part of the map legend is completely unreadable under normal lighting.

Almost invisible to UV light

In multispectral images, you can see everything.

In Asia, there is a monster with very long ears that can cover its entire body.

In Africa, there are snakes that make smoke on the ground.

Like starlight propagating how the universe looked long ago, multispectral light takes us back to those bewildering moments when matter was first created.

Through this lens, we witness mistakes, changes of heart, naivety, uncensored thinking, the imperfections of the human imagination, and so on.

What will the future hold?

There are many things in the past, but few people have the technology to save them before they are gone forever.

That's why I started teaching this new hybrid technology, which I call "text science."

Text science is a combination of liberal arts researchers who have the ability to read archaic words and ancient handwriting, who know how text is made, who have learned traditional techniques for identifying places and dates, and new technologies like image science, who have knowledge of the chemistry of inks and pigments, and techniques like optical character recognition.

Last year, a freshman in my class, a student who was fluent in Latin and Greek, was working on an image of a palimpsest taken in a famous library in Rome.

As I worked, I started to see little Greek letters behind the text.

Everyone gathered, and he read out a hidden line of text that belonged to the Greek comedian Menander.

Those words were pronounced out loud for the first time in over a thousand years.

From that moment on, you could say he stepped into the academic world.

Ladies and gentlemen, this is the future of the past

thank you

(applause)

Uncover hidden switches, evade secret traps, and finally your expedition stands at the heart of an ancient temple in the lost city.

While studying the inscription in near total darkness, two of the eight graduate students accompanying you accidentally bumped into the altar.

Suddenly, a plume of green smoke erupted, and the walls around us began to shake.

I barely escaped for my life, and I found myself in a room with five corridors, one of which leads to the altar and the other to the outside.

The giant hourglass in the center begins to tick, and there's less than an hour left before it's all gone, and the shaking of the walls is telling us to get out before that happens.

Thinking back on the journey up to this point, it will take 20 minutes to reach the exit even if you walk briskly.

We know this is the last room leading to the exit, but the markings we made where we came through have been erased, and no one remembers the way.

If nine people split up, each will have plenty of time to find out where the four corridors lead and return, and then everyone can follow the correct path.

But there was one problem: the inscription spoke of a curse on the altar, that the spirits of the king and queen would haunt the intruders and lead them to their destruction through hallucinations.

You remember the green smoke and you realize that two of your students were cursed.

One or both of the two may lie, but they may also tell the truth.

I'm pretty sure I'm not cursed, but I don't know which students to trust. Cursed students don't always lie, so I have no way of knowing which students are cursed.

Can you see how everyone can escape?

Cursed students don't have to worry about attacking or hurting other students.

The curse only works in conversation.

If you want to think for yourself, pause the video here!

3 seconds to answer 2 seconds to answer 1 second to answer First of all, I'm sure I'm not cursed, so I can check one corridor by myself.

This leaves us with eight students for the remaining three corridors.

You can't let groups of four go in two directions, because if one group is divided two to two, you have to figure out who to trust.

But if you have one duo and two trios, it's bound to work. Let me tell you why.

I don't know if the cursed students lie, but I do know that only two were cursed, and the other six must tell the truth.

When each group returns to their room, they're either all giving the same report or they're arguing over whether they've found the exit.

When the three men agree and come back, we know nobody's lying.

I don't know if it's true about the duo, but what we need is solid information about three of the four paths.

As for the fourth, we can figure it out by process of elimination.

Of course, if you can find your own way out, then this doesn't matter, but if you don't, you're left with three possibilities.

If all the groups come back in agreement, either they're all telling the truth, or they're two cursed dudes.

In any case, let's ignore the opinion of the duo.

If there is one group that is arguing, the other two groups are right, if there are two groups that are arguing, the cursed student is in a separate group.

Green smoke disappears from the two students as the temple collapses behind them.

You have all escaped and the curse has been lifted.

After overcoming the ordeal, you'll tell the group to get some rest, and you'll be off on another expedition.

After the outbreak of the French Revolution in 1789, Europe was in turmoil.

Fearing the same fate as Louis XVI, neighboring monarchs attacked the New Republic, while at home extremism and factional feuds were wreaking bloodshed.

In the midst of all this conflict, a powerful figure emerged to take the initiative in France.

Is he the revolution's savior or destroyer?

Be quiet, be quiet Who is the accused? no one seems

Your Honor, this person, Napoleon Bonaparte, was a dictator who tried to compensate for his short stature by invading most of Europe.

Napoleon was at least average height at the time.

The idea that he was petite is British wartime propaganda.

he's not a dictator

Protecting a young republic from the pressure of European kings Protecting a young republic from the pressure of European kings

Didn't he seize power himself by overthrowing the government?

Your Honor: A successful soldier at a young age, Napoleon was a total supporter of the French Revolution and the ideals of liberty, equality and fraternity.

But revolutionaries lacked real leadership.

The first to come to power, Robespierre and the Jacobins, led a reign of terror, with anti-Catholic extremism and endless executions of those who disobeyed.

The presidential government that drove them out was an unstable and incompetent oligarchy.

I needed a strong leader who could rule wisely and fairly.

Is it just that another ruler who has omnipotence has appeared in France after the revolution?

it's a little different

Napoleon's power rested in a constitution, recognized and established by the popular election of the consul government.

That constitution was actually enacted under gun threat during a military coup, and a nation weary of repeated civil wars just accepted the dictator! A nation weary of repeated civil wars simply accepted the dictator!

Even so, Napoleon introduced a new constitution and code of laws and preserved the most important achievements of the revolution: freedom of religion, the abolition of hereditary privileges, and all men equal before the law.

All men - exactly that

He deprived women of the rights conferred by the Revolution and reinstated slavery in the French colonies.

Centuries later, Haiti still hasn't recovered.

what is equal?

At the time, this was the only kind of equality that could be sustained stably, and still far ahead of its neighbors.

Speaking of neighboring countries, what happened to the invasion?

good question sir

What invasion are you talking about?

It was the neighboring powers who twice attempted to invade France, restore the monarchy, and stop the wave of liberalization sweeping Europe, before Napoleon took power.

As a soldier and general, Napoleon defended France, but he knew that attack was the best defense.

Was it an attack on all of Europe?

Peace was promised in 1802, and other European powers recognized a new government in France.

But Bonaparte didn't feel safe until he had all of Europe in his hands, so he only knew how to fight.

He imposed a British blockade across Europe, invaded any country that did not comply, and waged more wars to keep the occupied territories.

what was the result?

Across Europe, millions of people died and the entire international order collapsed.

And let's not forget another achievement: the spread of ideas of freedom and democracy throughout Europe.

Thanks to Napoleon, Europe went from being a chaotic patchwork of territories of feudalism and religion to being an efficient, modern, agnostic nation-state with more power than ever before.

Is he responsible for the emergence of nationalism and the massive military build-up?

You know what happened a century later.

So what would Europe have been without Napoleon?

unimaginably improved/worse

Napoleon's unstoppable momentum was lost, along with many soldiers, in the face of the Russian General Winter.

But even after his abdication and expulsion, he didn't give up, escaping from confinement and daring to regain the throne before suffering his second and final downfall.

Bonaparte was a contradictory ruler who defended popular revolution by imposing an absolute dictatorship, popularized the idea of ​​liberty through imperial wars, and although he failed to achieve his dream of conquering Europe, it is clear that Bonaparte had a great impact, for better or worse.

Ah, love is so romantic, so beautiful, so intoxicating, so sad, so painful Sometimes I feel those feelings at the same time

Why do we choose the path of trials ourselves?

Does love give meaning to our lives Or is love an escape from loneliness and suffering?

Is love a sexual desire, or is it a biological trap for procreation?

is love all we have

do we really need love

If love has any meaning, it's something that science and psychology have yet to figure out.

But if you look back in history, some great philosophers have put forward an interesting theory.

love brings us together again

The ancient Greek philosopher Plato put forward the idea that we love each other in order to be perfect.

In "The Banquet," he describes a feast where the comedic poet Aristophanes entertained his guests and began the following story: Humans were originally creatures with four hands, four legs, and two faces.

One day, angering the gods, Zeus cut all the humans in two.

Since then, humans have lost half of themselves

Love is the search for a half to be whole again, or at least that's what Plato thought a drunken comedy poet would say.

love drives men to procreate

After Plato, the German philosopher Arthur Schopenhauer argued that sexual love is a sensual illusion.

I suggested that people love each other because this sexual desire creates the delusion that the other person makes them happy. But we're sorely mistaken.

The principles of nature lead us to procreation, and the form of love we seek is for prosperity.

When our sexual desires are satisfied, we are back in trouble again, and only perpetuating this monotonous human cycle of sustaining offspring succeeds.

It's a sad story

love is an escape from loneliness

According to the Nobel laureate and British philosopher Bertrand Russell, we love each other to satisfy our physical and psychological desires.

Humans are made to procreate, but without the ecstasy of passionate love, we cannot be satisfied with sex.

Fear of a cold, cruel world keeps us in hard shells, confined and isolated.

The joy of love, the intimacy and the warmth of the world are the things that make us feel less anxious, let us escape from our lonely shells, and enrich our lives.

Love is the best thing in life that enriches all of human existence.

Love is also the cause of trouble

Gautama Siddhartha, known as the Buddha, the Enlightened One, would have had an interesting conversation with Russell.

Buddha argued that humans love each other to satisfy their basic desires.

But our passionate desires are flawed, and even attachment, or love, can become a source of suffering.

Luckily, the Buddha discovered the Noble Eightfold Path, which is the way to get rid of all afflictions and by this you can enter Nirvana, the state of peace, clarity, understanding and compassion.

Writer Cao Xueqin expressed this Buddhist idea in one of the classic Chinese masterpieces, The Dream of Red Mansions, where he said that love is foolishness.

In the story, Jia Rui falls in love with Xifeng, but Xifeng deceives and humiliates Jia Rui.

A conflict of love and hate tears his heart apart. Then a Taoist priest comes and gives him a mysterious mirror that cures illnesses and tells him not to look directly at the mirror.

But in the end he saw

I saw Xi Feng in the mirror

His soul enters the mirror and is wrapped in iron chains and dies.

Not all Buddhists think this way about romantic or sexual love, but the point of this story is that attachment can be tragic, and like the magic mirror in this story, it should be avoided.

love is more than yourself

Let's end with a little positive story

French philosopher Simone de Vauvoir proposed that love is the desire to be one with another, that it gives meaning to life.

But I didn't talk much about the question of why we love each other, but rather focused on how we can love each other better.

She's always been fascinated by love problems, and tended to make them the only reason they exist.

I thought that relying on others to justify our existence could easily turn into boredom, a game of power.

To avoid falling into this trap, Vauvoir advised us to be truly in love, like best friends.

Lovers support each other, discover themselves, transcend themselves, and enrich the life and world they walk together.

I'll never know why I fall in love, but I'm pretty sure it's an emotional roller coaster ride.

love is scary and fun

hurt painfully

lost myself

or may discover

so sad no it might be the best thing in my life

Are you still looking for love?

Have you ever reached out to a friend and found that he or she didn't understand the gravity of the problem?

Have you ever made a fuss when you gave your opinion?

Or, in the middle of an argument, have you ever been accused of not listening at all?

What's happening?

There's a lack of communication, one way or another, we've all experienced it.

It creates confusion, it creates animosity, it creates misunderstandings, or it destroys a multi-million dollar Mars rover.

Human communication is incredibly complex, even when you're in the same room, face to face, and speaking the same language.

But fortunately, if you have a basic understanding of what's going on when you communicate, you can prevent these kinds of misunderstandings.

Researchers have long sought to understand what happens during communication.

One interpretation, called the "transmission model," sees communication as sending a message directly to the other person, like throwing a ball at the other person and then going away.

But in reality, this simple model fails to explain the complexity of communication.

That's where the "interaction model" comes in. This model incorporates a variety of communication issues.

A metaphor for thinking more accurately about how people communicate is playing catch.

When you send a message to someone, they will respond

Through this interaction, we create meaning together.

But this interaction adds another layer of complexity.

You can't fully share your thoughts and feelings in Vulcan Mind Merge like you can in Star Trek.

When humans exchange messages, they inevitably involve their own subjectivity.

The sender expresses his own interpretation of a message, and the other party of communication also receives his own interpretation of the message.

Our perceptual filters constantly shift meanings and interpretations.

remember to catch the ball

Let's turn the ball into a lump of clay

As each person touches it, each lump of clay is transformed into a shape that fits his or her own view. There is no limit to the number of variables that can be measured, and it involves knowledge, past experience, age, race, gender, ethnicity, religion, family background, and so on.

At the same time, the receiver also interprets the message, but their interpretation is based on their own understanding of the relationship between them and the other, the semantics and connotations of the actual words used.

Interpretation can also be disrupted by other stimuli, such as the sound of a car or a rumbling stomach.

Emotions also reduce comprehension, and the complexity of communication increases exponentially as more and more subjective people join the conversation.

As the lump of clay moves back and forth between the two people, it is remade, deformed, and constantly changing.

But fortunately, there are a few simple tricks that can help anyone navigate their day-to-day interactions and improve their communication.

Recognize that active listening is different from listening to someone in the air

Actively addressing other people's verbal and non-verbal responses and adjusting your message for better understanding

2. When listening, use your ears and eyes, and also use your intuition.

Communication is not just words

3. Take time to get others to understand

In our haste to talk about ourselves, it's easy to forget that communication is interaction.

Be open and listen to what others have to say

Finally, number 4: be aware of your own perceptual filters.

Factors of your experience, such as culture, community, and family, influence the way you see things.

Say, "This is how I think about this problem. How about you?"

Don't assume that your views are objective facts.

Then you'll be able to share the dialogue with others and reach a common understanding together.

I believe that large organizations have an unparalleled potential to effect change, and that we, as individuals, have an unparalleled power to influence the direction that an organization takes.

This belief in me didn't come naturally, because my family didn't trust large organizations.

My mother escaped from North Korea when she was 10.

In order to do so, she had to dodge the eyes of the repressive governments, occupation forces, and armed border guards that loomed over her life.

Later, when I decided to move to America, I had to defy the very conventional wisdom that girls can never be the best or the smartest.

If I hadn't happened to have a boyish name, I wouldn't have been able to slip through the immigration process and come to America.

My mother's courage and passion gave me opportunities that she didn't have, and I was raised in contrast to her.

Instead of avoiding large organizations, I ventured into them.

Over the course of my career, I've had the opportunity to work for The Wall Street Journal, The White House, and now one of the largest financial institutions in the world, leading a business called Sustainable Investing.

As I worked inside, I came to understand that these institutions can have a huge impact, just like a tanker ship can leave a huge undertow. And I'm even more convinced that the world's capital markets are made up of about a quarter of a billion dollars in stocks and bonds from all over the world, and that if we want to, they can be the most powerful force for good in society.

Some of you might normally think that global capital markets and social change are mutually exclusive in the same sentence or paragraph.

Many people think that the capital markets are like the ocean.

For it is a vast, inhuman, and rugged force of nature, unaffected by our wishes and desires.

The best we can do is to use a small amount of savings or pension deposits to catch a little bit of a good tide and hope that we don't get swept away by the turbulence.

but is that so?

Because, in fact, one-third of this ocean of capital belongs to individuals like us, and most of the rest of the capital market is in the hands of institutions, but that power, that power, that capital, that comes from us, from us as individuals, as members, as subscribers, as beneficiaries, as shareholders, as citizens.

So if we're the ultimate owners of the capital markets—why can't we make our voices heard?

Why can't we make waves?

I'll change the question. Did any of you buy fair-trade coffee the last time you went to a supermarket or Starbucks?

Have you ever gone to a restaurant, ordered sustainably farmed trout, and resisted the miso teriyaki Chilean sea bass you really wanted?

Who drives a hybrid or electric car?

Why do we do this?

One electric car is nothing compared to 1.2 billion conventional internal combustion engine cars.

One fish is just one fish in the sea

Even a single cup of coffee is part of this crazy world of coffee beans.

But we act this way because we believe that it makes sense, that our actions add up, and that our choices can affect others and affect us as a whole.

In my bag is a coffee cup that I bought a few years ago.

You can use this any number of times

Various things are written Please take a look

"This cup can be used any number of times."

"Other people may also want to use this cup."

"This cup will save the earth"

How could this plastic cup have such power?

(Laughter) So why do you think choosing a $5,000 shade-grown, specialty, fair-trade coffee that's poured into a reusable cup is influential, and not a $500,000 investment in your personal pension investment account?

Why are we so concerned about both the supermarkets and the capital markets, and not sending the message that we care about fair labor standards, sustainable production practices, and healthy societies?

Why don't you choose an investment destination even if you choose a latte?

I think this has something to do with the fairy tales we all have in our collective consciousness.

Remember Grimm's Fairy Tales about the magic porridge pot?

If you say to the pot, "Boil it, little pot, boil it," the pot will be filled with sweet porridge.

If you say "Stop, little pot, stop", it will stop.

But if you make a mistake, Nabe will not listen to you and you will be in big trouble.

When it comes to capital markets, similar stories are ingrained in our heads.

We believe the market is a magic pot that is subject to only one spell: make more money.

The only way to fill the pot with gold is to say it verbatim.

If you mix in superfluous words like "protect the environment," the spell doesn't work.

I believe that if you mix in the wrong words, like "promote a just society," following this fable, the gold coins will either shrink or disappear entirely.

So I asked people what they thought

I actually asked a thousand individual investors on the street, and I found something interesting.

The overwhelming majority of people wanted to add additional words.

71% of respondents said they were interested in sustainable investing, which we define as "best-in-class investing," which is the existing customary investment process plus additional information obtained from environmental, social and governance considerations.

71% of respondents wanted this

72% said companies that did this would be more financially successful.

People believe that if you do the right things, you will get good results.

But the funny thing is, 54% of people still said they thought they'd get less money if they invested in those stocks.

Is this true?

Will investing in shade-grown coffee, instead of drinking it, make me less porridge?

Burtsby's and Ben and Jerry's investors wouldn't say that.

Both started out as small, socially conscious companies, but gained immense consumer popularity and were eventually bought by big companies, Unilever and Clorox, each for tens of billions of dollars.

But what's important here is

These companies recognized that they needed to maintain a socially conscious mission in order to protect the value of their investment.

If we didn't keep adding words like "environmentally friendly" and "socially conscious," the profits of these brands would not have increased.

But maybe this is just the exception, right?

Businesses that are serious — the ones that power the economy, the ones that power pension funds, the ones that make the world go round, maybe they just need to focus on making more money.

Harvard Business School studied this subject and found something very interesting.

If you had invested 20 years ago in a portfolio of companies that were dedicated to making a profit each period, one dollar would have gone up to $14.46.

You might think that's not a bad thing, but if you invested that same dollar in a company that was looking to grow itself by focusing on the most important environmental and social issues, that dollar would have grown to $28.36.

Almost twice as much rice porridge

To be clear, the success of a company like this isn't about throwing money around to make it look like a good company.

It's the result of focusing on things that matter to our business, such as reducing energy and water waste in our manufacturing processes, and when we welcomed our CEO, we rewarded him not only with quarterly performance, but also with long-term company performance, service to local communities, and high employee loyalty and retention and high productivity through the development of a quality corporate culture.

Harvard not only

The University of Oxford also looked at the impact of sustainability and economic impact -- they looked at 120 different studies, and what they found over and over again was that companies that paid attention to these sorts of key things were, in fact, more efficient in their operations, and they achieved higher share price indices at a lower cost of capital.

And Mr. Al Gore—

Twenty years ago, when I was working for him in the White House, he was one of the first people to call attention to business and government about climate change.

After leaving the White House, he founded an investment bank called Generation, and he put things like environmental sustainability at the center of his investment process.

At the time, many people were skeptical of his ideas.

Ten years later, his track record proves that sustainable investing can be a healthy investment if done right.

Far from being less porridge, it's well above the norm by mixing in maintainability.

Now, sustainable investing, fortunately, doesn't require any spells, it doesn't require any secret investing techniques, it's not just for the elite.

Not just private equity for billionaires

Sound investments -- not just clean tech or microfinance for the needy in emerging markets or bakers in Brooklyn.

Stocks, bonds, and Fortune 500 companies

Also an investment trust

Anything you see on the market today applies.

And here's what I believe: evidence that together we can make sustainable investing the new normal.

First, there's a growing body of success stories, demonstrating that sustainable investing, if done right -- can be profitable if you stick to the same investment codes of conduct that the traditional investment industry has.

it makes sense

Second, the biggest obstacle that stands in our way may just be our imagination.

You can simply get rid of the myth that reflecting your personal values ​​on your investments will reduce your returns.

Once you're out of there, you can appreciate the value of the facts we've been talking about.

Third, the future is already in front of us.

Sustainable investment has already created a 2 trillion yen market and is the fastest growing field in the investment industry.

In the United States, as you can see, we've had tremendous growth.

Sustainable investing now accounts for one in every six dollars invested under institutional management in the United States.

So what are we waiting for?

For me, the inspiration came from my mother.

My mother's aspirations were clear: a life with the freedom to choose my own path, to listen to my inner voice, to carve out my own path.

He pushed hard for that goal, and was determined not to let the military, obstacles, and large institutions get in his way.

She went to America and became a teacher, an award-winning author, a mother, and eventually sent her daughters to Harvard.

These days, I have a voice in some of the most powerful organizations in the world, and I live a very comfortable life.

My mother's Korean name, which means "passionate clarity," seems too prophetic.

"Passionate clarity." That's what we need to drive change.

“Passion” to realize change in the world “Clarity” to show the way forward

We have more choices than ever before

It has the power to appeal to the world like never before.

change your perspective

Cast your vote for the small changes you make

Invest in the changes you want in the world

Recreate the fairy tale in your head, change the market

thank you

(applause)

When we hear the word radiation, we tend to think of big explosions and terrifying mutations, but that's not all.

Radiation also has to do with the light in the rainbow and the x-rays that doctors see.

What exactly is radiation and how concerned should we be about its effects?

To answer that, we must first understand that the term radiation refers to two very different kinds of scientific phenomena: electromagnetic radiation and nuclear radiation.

Electromagnetic radiation is pure energy, radio and magnetic waves interacting and oscillating through space.

The faster this wave oscillates, the more energy it has.

The low energy range includes radio waves, infrared, and visible light.

In the high energy range, there are ultraviolet rays, X-rays, gamma rays, etc.

Modern society relies on sending and detecting electromagnetic radiation.

You can use radio waves to download emails to your cell phone, open x-ray images, and see them in the visible light that your screen emits.

Nuclear radiation, on the other hand, comes from atomic nuclei, where protons repel each other due to their positive charges.

This repulsive phenomenon is known as the "strong force," and it's the force that keeps the nucleus in shape.

But combinations of protons and neutrons, called isotopes, remain unstable and radioactive.

It reaches a steady state by randomly ejecting matter or energy, called nuclear radiation.

Nuclear radiation comes from natural substances such as radon, a gas that seeps out of the ground.

We also refine naturally occurring radioactive ores to fuel nuclear power plants.

Even bananas contain trace amounts of radioactive potassium isotopes.

So how do we escape from the dangerous effects of living surrounded by radiation?

First, not all radiation is dangerous.

Radiation becomes dangerous when it forces electrons out of atoms, destroying DNA in the process.

It's called ionizing radiation because when an atom loses an electron, it's called "ionizing."

All nuclear radiation is ionizing, but the only electromagnetic radiation that is ionizing is the one with the highest energy.

That includes gamma rays, x-rays, high-energy ultraviolet rays.

So when taking x-rays, doctors take precautions by covering those parts of the body that don't need to be taken, and people who enjoy swimming in the sea wear sunscreen.

Cell phones and microwave ovens, on the other hand, are low energy and pose no risk of ionizing radiation.

The greatest danger to the body is exposure to high doses of ionizing radiation in a short period of time, which is called acute exposure.

Acute exposure completely deprives the body of its natural healing power.

It can cause cancer, cell dysfunction, and even death.

Fortunately, acute exposures are rare, but we are also exposed to small amounts of ionizing radiation in our daily lives, from both natural and man-made sources.

Scientists struggle to quantify such dangers.

The human body frequently repairs damage from small amounts of ionizing radiation, and if it can't, the effects of the damage may not be apparent even ten years later.

When scientists compare exposures to ionizing radiation, they use units called sieverts.

Acute exposure to 1 sievert can cause vomiting within hours, and 4 sieverts can be fatal.

But the amount of radiation we receive in our daily lives is very small.

The average annual radiation that humans receive from all sources is 6.2 millisieverts, 30% of which comes from radon.

Each dental x-ray exposes you to only 5 microsieverts of radiation, so you'd have to take more than 1,200 to reach your annual capacity.

Remember that banana?

If you could absorb all the radiation in bananas, you would need to eat 170 bananas every day to get your radiation dose for a year.

we live surrounded by radiation

Most are not ionizing radiation

As for the remaining ionizing radiation, the amount that we are usually exposed to is small, and we can reduce the risk of harm to our health by testing our homes for radon and by using sunscreen.

Marie Curie, one of the pioneers of radiation research, said about this kind of question, "There is nothing to fear in life, there is only something to understand.

Now is the time to understand more and you will have less to fear."

Our daily lives are full of situations that force us to make decisions.

Some decisions are small and trivial, but there are also decisions that have a significant impact on our lives.

For example, which politician should I vote for?

Should I try this hot diet?

Can you become a millionaire by email?

With so many opportunities to make decisions, it's impossible to make the perfect choice every time.

But there are many ways to increase your odds of making good choices, and one of the most effective is critical thinking.

Approaching a problem in this way allows us to carefully analyze the situation, uncover hidden issues such as biases and manipulations, and make the best decisions.

The reason "critical" has such a negative connotation is that it is, in fact, part of it.

Rather than picking something just because it looks good, people who use critical thinking scrutinize every possible option with skepticism.

We use this tool to weed out all but the most useful and reliable information.

There are many ways to approach critical thinking, but the five-step process I'm sharing with you today may help you solve any number of problems.

Part 1 Clarify your doubts

It means knowing what you're looking for.

Sometimes it's easier said than done

For example, when it comes to deciding whether or not to try a diet that's all the rage right now, the reasons for trying it can be ambiguous because of other factors, such as the marketing claim that results can be seen in as little as two weeks.

But if you have a clear vision of what you're trying to accomplish with your new diet in this situation -- whether it's weight loss, nutrition, or strength -- then you'll be able to sift through the information, find what you want, and decide if the approach you're talking about really meets your needs.

Part 2 Collect information

There's a lot of information out there, and if you're clear about your question, you'll be able to pick out the information that's directly related to it.

If you're thinking about changing your diet to improve your nutrition, you're probably going to seek expert advice and look for other people's testimonials.

By gathering information, you can weigh your options and move closer to making decisions that meet your goals.

Part 3: Use the information. What's going on here is asking critical questions.

As you make decisions, ask yourself, "What thoughts are influencing me?"

"What is the premise?"

"Does my interpretation of the information make sense?"

For example, if you get an email that says, "I'm sure you'll win a lot of money," you might ask, "What drives my actions in this situation?"

"Do you think the sender is telling the truth?"

"Given the evidence, is it logical to assume that money will be available?"

4 Predict what will happen

Suppose it's election time, and you chose a candidate because he promised to lower the price of gas for motorists.

At first glance it looks very good

But what about the long-term environmental impact?

Gasoline prices are holding us back, but if those constraints were loosened, it could have serious and unforeseen consequences, such as a sharp rise in air pollution.

Part 5: Explore another point of view

Ask yourself why so many people are attracted to your opponent's policies.

Even if you don't agree with a single thing the candidate says, examining every point of view may reveal why other people are attracted to a policy that doesn't seem justified to you.

This allows us to explore alternatives, assess our choices, and ultimately make informed decisions.

This five-step process is just a tool, and it doesn't eliminate all the hard decisions in life.

It gives us more opportunities to make solid choices.

Critical thinking gives us the tools to sift through large amounts of information and find what we're looking for.

With enough users, that power can make the world a more sensible place.

Your wealthy, eccentric uncle has died, so you and 99 of your nasty relatives are gathering for a memento.

Your uncle wanted to give you all his property, but he knew that you would be haunted by your relatives for a long time.

I decided to rely on all the knowledge he gave you to solve the quiz.

My uncle left a will that read, "I thought of a puzzle.

If all 100 people can answer together, the inheritance will be divided equally among them all.

But whoever sees this pattern first and solves the quiz using only their brains, the whole legacy belongs to them.

Good luck."

A lawyer took you and 99 relatives to a hidden room in a mansion with 100 lockers, each containing a keyword.

Lawyers say every survivor is assigned a number from 1 to 100.

Heir 1 opens all lockers

Heir 2 closes lockers that are multiples of 2.

Heir 3 will change the state of every locker that is a multiple of 3. If the locker is open, it will be closed, and if it is closed, it will be open.

All 100 people will continue this pattern

In the end, the keyword inside the locker that was left open is the key to opening the safe.

Before your cousin Thaddeus starts a series of operations, step forward and tell the lawyer the locker that the door is left open.

So how?

[Pause the video here and think for yourself]

[Answer 3] [Answer 2] [Answer 1] The key here is to realize that the number of factors in the locker number is the same as the number of times you touch the locker.

For example, locker 6 is opened by person 1, closed by person 2, opened by person 3, and closed by person 6.

1, 2, 3 and 6 are factors of 6

So if the locker number has an even factor, the door stays closed, and if the factor has an odd factor, the door stays open.

Most lockers have an even number of factors, which makes sense because the factors usually come in pairs.

In fact, only perfect square numbers have an odd number of factors, because the square of one factor is equal to that number.

In the case of locker 9, open at 1, close at 3, and open at 9

3 x 3 = 9, but we only count 3 once.

So the perfect square locker remains open.

I know these 10 lockers are the answer, so I read the keywords in it, "The code is the first five locker numbers that you touch only twice."

Now you realize that the double-touch rocker must be a prime number, because 1 and the number itself are factors of two.

So the code is 2-3-5-7-11

A lawyer will take you to the vault so you can inherit your estate.

Unfortunately, my relatives were too busy interrupting each other to pay attention to my quirky uncle's quiz.

Water is virtually everywhere, from soil moisture and ice caps to the cells in our bodies.

Depending on where you live, your body mass index, your age and your gender, the average human is between 55 and 60 percent water.

Newborn babies contain more water

It's 75% water, so it's almost like a fish.

But by the time they reach their first birthday, their body water content is down to 65%.

So what role does water play in our bodies? And how much water do you really need to drink to stay healthy?

H2O in our bodies protects and lubricates joints, regulates body temperature, and nourishes the brain and spinal cord.

Water is not only in the blood

The adult brain and heart are about 3/4 water.

About the same amount of water as a banana

Lungs are 83% closer to apples

Even the seemingly dry human bones are 31% water.

If we are all made of water and surrounded by water, why should we still drink so much water?

We lose about two to three liters of water every day through sweating, urination, defecation and even breathing.

While these functions are essential to our survival, we must replace water loss.

Maintaining a balanced amount of water is essential to avoid dehydration, overhydration, and other adverse health effects.

When you sense that you're dehydrated, osmotic receptors in the brain's hypothalamus signal to release antidiuretic hormone.

When antidiuretic hormone reaches the kidneys, it synthesizes water channel proteins called aquaporins, which reabsorb and retain water in the blood, resulting in highly concentrated, dark urine.

As dehydration progresses, you feel less energetic, and mood, skin hydration, and blood pressure drop along with your ability to think.

A dehydrated brain works harder to function like a normal brain and even temporarily shrinks due to dehydration.

Overhydration, or hyponatremia, occurs when you drink a lot of water in a short period of time.

Athletes often become overhydrated because it is very difficult to regulate their hydration levels in extreme conditions.

A dehydrated brain promotes the production of antidiuretic hormone, whereas an overhydrated brain slows or stops the release of the hormone into the bloodstream.

Sodium in the body dilutes and cells swell

In severe situations, the kidneys can't keep up with producing enough diluted urine.

Water intoxication sets in, causing headaches, vomiting, and in the worst cases, convulsions and death.

but that is a very rare case

On a normal day-to-day basis, maintaining healthy hydration is easy for those of us lucky enough to have access to clean drinking water.

It has long been said that drinking eight glasses of water a day is a good idea.

That estimate has since been fine-tuned

It is now said that the amount of water we should consume is highly dependent on body weight and environment.

The recommended daily intake is 2.5 to 3.7 liters for men and 2 to 2.7 liters for women, but this can go up or down depending on whether you're healthy, active, old, or temperature.

While water is the healthiest source of hydration, other beverages, such as caffeinated coffee and tea, can also provide hydration.

And the water in food makes up one-fifth of our daily water intake.

Vegetables and fruits, such as strawberries, cucumbers and even broccoli, are more than 90 percent water, which can help you stay hydrated and get beneficial nutrients and fiber.

Adequate water intake is thought to have many long-term benefits.

Studies show that optimal hydration may reduce the incidence of stroke, make diabetes easier to manage, and reduce the risk of certain types of cancer.

Getting the right amount of water, in any form, can make a big difference in how you feel, think, and function on a daily basis.

How do schools of fish swim in harmony?

And how do the tiny cells that make up your brain generate your complex thoughts, memories, and consciousness?

Strangely enough, the answer to these questions is almost universal: emergence, the spontaneous generation of sophisticated behaviors and functions from large groups of simple elements.

Like many other animals, fish live in groups, but not because they enjoy socializing.

Rather a matter of life and death

Schools of fish exhibit complex swarming movements that help them escape hungry predators, and a single fish can quickly become easy prey.

So where are the effective leaders?

Actually no, everyone is a leader

What was that?

Schools of fish twist and turn in spectacular ways to evade sharks, giving the appearance of deliberate coordination, but in reality, individual fish follow two basic rules that have nothing to do with sharks: keep your distance from each other, and two, keep swimming.

Each individual fish is focused on this small, local interaction, but when enough fish join the shoal, something amazing happens.

The movement of individual fish takes over in a whole new realm, the entire school of fish starting its own sequence of movements.

Herds are not led by one animal.

If enough fish follow local rules, they will emerge.

It's the kind of coincidence that happens over and over again that allows swimming fish to escape predators.

Not limited to fish

Emergence is a fundamental property of many complex systems of interacting elements.

For example, when millions of grains of sand collide with each other in a certain way and then rise up, they almost always create the same ripples.

And when water freezes in the atmosphere, the special way water molecules bind stably creates beautiful snow crystals with radial structures.

Emergence is complicated because when you break it down into its components, like a car engine, you can't understand it.

Breaking things down is a good first step in understanding complex systems.

But when you divide a school of fish into individuals, it loses its ability to escape predators, leaving nothing worth studying.

It's well known that if you break the brain down into individual neurons, it's completely useless.

On the other hand, whatever you're thinking about right now isn't the result of just one neuron in the corner of your brain.

Rather, mental activity is caused by the collective activity of so many neurons.

The human brain has billions of neurons, and trillions of connections between these neurons.

If you flip a switch on such a complex system, it would behave in all sorts of strange ways, but it doesn't.

The neurons in our brains, like fish, follow simple rules, and when grouped together, they generate stable patterns of their own that allow us to recognize faces, to perform the same task skillfully over and over again, to repeat the trivial gestures that everyone likes.

So what's the simple rule for the brain?

The basic function of individual neurons in the brain is to excite or inhibit other neurons.

When you connect a few neurons together to form a simple circuit, you get a rhythmic pattern of activity, a feedback loop that signals and stops, a coincidence detector, and disinhibition.

As more neurons connect, the network produces increasingly complex patterns of activity.

Over time, many neurons interact in many ways simultaneously, and the system becomes chaotic.

The trajectory of network activity cannot be easily described by the simple, localized circuits described earlier.

And then, out of this chaos, patterns emerge and are reproduced over and over again.

At some point, the pattern of development of this behavior became sufficiently complex that humans became interested not only in emergent phenomena, but also in their own biological origins.

And the phenomenon of emergence, which manifests itself on so many different scales, is the same wonderful feature that fish exhibit. Emergence doesn't need a core person or thing.

If the rules are applied correctly, and some basic conditions are met, complex systems will repeat the same behavior over and over again, turning chaos into harmony.

And the same thing is happening in the complex behavior of the molecules that make your cells function, in the intricate web of neurons that makes you think and who you are, in your network of friends and family, in the structure and economy of cities around the world.

In 1996, 56 people participated in a study -- a new pain reliever called Trivaricaine.

Each index finger is coated with the new drug and the other finger is left untouched.

Then I crushed both fingers with a pincer.

Subjects reported less pain in the treated finger than in the untreated finger.

That's not surprising -- except that the experimental drug wasn't a real pain reliever, it was just a fake concoction that didn't contain any pain-relieving ingredients.

What did this placebo do to the subjects?

It's a phenomenon that can't be explained by the placebo effect, where drugs, treatments, therapies that don't work, sometimes counterfeits, mysteriously improve people's symptoms.

In the 1700s, doctors began using the term placebo after realizing the power of fake medicine to improve symptoms.

It was given when the right medicine wasn't available, or when you thought you were sick.

In fact, the word placebo is Latin for "I will please," suggesting a history of comforting sick patients.

To get the placebo effect, it's important that the drug looks real. Doctors made sugar pills, gave water-filled injections, and even performed sham surgeries.

It wasn't long before doctors realized another use for deceiving patients was in clinical trials.

By the 1950s, researchers were using placebos as a standard tool for testing new treatments.

For example, half of the patients who are tested to evaluate a new drug receive the real drug.

Others took the same looking placebo

The researchers believed that because patients could not know whether the drug they received was real or fake, the results were unbiased.

Then, by comparing the effects of the new drug and the placebo, the efficacy of the drug is shown.

Because of ethical issues, using placebos in this way is becoming rare these days.

If a new drug can be compared to conventional drugs and alternatives, it's preferable to no treatment for some people, especially when they have a serious illness.

In these cases, the placebo is often used as a control to fine-tune trials to allow accurate comparisons between new drugs and conventional or alternative drugs.

But even a placebo can have an effect on the human body.

Because of the placebo effect, patients experience improvements in a range of ailments, including heart disease, asthma, and severe pain, even after being treated with placebo drugs and sham surgery.

we're still trying to understand how it works

Some believe that the placebo effect isn't real, it's just confused with other factors, like patients reporting false improvements to impress their doctors.

On the other hand, some researchers say that if a patient believes a fake treatment to be real, the expectation of recovery can become a physiological trigger that actually causes recovery.

Placebo appears to be able to induce measurable changes in blood pressure, heart rate and the release of pain-relieving substances like endorphins.

Subjects in pain studies often say that the placebo relieves their discomfort.

Placebos, like adrenaline, may reduce stress hormones, which can delay the harmful effects of disease.

So shouldn't we celebrate the strange benefits of placebo?

not necessarily

If you think a fake treatment has cured your symptoms, you may be missing out on a drug or treatment that really works.

Additionally, the positive impact may fade over time, which is quite common.

And because the placebo effect obscures clinical effects, scientists are even more motivated to discover what impact placebos have on us.

Despite all the things we know about the human body, there are still mysteries and enduring mysteries, like the placebo effect.

What other unknowns and wonders are there?

As we get so caught up in exploring the world around us, have we forgotten what we're most interested in studying: that lies behind our eyes (our brain).

When I was talking to my friend about something great, and at the climax, my friend suddenly interrupted me, saying, "'The alien and I' is '-and I.' 'Me and-' is wrong."

Most people would be annoyed. Aside from the fact that it's rude to interrupt, do you think it's a good point?

Is your sentence actually grammatically incorrect?

Anyway, if you can understand the meaning, why don't you care about grammar?

From a linguistics perspective, grammar is the collection of patterns of how words are put together to form phrases and clauses, whether spoken or written.

Patterns vary by language

In English, the subject usually comes first, then the predicate, then the object, but in many languages, such as Japanese, the order is subject, object, predicate.

Some scholars have tried to identify patterns common to all languages, but so-called linguistic universals have rarely been found, except for a few basic characteristics, such as "there are nouns and verbs."

Any language needs consistent patterns to function, but the study of these patterns has sparked an ongoing debate between two positions: normative and descriptive.

Quite simply, normativeism holds that language should follow consistent rules, whereas descriptiveism sees variation and environmental change as natural and necessary elements of language.

For a long time in history, the majority of languages ​​were spoken.

But as human interaction expanded and writing became more important, written language was standardized to expand communication and ensure understanding with people from other regions.

The standard form was the only official formalization in many languages, but it was originally just one of many variations of spoken language, usually the language of those in power.

Linguistic purists sought to establish and popularize this canonical form by writing detailed rules that reflected the accepted grammar of the time.

And the rules of written language also apply to spoken language.

Speech that deviated from the rules of the written language was seen as a sign of slurred speech and low social status, and many who grew up with such speech were coerced into standard speech.

But in recent years, linguists have come to understand spoken language as a separate phenomenon, with different rules and patterns than written language.

Most people learn spoken language before they can remember

The formation of the spoken language repertoire is through unconscious habits, not by memorizing rules.

And because spoken language can change meaning with mood and intonation, it often has a more flexible structure to suit the needs of the speaker and listener.

For example, we avoid using complex clauses that can't be parsed quickly, we reshape words to avoid unnatural pronunciations, we cut sounds so we can speak more quickly.

An approach that tries to understand and classify these differences without defining one type as the correct answer is known as descriptiveism.

Rather than trying to decide how a language should be used, it describes how people actually use it, and tracks the development of ingenuity that arises in the process of using language.

But normativeism and descriptiveism aren't mutually exclusive, even though there's an ongoing debate between them.

Prescriptivism is most commonly considered correct at some point, and is most effective at communicating patterns of language to people.

Not only is this important in formal settings, but it also facilitates communication when meeting non-native speakers from different backgrounds and backgrounds.

Descriptivism, on the other hand, gives us insight into how human thought works and how we intuitively shape our worldviews.

Ultimately, grammar is best thought of as a collection of linguistic habits that are constantly negotiated and reshaped by the entire language population.

Grammar, like language, is a complex and wonderful fabric, and people all over the world contribute to the weaving of grammar, speakers and listeners, writers and readers, normists and descriptives.

we all have what we need

I need air to breathe

clean drinking water

I need food and a place to sleep and love

love is wonderful too

And we all need a safe place to pee.

(laughs) Right?

As a transgender person who doesn't fit into any gender box, if I had the power to change the world of tomorrow and make my life easier, the first thing I would do is use that omnipotent power to create genderless private toilets in every public space.

(Applause) There's a lot of media coverage these days about transgender and its specific issues.

It's a very good thing, and it's necessary, but there's a very small group of people who get the attention, who are more affluent, who have a certain degree of name recognition, and who probably don't worry about going to the bathroom during recess in college or where to change in high school gym time.

Money and fame protect transgender celebrities on television from everyday problems, but the rest of us have to face the same challenges every day.

public toilets—

For as long as I can remember, it's haunted me, starting as a child when I was a little bitch, and then as a seemingly masculine but overwhelmingly female hormone-controlled creature.

(Laughter) Well, now that I identify as transgender, public restrooms and locker rooms are the places where I'm most likely to be criticized and embarrassed.

I often get abused from the other side of the door

I was even dragged out by a security guard without my pants fully pulled up.

People who stare, people who scream, people who whisper, one time a little old lady slapped them across the face with a small bag. Judging from the black bruises I had around my eyes that day, the bag must have contained at least $70 worth of change and a lot of hard candy.

(Laughter) I know what you're thinking, and you're pretty much right.

You can use the men's restroom, and that's what I usually do these days.

But that doesn't solve the locker room problem, does it?

And you shouldn't have to use the men's restroom, because you're not a man.

i am transgender

And recently, there are politicians who deliberately try to incite fear and insistently try to pass the "toilet law."

Did you know?

They're creating laws to force people like me to use the most reasonable toilet they can think of, to conform to the gender they were assigned at birth.

If these politicians get their way -- like in Arizona, California, Florida, Houston, Texas, and it happened just last week in Ottawa -- then the men's restroom option is illegal for me, too.

Every time a bill like this one comes up, it makes me want to say, who the hell is going to enforce these laws?

Undergarment check?

Impossible, right?

Are you going to do a genital examination in front of the public pool changing room?

There is no legal, morally plausible way to enforce these laws anyway.

It's a law that only fuels anxiety and spreads transphobia.

I won't protect anyone

But it certainly makes society a more dangerous place for some people.

And all the while, transgender children suffer.

Some children drop out of school or even give up on life.

Transgender people, especially so-called gender-neutral youth, run into additional problems when they use pools and gyms, but also in universities, hospitals, and libraries.

It's been a long time since I started telling you how we are treated at the airport.

If we can't take action now and make these places truly open and accessible to everyone, then let's face it, we should stop calling them "public places."

And let's just admit that it's really only open to a select group of people, that it's only open to those who fit into the two gender categories.

never since i was born

This problem starts at a very young age.

I have a friend's daughter, a little girl.

I'm a self-admitted "male woman"

From cowboy boots to yellow toy trucks to insect cages, everything is a boy's hobby

If you ask me what my favorite color is

What came back was "camouflage color"

(Laughter) This lovely girl last October after spending half a day in kindergarten came home with her pants wet and was teased by the other kids for trying to use the girls' bathroom.

Using the boys' toilet has already been prohibited by the teacher.

He said he drank two glasses of juice that day.It was a Halloween party, so everyone drinks a beautiful red juice, right?

And I couldn't hold my pee so I let it out.

He and the other kindergarteners were only four years old.

Already at that age, the kindergartners were bullish enough to keep tabs on their so-called "public" toilet use.

at the age of four

The child has already learned the cruel reality that kindergarten bathroom doors don't have signs welcoming people like her.

That the toilet will continue to be a problem for me, and that the problem originates from me and is my own.

A friend of mine asked me to talk to that little girl, and I did.

I wanted to tell you, "I'll walk into kindergarten with your mother and talk to you, so you don't have to worry anymore." But I couldn't lie.

I wanted to say, "Everything will be fine when I grow up," but I couldn't.

So I asked them to tell me what happened, I asked them to tell me how they felt

"I was angry and sad," said the child.

So I said, "You're not alone," and I said, "You've been treated badly," and he said, "Have you ever peeed?"

I said, "Yeah, but that was when I was little."

(Laughter) Of course that's a lie, but you know, when you're 42 or 43, sometimes it leaks when you sneeze or cough, or when you're running up the stairs or when you're stretching.

please be honest

Do you have leaks?

But the child shouldn't know

(Laughter) So I said, "When you grow up, your bladder gets bigger --

When you're as old as I am, you'll be able to endure much longer," he promised.

"Until you get home?"

so asked

"Yes—until I get home."

Hearing that, the child felt a little relieved.

So let's build a genderless private bathroom, and add a small chair that you can change into your gym clothes.

Can I change the world overnight for my children? I can't, but I can create a safe, private room where they can escape, even if it's just for a minute.

I can do this

so let's do it

If you're like many people out there right now and have many reasons why this shouldn't be a priority, some of you think it's too expensive, some of you say that giving a transgender person a safe bathroom or a place to change clothes is an endorsement of a way of life that's against your ethics, or it's hurting your masculinity, or it's against your religious beliefs.

If caring for people like me just isn't possible, what about the women and girls who worry about their body?

People with similar troubles?

A boy one head shorter than his classmates? What if you're worried about your voice changing slower than others?

If you are a teacher, you must be a cruel teacher

right?

What about people with anxiety?

What about people with disabilities or who need assistance with the toilet?

What about people who, for whatever reason, don't have the desirable physique that most people think?

How many people still feel embarrassed or lack the courage to take off their clothes in public? How many of us keep away from something as important as physical exercise because of it?

These people, all of them—would you benefit from a private bathroom or changing room?

We can't change transphobia overnight, but we can give everyone a place to change, and then everything will work out and we can create a safer society for all of us.

thank you

(Applause) Thank you.

(applause)

Police are conducting a face-to-face contact to identify the culprit. Ten witnesses to a bank robbery fleeing from the crime scene have been recruited.

If six of them point to the same person, then that person is likely the real culprit.

It sounds very strange to say

A lot of things in our society are driven by majority votes and consensus, whether it's politics, business, or entertainment.

So it's natural to think that the more consensus, the better.

up to a point it's usually true

But sometimes, as consensus approaches perfection, it becomes less reliable.

It's a phenomenon called the unanimous paradox.

The key to unlocking this apparent contradiction is to consider how much uncertainty there is in the situation in question.

For example, if you were to ask which one of these apples, it wouldn't be surprising if the consensus was unanimous.

On the other hand, we should think that there will be a range of answers when it comes to matters in which it is natural that there are some differences.

If you toss a coin 100 times, you'd think about half the time it would come up heads.

But when all you see is heads, you start to suspect something is wrong.

Of course, identifying suspects isn't as random as tossing a coin, and it's not as straightforward as picking a banana from an apple.

In fact, one 1994 study reported that nearly 48 percent of eyewitnesses were more likely to pick the wrong person based on face-to-face contact, and many were more confident in their answers.

A brief sighting can make our memory less credible, but we often overestimate our accuracy.

But when they all point to the same person, it's more of a systemic error than the witness's fault.

System errors aren't just about human judgment.

Between 1993 and 2008, the same woman's DNA was found at multiple crime scenes across Europe, and its owner was attributed to the fictitious Heilbronn Phantom.

The DNA evidence was a strange match, because it was false evidence.

In fact, the swabs used to collect the DNA samples had been accidentally contaminated by a woman working in a shipping plant.

Systemic errors can also occur in deliberate fraud, such as Saddam Hussein's presidential election in 2002, when voter turnout was 100 percent, and everyone reportedly supported a seven-year re-election.

When you think about it this way, the unanimous paradox isn't so contradictory.

Again, in theory, it's ideal for everyone to agree, especially if there isn't much variability or uncertainty.

Even if we truly strive for harmony and consensus, we should think that it is normal to have mistakes and disagreements in many cases.

Too perfect to be true is probably what it is

First itchy throat and then coughing

Muscle pain sets in, irritability and loss of appetite

yes definitely a cold

Given the miserable succession of symptoms, it's likely that an infection is wreaking havoc on your body, but is that really the case?

what's really bothering you

What if your body itself was responsible for the vicious onslaught?

When a pathogen, such as a cold virus, enters your body, it first makes you sick, then it becomes more infected and kills your cells.

But this unwelcome invasion also has another effect: it alerts your immune system to your condition.

As soon as you realize you're infected, your body goes into defense mode.

Cells called macrophages are the first line of attack, finding and destroying viruses and infected cells.

The macrophages then release proteins called cytokines, whose role is to attract and organize virus-destroying cells from the immune system.

If this kind of cooperative play is strong enough, the infection will be wiped out before the person realizes it.

But this is just preparing the body for the actions it really needs.

In some cases, the virus spreads even further, invading the bloodstream and vital organs.

To avoid this danger, our immune system needs to coordinate with the brain to mount a more powerful attack.

That's where the unpleasant symptoms I mentioned earlier occur, starting with a fever, then pains all over the body, and drowsiness.

So why do we have this experience?

When the immune system is under attack, more cytokines are secreted, resulting in two reactions.

It sends information to the brainstem quickly through the vagus nerve, which passes near a key area of ​​pain processing.

Next, cytokines circulate in the body and reach the hypothalamus in the brain, which controls body temperature, thirst, hunger, sleep, etc. Controls body temperature, thirst, hunger, sleep, etc.

When it receives that information, the hypothalamus produces yet another molecule called prostaglandin E2, which puts the hypothalamus into combat mode.

The hypothalamus commands the muscles in your body to contract, which raises your body temperature.

You get sleepy, and you lose your appetite and you lose your thirst.

But what causes these unpleasant symptoms?

We don't know for sure yet, but some people say it's to help the body heal.

Elevated fever reduces bacterial activity and helps the immune system destroy pathogens.

Sleep allows the body to channel its energy into fighting infection.

When you don't eat, your liver takes up most of the iron in your blood, which effectively starves the bacteria because iron is essential to their survival.

Reduced dry mouth feeling mild dehydration Reduces sneezing cough vomiting Diarrhea reduces further transmission Sneezing cough vomiting Reduces diarrhea reduces further transmission Sneezing cough vomiting Reduces diarrhea reduces further transmission

But you should know that dehydration can be dangerous if you don't drink enough water.

Pain sensitizes the body, but it can also draw attention to infected areas that are deteriorating or likely to become a serious medical condition.

In addition to physical symptoms, illness can make you feel restless, depressed, and even confused.

Cytokines and prostaglandins reach higher tissues in the brain and block the activity of neurotransmitters, such as glutamate, endorphins, serotonin, and dopamine.

It affects areas like the limbic system, which regulates emotions, and the cerebral cortex, which is involved in reasoning.

So in reality, most of the unpleasant symptoms that occur when you get sick are caused by your immune response.

Unfortunately it doesn't always work perfectly

In particular, millions of people around the world suffer from autoimmune diseases, where the immune system sees it as a threat and attacks its own body, even though the body is in a normal state.

But most of us, through millions of years of evolution, have fine-tuned immune systems that tend to do more good than bad for our bodies.

The symptoms of disease can be unpleasant, but it is the primordial actions of these symptoms that combine to keep us safe from the threats of the outside world for centuries to come.

Our memories shape us in many ways, they preserve memories of the past, acquire and retain skills, and plan for the future.

In the computer that is now our right-hand man, that same role is played by memory. Whether it's a two-hour movie, a two-word text file, or an instruction to open a file, all of a computer's memory is made up of units called bits (binary digits).

Each bit is stored in a memory cell that can switch between two states, 0 and 1. It can switch between two states, 0 and 1.

Files and programs are made up of millions of bits, all processed by the central processing unit (CPU), the brain of the computer.

As the amount of bits to be processed grows exponentially, computer designers are constantly faced with size, cost and speed problems.

Computers, like us, have short-term memory for immediate tasks and long-term memory for permanent storage.

When you run a program, the operating system allocates space in short-term memory to execute the instructions.

For example, in a word processor, when you press a key, the CPU accesses this area and grabs a few bits of data.

The CPU can modify that bit or even create a new one.

The time it takes to do this is called memory latency

Because program instructions must be processed in rapid succession, areas in short-term memory can be accessed in any order, hence the name random access memory (RAM).

The most common type of RAM is Dynamic RAM (DRAM)

Each memory cell consists of a small transistor and a capacitor that holds an electrical charge that is 0 when there is no electricity and 1 when there is electricity.

This memory is called dynamic because it can hold electricity for a short time because it discharges, and it needs to be recharged at regular intervals to retain the data.

Even a low latency of 100 nanoseconds is too slow for modern CPUs, so a small fast internal memory cache made of static RAM (SRAM) is also used.

SRAM is usually made up of 6 transistors and doesn't need to be refreshed.

SRAM is the fastest memory in a computer system, but it's also the most expensive, taking up more than three times the space of DRAM.

The drawback of RAM and cache is that data is only retained when power is on.

If you want to keep data when the power is off, you have to transfer it to long-term storage, and there are three main types.

The first is magnetic storage, which is the cheapest, and data is stored as magnetic patterns on a magnetic film on a rotating disk.

But reading the data requires spinning the disk to where the data is, so the drive's latency is 100,000 times slower than DRAM.

And then there's optical storage media like DVDs and Blu-rays, which also use spinning discs, but they also use reflective coatings.

Bits of information are encoded using dyes as laser-readable light-dark spots.

Optical storage is cheap and removable, but it also suffers from higher latency and lower capacity than magnetic storage.

And finally, solid-state drives (SSDs), like flash sticks, are the newest and fastest long-term storage media.

SSDs have no moving parts and store bits by trapping and releasing charge in specially designed internal structures using floating gate transistors.

So how reliable are these billions of bits?

We tend to think of memory performance as stable and permanent, but it actually degrades fairly quickly.

The heat generated by the device and its surroundings can demagnetize the hard drive, decompose the dye in the optical storage medium, and cause charge leakage in the floating gate.

SSD has another weakness

Repeated writing to the floating gate transistor causes it to degrade and eventually become unrecordable.

Fearing that the data life span of current storage media is less than 10 years, scientists are working to exploit physical properties at the quantum level to make storage media faster, smaller and more durable.

So far, neither humans nor computers have acquired immortal memory.

I have been fascinated by the sea since I was a child

It's a wonderful place full of color and life, home to strange alien-like creatures.

I imagined giant sharks dominating the food chain, and graceful sea turtles swimming across coral reefs.

As a marine biologist turned photographer, I've devoted most of my work to finding magical places that I dreamed of when I was little.

As you can see, I've been exploring underwater since I was very young.

But the first time I really went underwater was when I was about 10 years old.

I still vividly remember swimming ferociously, trying to touch an old cannon on shallow coral.

And when I finally got hold of it and looked up, I was immediately surrounded by colorful fish.

that was the day i fell in love with the sea

Thomas Pesczak Conservation Photographer After living on Earth for 40 years, I have been given the rare opportunity to explore the wonders of our oceans for National Geographic and the Save Our Seas Foundation.

I've photographed everything from gigantic sharks to the cutest sharks that fit in the palm of your hand.

In the cold waters of Canada's Great Bear Rainforest, I witnessed a very fishy-breathing humpback whale feeding just 10 inches away.

I've also been present at mating grounds for green turtles in the Mozambique Channel.

Every person on earth and the ocean have influenced each other.

And the pristine oceans I dreamed of as a child are becoming harder and harder to find.

They are being cornered and threatened more and more.

We humans have been one of the planet's main captors, and I've witnessed and filmed its growing impact firsthand.

For a long time, I've wanted to create interest by shocking people with shocking photos.

There are advantages to this approach, but I'm going back to my roots.

I thought the best way to bring about change was to appeal to love.

Maybe I'm a matchmaker of sorts. As a photographer, I've had the rare opportunity to reveal a whole range of animals and ecosystems hidden beneath the surface of the ocean.

If you don't know it exists, you can't care for it or defend it.

Revealing the hidden is the power of conservation photography.

(music) I've visited hundreds of bodies of water, but there are a few that really struck me.

The first time I experienced that kind of excitement was 10 years ago off the rocky, undeveloped coast of South Africa.

Every year in June and July, huge schools of sardines make the sardine run northward migration.

there's a good reason for this

Because a fast and hungry predator secretly pursues them at a furious pace.

Dolphins generally hunt in groups and separate some of the sardines from the shoal to form spherical shoals called bait balls.

We drive the fish to the surface of the ocean to enjoy this living, moving feast.

there's a shark right behind

Many people believe that dolphins and sharks are natural enemies, but they actually coexist during the Sardine Run.

Dolphins help sharks feed more efficiently

Without the dolphins, the bait balls would be more dispersed, and the sharks would get stuck in so-called sardine donuts, with mouthfuls of water and nothing to gain.

Now, I also had some exciting moments with sharks on the Sardine Run, and I know they don't see me as food.

But at this wild feast, they get bumped and finned like any other fish.

Traveling east from the coast of Africa, across the vast Indian Ocean, you end up in the coral islands of the Maldives.

During the intense southwest monsoon, manta rays from all over the islands migrate to a tiny spot on Baa Atoll called Hanifaru.

Large amounts of crustaceans, usually smaller than the human eye, are the main diet of the manta ray.

When plankton are unevenly distributed, the manta ray feeds alone, then flips backwards over and over again, much like a puppy chasing its own tail.

(Music) But when the plankton is concentrated in one spot, the rays line up and form a long chain for food.

As the plankton abundance increases, the rays swim closer together, a peculiar behavior called cyclone feeding.

Swirling in tight formation, the rays become layered cylinders that swirl up plankton and suck it up into their cavernous mouths.

The experience of diving with hundreds of stingrays is truly unforgettable.

(Music) When we first shot Hanifaru, it was unprotected and threatened by development.

By working with NGOs like the Manta Trust, my photography eventually helped Hanifaru become a marine protected area.

Fishermen on nearby islands used to catch rays to make traditional drums from their skins.

Today, they're the most passionate conservationists out there, and stingrays bring in $8 million more each year in the Maldives.

I've always wanted to go back in time and go to a time when maps were mostly blank and it said, "There are dragons here."

The closest I've been to an ocean during that time period was on the western atoll of the Indian Ocean.

Diving in a sea like this, far away from sea lanes and fishing fleets, gives you a poignant sense of what the sea once looked like.

Most people have never heard of a small coral reef in the Mozambique Channel called Bassas da India.

The reef is a barrier, and the inner lagoon is a nursery ground for the Galapagos shark.

This shark isn't very timid, even during the day.

I had a hunch that at night, I would be more daring and come out with more.

(music) Have you ever seen so many sharks on a single coral outcrop?

Capturing and sharing moments like this reminds me why I took this path.

Already this year, I did some work for National Geographic in Baja California.

About half way down the Pacific side of the peninsula is the San Ignacio Lagoon, an important breeding ground for gray whales.

This coast was the site of 100 years of slaughter, where more than 20,000 gray whales were killed and only a few hundred survived.

Today, that whale's offspring gently push their young to the surface to play and even interact with us.

(music) This species has made a truly remarkable comeback.

Now, on the other side of the peninsula, there's a quiet fishing town called Cabo Pulmo.

It was on the brink of collapse after decades of overfishing.

In 1995, local fishermen petitioned for the sea to be designated as a marine reserve.

What happened after that was nothing short of miraculous.

In 2005, after only 10 years of conservation, fish populations made an unprecedented recovery.

But see for yourself, let's go together

Take a deep breath, dive deep and swim into the biggest and densest shoal of fish I've ever encountered.

(music) Everyone can create hope

Through my photography, I want to tell you that it's not too late to protect our oceans.

I want to highlight nature's resilience, especially in the face of 7.3 billion people.

My hope is that in the future, I will have to look very hard to take pictures like this, and I will take pictures that will serve as examples of coexistence with the sea.

I can only hope that it will become a regular occurrence.

To survive and advance in my profession, I must be a desperate optimist.

I always work under the assumption that there's a great, transformative photo right around the corner, or beyond that coral, in that lagoon, or beyond.

(music)

Imagine you're on a game show.

I've already won $1,000 on the first lap and got a chance to win a bonus.

Now here's your choice

You either get a guaranteed $500 bonus, or you flip a coin.

$1,000 bonus on heads

No bonus for tails

By the second round, I have $2,000 in my pocket, so I hit a penalty.

here's another option

You can either play with a loss of $500 or try your luck at a coin toss.

Zero loss if heads, $1,000 if tails

If you're a normal person, on the first round, you'd choose to get a guaranteed bonus, and on the second round, you'd choose to flip a coin.

But when you think about it, this doesn't make sense at all.

These two have exactly the same probabilities and outcomes.

So why does the second option feel so much scarier?

The answer is a phenomenon called "loss aversion"

Rational economic theory dictates that decisions should be made based on simple mathematical calculations and how much risk you're willing to take relative to the amount you're betting.

But research shows that for many people, the negative psychological effects of losing something are about twice as strong as the positive effects of gaining the same thing.

Loss aversion is a "cognitive bias" that's rooted in heuristics, a method of short-cut answers based on past experience and intuition rather than rigorous analysis.

It's kind of like taking a shortcut in your head, which can lead you to make irrational choices, but unlike falling in love or bungee jumping, it's a logical fallacy that can easily be proven wrong.

This way of thinking is notoriously unsuitable for situations where probability is involved.

For example, let's say you roll a die with four green sides and two red sides 20 times.

Choose from the following patterns, and if you get it exactly right, you'll get $25.

which one would you choose?

In one study of college students, 65% of the subjects chose pattern B, even though pattern A was shorter, included in pattern B, and had a higher chance of winning.

This is called a "conjunctive fallacy"

It's an illusion of the brain that it thinks there should be more greens and chooses the less probable option.

Heuristics are also very bad at dealing with numbers in general.

In one experiment, students were divided into two groups

Group 1 was asked if Mahatma Gandhi died before or after the age of nine, and Group 2 was asked if it was before or after the age of 140.

Both numbers were far from the truth, but when asked what age they actually died at, the average age for Group 1 was 50, while for Group 2 it was 67.

The fact that the information in the original question was clearly incorrect shouldn't be relevant here, but it did affect the answer nonetheless.

This is called the anchoring effect, and it's used in marketing, negotiations, etc. to increase the amount that the other party is willing to pay.

Why do the heuristics that make all these mistakes exist in the first place?

because it is also very convenient

For most of human history, making quick decisions with limited information was the key to survival.

When you don't have time to logically analyze all the possibilities, heuristics can save lives.

But today's environment calls for far more complex decisions, and those decisions are driven by unconscious factors much more than we think, and affect everything from health care to education to finance to criminal justice.

You can't switch off the heuristics, but you can be aware of their existence.

When you come across a situation involving numbers and probabilities and complex details involving numbers and probabilities When you come across a situation involving numbers and probabilities and involving complex details When you come across a situation involving numbers and probabilities and complex details, take a moment to think about it.

If you put all the letters in The Moby Dick, published in 1851, in a giant rectangle, you'll notice a peculiar pattern.

So was Herman Melville a hidden seer?

The answer is no, because of a mathematical theorem called Ramsey theory.

It's also why you can see geometric shapes in the night sky, and why you can tell in all London that at least two people have exactly the same number of hairs without actually looking at it. This theory explains why you can find patterns in any sentence, even the lyrics of Vanilla Ice.

So what is Ramsey theory?

Simply put, if a set or structure is made up of enough elements, there will always be some interesting pattern within it.

As a simple example, let's look at something called the party problem, a classic example of Ramsey theory.

Suppose at least six people attend a party.

Surprisingly, if you pick any three people, you can say that any pair either knows all of them or has never met them, even if they don't know anything about the attendees.

We can prove this by drawing all the possibilities on a graph.

Each dot represents one person and the lines indicate that they know each other

There are only two possibilities for a pair: they know each other or they don't.

There are many possibilities, but they all have the properties we seek.

6 is the smallest number of attendees for which this principle applies and can be expressed as

Ramsey theory guarantees that there exists such a minimum number for any given pattern, but there is no shortcut to finding it.

In this case, the combination gets out of control as the number of attendees increases.

Suppose, for example, that we are trying to derive the minimum size of a party that satisfies the condition that there are five people who know each other and five people who do not know each other.

5 is a small number, but it's almost impossible to find an answer with this kind of exhaustive solution.

This is because the number of possible combinations is enormous.

At a party of 48 people, there are 2 to the power of 1128 possible combinations, more than there are atoms in the universe.

Even with the help of computers, the only answer to this question is that the attendance is between 43 and 49.

What this shows us is that certain patterns with what appear to be astronomical probabilities can emerge from relatively small populations.

It's safe to say that for very large gatherings, the possibilities are endless.

A set of 4 stars whose 3 points do not form a straight line is always a quadrilateral.

If you extend your search to the thousands of stars you'll find in the night sky, it's not too surprising that you can find any familiar shape, even a living creature, if you look for it.

So what about the possibility that there are texts with hidden prophecies?

Considering the number of letters and the variety of words that can be associated with them, and their abbreviations and alternative spellings, it's quite possible.

you should try

If you choose a sentence you like and arrange the letters in a grid pattern, what will you find?

In the words of mathematician Theodore Motkin, "Disorder is common, but complete disorder is impossible."

On the scale of the universe, there is no doubt that random elements will form a particular array, and humans, evolved to notice patterns and find signs in the noise, often want to find purposeful meaning in empty places.

So the messages that make us awed may be hidden in books, in toasted night skies, etc., but they may be hidden in toasted night skies, etc., but their roots are usually our consciousness itself.

As the country's top spy, you must infiltrate the headquarters of an evil organization and locate the hidden control panel to shut down the death rays.

But the only clues we have are the following information gathered by a fellow investigative team:

The headquarters is a huge pyramid with one room on the top floor, two rooms on the floor below, three rooms on the next, and so on.

The control panel is hidden behind a painting and is on the highest floor with the following conditions: Each room has exactly three doors leading to other rooms on the same floor, but the control panel's room leads to just one other room There are no corridors and no stairs to consider

Unfortunately there is no floor plan and you only have time to search one floor or else the alarm will go off again.

Do you know what floor the control room is on?

[Pause here to solve this riddle for yourself]

[Answer: 3 seconds] [Answer: 2 seconds] [Answer: 1 second] To solve this riddle, we need to visualize the problem.

First, the answer floor has one room with a door leading to the control panel room. One room with a door leading to the control panel room.

So there must be at least four rooms, let's represent the rooms with circles and the entrances with lines.

But connecting B and C makes any other connection impossible, so the top to fourth floors are not applicable.

The control panel should be as high up as possible, so let's start looking at the pyramid from upstairs.

The 5th floor from the top doesn't work either

Draw a diagram and you'll see, but there's another way to make sure you don't miss any possibilities.

A door, represented by a line in the diagram, connects two rooms.

In other words, no matter how many rooms you connect, the sum of the number of adjacent rooms must be an even number.

The 5th floor from the top satisfies the first requirement, but has 3 adjoining rooms each, requiring 4 rooms, plus a control panel room that connects to 1 room, so the total number of adjacencies is 13.

This is an odd number, so it can't happen, and in fact, any floor with an odd number of rooms won't meet the condition.

Let's take a look downstairs

When you draw a diagram of the room, you'll see how this arrangement works.

By the way, the study of such visual models of relationships and connections between different objects is known as graph theory.

In a basic graph, the circles represent objects, known as nodes, while the lines connecting them are called edges.

Researchers studying graphs like this ask questions like, "How far is this node from that node?"

"How many edges does the node with the most connected edges have?"

"Is there a path between these two nodes? If so, how long is it?"

Graphs like this are often used to depict communication networks, but they can represent just about any kind of network, from city traffic to people's social relationships to the chemical interactions between proteins to the spread of epidemics between different regions.

Now let's use this technique to get back to the pyramid.

You dodge security guards and security cameras, infiltrate the 6th floor from the top, locate hidden panels, move some prominent levers, and send death rays into the ocean.

Now it's time to unravel the mystery Why does the investigative team always give you cryptic information?

Hey, guys

If you like this problem, try solving these two as well.

I'd like to ask you to raise your hands. Has anyone ever unfriended you on Facebook? Because that person said something offensive about politics, religion, parenting, food.

(Laughter) Who has at least one person you don't want to talk to and avoid?

(Laughter) It used to be that in order to have a polite conversation, all you had to do was follow Professor Higgins in "My Fair Lady" and talk about the weather and your health.

These days, with climate change and anti-vaccination -- (Laughter) it's no longer a safe topic.

In the world we live in, any conversation can become controversial, and politicians can't talk to each other, and some people will vehemently argue for or against even the most trivial of issues.

It's not normal. A Pew Research Center survey of 10,000 American adults found that people are more polarized and conflicted today than ever before in history.

People won't compromise, they won't listen

And we decide where to live, who to marry, who to be friends with, based on what we already believe.

This also means not listening

Conversation requires a balance between speaking and listening, and somewhere along the way we've lost that balance.

Technological development is also a factor.

You probably still have your mobile phone with you or within reach.

According to the Pew Research Center, one-third of teens send 100 or more messages a day.

Most of these people are probably more likely to message than to speak face-to-face.

There's an interesting article in The Atlantic magazine written by a high school teacher named Paul Barnwell.

He gave his students a communication task.

I wanted to teach people how to talk about specific topics without taking notes.

He wrote, "I have come to realize—"

(Laughter) "Speaking is the most overlooked skill that teachers fail to teach.

Students spend hours each day interacting with ideas and other people through screens, but they have few opportunities to hone their interpersonal skills.

Weird as it may sound, we have to ask ourselves, is there any skill in the 21st century that is more important than the ability to speak coherently and confidently?"

My job is to speak: Nobel laureate, truck driver, billionaire, kindergarten teacher, head of state, plumber.

I talk to people I like and people I don't like

I talk to people who I personally disagree with at all.

I still have great conversations with them.

In the next 10 minutes, I will teach you how to speak and how to listen.

You've probably heard a lot about conversational tricks, like looking people in the eye, thinking about topics of interest in advance, looking them in the eye, nodding and smiling to show you're listening carefully, repeating and summarizing what they've said --

forget all that

it won't help

(Laughter) You don't have to learn how to look like you're listening attentively, if you're actually listening attentively.

(Laughter) (Applause) I use my skills as a professional interviewer in my everyday life.

I'm going to teach you the art of interviewing, which will also help you become a better conversationalist.

Learn how to have conversations that don't waste each other's time, don't get bored, and don't hurt each other.

We've all had great conversations

i know what it's like

It's the kind of conversation that makes you feel like you've been drawn in and inspired, that you've made a real connection, that you've been completely understood at the end of the conversation.

There's no reason most conversations shouldn't be like that.

Let's take a look together at 10 basic rules of conversation, and if you master at least one of them, you'll have better conversations.

Part 1: Don't do "while"

Not only should we stop playing with our phones, tablets, and car keys,

It means that your body and mind are there.

be in the moment

Don't think about arguing with your boss

don't think about what to have for dinner

If you want to drop out of the conversation, please drop out, but please don't participate halfway.

No. 2 "Do not talk one-sidedly"

If you want to express your point of view without reactions, arguments, counterarguments, and opportunities for growth, write a blog.

(Laughter) The reason I don't put dogmatic people on my show is because it's boring.

If you're a conservative, you hate Obama, food stamps, and abortion.

Liberals hate big banks, oil companies and Dick Cheney.

I know what you mean

It's not going to be like that

You have to approach the conversation with the attitude that there must be something to learn.

Famous therapist M. Scott Peck said, "To really listen, you have to put yourself aside."

This means that sometimes you need to put your opinion aside.

“Feeling accepted makes the speaker feel less vulnerable and allows the listener to see the innermost parts of themselves.”

Let's repeat Let's face it with a learning attitude

Bill Nighy said, "Everyone you meet knows something you don't."

I would say, "Everyone is an expert in something."

No. 3 “Ask open-ended questions”

Learn from journalists

when/where/who/what/why/how

Even if you ask a complicated question, you only get a simple answer.

If I ask, "Were you scared?"

Respond to the most striking word in the question, in this case "I was scared" and the answer is "yes" or "no."

"Were you angry?" "Yes, very angry."

Let the other person explain

I ask questions like, "How was it?"

"How did you feel?"

That forces them to stop and think, and they'll come back with a much more interesting answer.

Part 4 “Go with the flow”

I have to let the thoughts that pop into my head go

I'm sure you've all heard interviews like this, where a guest talks for minutes and then the host asks a question that's completely irrelevant or something they've answered before.

The host must have stopped listening two minutes ago, and he came up with a clever question, and decided he had to say it.

we are doing exactly the same

I remember running into actor Hugh Jackman at a coffee shop while I was sitting and talking with someone.

(Laughter) And stop listening.

Stories and ideas come to mind

Let's just let it float and disappear

5. If you don't know, say you don't know.

People on the radio, especially on NPR, know that what they say will be on the record, so they're very careful when they say they're experts in something or know something for sure.

Everyone please do the same

don't make the story cheap

Lesson 6: Don't equate the other person's experience with your own.

Don't bring up the story of losing a family member when the other person is talking about losing a family member.

Don't bring up how much you hate your job when someone is talking about trouble at work.

Your experience and yours are completely different.

every experience is individual

More importantly, I'm not talking about myself.

You don't have to take the opportunity to show how great you are or how troubled you are.

When Stephen Hawking was asked what his IQ was, he said, "Well, you're a loser to brag about your IQ."

(Laughter) Conversation is not an opportunity for self-promotion [conversation in the 21st century].

"How are you doing today?"

It's condescending and disgusting, but everyone tends to do it

Especially in conversations at work and in conversations with children, they repeat and change their words in an attempt to prove their point.

please don't do that

8. Don't get hung up on the details

And frankly, they don't care about the details -- details like years, names, dates, which you may be struggling to remember.

The other person is not interested I'm interested in you

Who are you and what do you have in common

So forget the details, we don't need it

Number nine, this is not the last, but the most important.

"To listen"

I can't tell you how many great people have said this, but listening is the most important skill anyone can develop.

Buddha said, and I paraphrase it a little, "When your mouth is open, you learn nothing."

Famous taciturn president Calvin Coolidge said, "Nobody ever got fired for what they heard."

(Laughter) Why don't we ask each other?

One is that people would rather talk than listen.

I'm in control when I'm talking

you don't have to ask anything you're not interested in

be the center of attention

strengthen your identity

But there are other reasons, too, because it's a distraction.

The average person speaks at 225 words per minute, but we can hear up to 500 words per minute.

Our minds try to fill the 275 words of spare capacity.

It certainly takes effort and energy to keep the other person's attention, but if you can't do that, you're not having a conversation.

It's just two people in the same place yelling unrelated words to each other.

(Laughter) We have to ask each other.

Writer Stephen Covey sums it up beautifully.

"Many people don't ask to understand,

I am asking you to answer

There's one more rule, number 10 is "keep it simple."

[My sister says, ``A good conversation is like a miniskirt, short enough to attract interest, but long enough to cover the point.'']

I grew up with a very famous grandfather, as was the norm in my family.

A lot of people would come in to talk to my grandparents, and after the customer left, my mother would come in and say, "Do you know who that person is?"

She became runner-up Miss America

He's the mayor of Sacramento.

She's a Pulitzer Prize winner He's a Russian Ballet dancer

And so I came to believe that everyone has something great hidden in them.

I think this is what makes me a good presenter.

As much as I can, I keep my mouth shut and my heart open, hoping to impress you. I've never been disappointed by that.

please do the same

Go out and talk to people, listen, and most importantly, expect to be impressed.

thank you for listening

(applause)

At the welcome reception of a diplomatic event in Moscow in 1956, Soviet leader Nikita Khrushchev said to Western ambassadors, "My vas pokhoronim!"

The interpreter in charge expressed it in English like this, "I'll bury you guys!"

That statement shook the Western world and heightened tensions between the Soviet Union and the United States in the midst of the Cold War.

Some people believe that this incident delayed the improvement of East-West relations by a decade.

Actually, this Khrushchev comment was a bit too literal.

Given the context, it should have been phrased, "We'll see you at your funeral." It feels less threatening in the sense that communism will outlive capitalism.

Although the intended meaning was later revealed, the initial impact of Khrushchev's words was so great that it could lead the world to a nuclear apocalypse.

So why is it that, despite the complexity of language and cross-cultural affiliation, this usually doesn't happen?

The answer lies largely in the skill and training of interpreters who seek to overcome language barriers.

Historically, most of the time, interpreting has been consecutive interpreting, where the speaker and interpreter pause their statements and wait for each other to speak.

But after the advent of wireless technology, World War II triggered the development of new systems for simultaneous interpretation.

In simultaneous interpreting, the interpreter translates the speaker's words immediately and translates into the microphone while the speaker is speaking.

There are no gaps, so the audience can choose the language they want to hear.

On the surface, things seem to go smoothly, but behind the scenes, human interpreters are constantly working to ensure that everything is conveyed exactly as the speaker intended.

this is no big deal

For a linguist who is already fluent in both languages, it takes about two years of training to expand his vocabulary and master the skills necessary to become a conference interpreter.

To get used to the unusual task of speaking while listening, the trainee follows the speaker in the same language and repeats every word he or she hears.

After that, we move on to practice rephrasing the remarks while adjusting the wording.

Finally, we go into training using the target language.

This practice creates new neural circuits in the interpreter's brain, and little by little, it becomes a habit to constantly try to rewrite sentences.

Over time, after a lot of hard work, interpreters develop a lot of skills that allow them to keep up with speed, deal with difficult terminology, and deal with different foreign accents.

They use acronyms to abbreviate long names, favor common words over specific terms, and even refer to visual materials such as slides.

Sometimes we use a term in its original language without translating it, while trying to find the best possible translation.

Interpreters also have the skills to stay calm in chaotic situations.

After all, the interpreter has no control over who says what, or how clearly they speak.

There is always the possibility that a curveball will come flying at you.

Simultaneous interpreters also often work in highly stressful situations, like the United Nations General Assembly, in front of thousands of people.

In order to be calm, the interpreter prepares carefully for the task, by writing down terms in advance, reading through books on the topic of the day, and researching previous talks on the same topic.

and the interpreters work in pairs

While one person translates words and phrases they hear in real time, the other person goes around to support, looking up documents, looking up dictionaries, and looking up related information.

Simultaneous interpreting requires a high degree of concentration, so the two switch roles every 30 minutes.

Your success depends greatly on your ability to work collaboratively.

Language is complex, and when abstract concepts and nuances are lost in translation, the consequences can be disastrous.

Margaret Atwood Quote: "When languages ​​fail, there are wars."

Conference interpreters know this better than anyone, so they work hard behind the scenes to make sure the language doesn't falter.

In 1997, a French woman named Jeanne Calment died at the age of 122 years and 164 days, making her the longest-lived person in history.

He had such an amazing lifespan that a rich man promised to give him 100 million yen if he broke this record.

But the reality is that living up to or beyond this age is very difficult, and may be unattainable for humans.

The human body just wasn't built to survive at extreme ages.

Survival is about 90 years old

What does aging mean, and what does it do to the body's efforts to stay alive?

We intuitively know what it's like to be old.

For some it's growth, for others it's aging.

But it's hard to find a rigorous scientific definition.

What we do know for certain is that aging occurs through intrinsic processes and interactions with the environment and surroundings, such as sunlight, toxins in the air, water, and food, that alter the structure and function of the cells and molecules that make up the body.

This change causes the body to deteriorate over time, eventually leading to the failure of all living organisms.

The exact mechanisms of aging are largely unknown.

Only recently, scientists have identified nine physiological traits that play a central role in aging, from genetic changes to changes in a cell's ability to regenerate.

First of all, as our bodies age, they accumulate genetic damage in the form of DNA damage.

This happens naturally during DNA replication, but it also occurs in cells that don't divide.

Organelles called mitochondria are particularly vulnerable to this damage.

Mitochondria produce adenosine triphosphate (ATP), which is the main source of energy for processes within the cell. Mitochondria also control many different cellular activities and play an important role in programmed cell death.

When mitochondrial function declines, cells first, and then all biological functions begin to deteriorate.

Other changes are known to occur in the way genes are expressed, also known as epigenetic abnormalities, which affect the tissues and cells of the body.

Genes with silenced or depressed gene expression become more prominent in older people, leading to degenerative diseases such as Alzheimer's that accelerate aging.

Not even our own cells can help us if we escape these harmful genetic mutations.

The fact remains that cell regeneration, which is the basis of life, declines with age.

DNA in cells is folded into chromosomes, each with two protected regions at the ends called telomeres.

Telomeres get shorter each time the cell replicates.

When telomeres become shorter than a certain length, cells stop replicating and die, reducing the body's ability to regenerate.

As we age, cells also decline, a process of cell cycle arrest seen at risk, such as when cancer cells proliferate.

But these responses become more frequent with age, resulting in decreased cell proliferation and replicative capacity.

Aging is also relevant to stem cells, which are present in many tissues and have the ability to replenish other cells indefinitely by cell division.

As we age, the number of stem cells declines and they gradually lose their regenerative capacity, which affects tissue regeneration and maintenance of bodily functions.

Other changes occur that affect the normal functioning of cells.

As we age, protein quality control functions cease, leading to protein damage and the accumulation of potentially toxic substances, leading to potentially fatal hypermetabolic activity.

Communication between cells becomes inactive, resulting in impaired bodily functions.

There's still a lot we don't know about aging.

After all, does the art of longevity come down to the well-known diet, exercise, drugs, or something else?

Will we be able to artificially extend our lifespans in the future through technologies like cell-repair nanobots and gene therapy?

Do we wish we could live longer than we do now?

Inspired by the longevity of 122, we started talking, but our curiosity knows no bounds.

About 60 million people around the world are fleeing war, violence and persecution.

They're forced out of their homes, and most of them are internally displaced, which means they've fled their homes, but they're still in their own countries.

Others cross borders and seek refuge abroad.

they are commonly called "refugees"

But what does this word actually mean?

We've known about the existence of refugees for thousands of years, but the modern definition comes from the 1951 United Nations Convention Relating to the Status of Refugees, which responded to the massive persecution and forced displacement of World War II.

The Convention defines a refugee as "a person outside the country of his nationality who is unable to return to his country because of a clear fear of persecution".

Persecution here is against race, religion, nationality, belonging to a particular social group or political beliefs, and often involves war and violence.

Today, about half of the world's refugees are children, some unaccompanied, and children in these situations are particularly at risk of child labor and sexual exploitation.

Each refugee situation is different, but many of them have to make dangerous and uncertain journeys.

But before we get into the details of their journey, let's clear one thing up.

There's a lot of confusion about the difference between "immigrants" and "refugees."

"Immigration" usually refers to people who have left their home country regardless of persecution, for example, to seek better employment opportunities, or to flee drought-stricken areas in search of better conditions.

Many people around the world have been forced to migrate because of natural disasters, food shortages and other hardships, but international law, right or wrong, recognizes only those fleeing conflict and violence as refugees.

What happens when people flee their country?

Many refugees' journeys are long and dangerous, with limited access to shelter, water and food.

Sudden and unexpected departures can leave personal belongings behind, and people fleeing conflict often don't have the visas or other documents they need to board planes or enter other countries.

Financial and political factors are also obstacles to traveling the normal route.

As such, they are usually only able to travel by land and sea, and often have to put their lives in the hands of smugglers to cross borders.

Some seek safety with their families, while others leave their loved ones behind and attempt to migrate alone, hoping to meet again someday.

This breakup can be traumatic and unbearably long lasting.

More than half of the world's refugees live in urban areas, but refugee camps are sometimes the first stop for those fleeing conflict, usually run by the United Nations High Commissioner for Refugees or local governments.

Refugee camps are intended for temporary housing, providing short-term housing until residents can safely return home, settle in a host country, or resettle in a third country.

But the possibilities for resettlement and long-term settlement are often limited.

As a result, many refugees are forced to remain in refugee camps for years, sometimes decades.

For asylum seekers, the first legal step in a new country is to apply for asylum.

At this point, they seek asylum as refugees and are not officially recognized as refugees until their applications are received.

Countries generally agree on the definition of refugee, but it is up to each country to scrutinize all asylum claims and decide whether to grant refugee status to an applicant.

National guidelines can vary greatly

Once an asylum seeker is recognized as a refugee, the host country has a number of responsibilities, such as a minimum standard of living and non-discriminatory treatment.

The most basic obligation to refugees is the principle of non-refoulement - that host countries should not deport or return refugees to countries where their lives or liberty could be threatened.

But the reality is that many refugees face unfair and discriminatory treatment.

They have to rebuild their lives in the face of xenophobia and racism.

And most of the time they are denied employment opportunities and have to rely entirely on humanitarian assistance.

Moreover, too many refugee children are out of school because of the lack of funding for education.

If you study your family tree, you may find that at some point your ancestors were forced to leave their hometowns to escape war, discrimination and persecution.

Let's remember that history, and it will help us hear stories of refugees who are currently looking for new homes away from home.

Brain and Food If you took all the water out of your brain, what would be the nutrient breakdown of your brain?

The weight of the completely dehydrated brain is mostly fat, also known as lipids.

The rest of the brain stuff is proteins and amino acids, a little bit of micronutrients and glucose. A little bit of micronutrients and glucose.

Of course, the brain doesn't function by simply collecting this nutrient as a raw material, but each nutrient has a tangible impact on brain function and development, and on mood and vitality.

So if you're feeling drowsy after lunch, or if you're feeling sharp in the middle of the night, it may simply be the food reaching your brain.

The big stars in brain fat are omega 3's and 6's.

These essential fatty acids are said to help prevent brain cell degeneration and must be supplemented with food.

Eating nuts and seeds rich in omega essential fatty acids Nuts and seeds and oily fish is very important for the production and maintenance of cell membranes.

While omega essential fatty acids are good for the brain, other fats such as trans fats and saturated fats can wreak havoc on your health if consumed over a long period of time.

Proteins and amino acids are the basic nutrients that help us grow and build, and they also control our emotions and behavior.

Amino acids contain the precursors to neurotransmitters, which are chemical messengers that carry signals between nerve cells involved in things like mood, sleep, memory, and weight regulation.

That's one reason why we feel calmer after a big plate of pasta and more alert after a protein-rich meal.

A complex combination of ingredients in food stimulates the release of noradrenaline, dopamine, and seratonin, which stimulate brain cells and affect mood.

But getting to brain cells is tricky, with amino acids competing for limited access.

By consuming a range of foods, your brain's messengers are balanced and your moods are not overly biased.

Like other organs in our body, our brains benefit from a steady supply of micronutrients.

The antioxidants in fruits and vegetables strengthen the brain to fight off free radicals that destroy brain cells, and it builds endurance.

Without powerful micronutrients like vitamins B6, B12 and folic acid, our brains are more susceptible to brain damage and depression.

Iron, copper, zinc, sodium, and other trace minerals, such as iron, copper, zinc, and sodium, and trace minerals are also essential for brain health and early cognitive development.

In order for the brain to effectively convert and synthesize these precious nutrients, the brain needs fuel -- and lots of it.

The human brain weighs only 2% of the total body weight, but consumes up to 20% of the energy source.

Most of that energy comes from carbohydrates, which the body breaks down into glucose or blood sugar.

The frontal lobe is very sensitive to low glucose levels, so any change in mental function may be one of the first signs of a nutritional deficiency.

Given that you're consistently receiving glucose, what types of carbohydrates in particular have an effect on your brain?

Carbohydrates can be divided into three main types: starches, sugars, starches, carbohydrates, and dietary fiber.

Although these three carbohydrates are often grouped together in the carbohydrate content value on most nutrition labels, the ratio of the subgroups carbohydrates and fiber to total carbohydrates determines how the body and brain respond.

Foods with a high GI, such as white bread, cause a rapid rush of glucose into the blood followed by a rapid decline.

When your blood sugar plummets, your attention span and mood drop.

On the other hand, oats, whole grains, and legumes release glucose more slowly, helping you maintain a steady alertness.

A wide selection of nutritious foods is very important for sustained brain function.

When it comes to what you eat, chew and swallow, your choices have direct and long-lasting effects on the most powerful organ in your body, your brain.

If you've ever had surgery, you'll remember counting down from 10, 9, 8, and when you wake up, before you've even counted to 5, the surgery is over.

But he wasn't actually asleep.

I was under more complex anesthesia.

You're unconscious, you're stuck, you have no memory of the moment, and hopefully you don't feel any pain.

Without stopping these processes once and for all, many surgical procedures would be very excruciating.

Medical texts from ancient Egypt, Asia, and the Middle East all mention poppies, mandrakes, poppies, mandrakes, and early anesthetics containing alcohol.

Today, anesthesiologists combine local anesthetics, inhalation anesthetics, and intravenous anesthetics in surgical formulations.

Local anesthesia prevents pain signals from certain parts of the body from reaching the brain.

Information such as pain travels through the nervous system as electrical signals.

Local anesthesia sets up electric barricades

It binds to proteins in the cell membrane of neurons that let charged particles in and out, keeping positively charged particles out.

One of the substances that does this is cocaine, and it was discovered by chance that its pain-relieving properties were in the mouth of an eye intern.

They're still sometimes used as anesthetics, but many of the common local anesthetics have a similar chemical structure and work the same way.

If major surgery requires unconsciousness, we need to work the entire nervous system, including the brain.

that is inhalation anesthesia

Diethyl ether was the first to be commonly used in Western medicine.

It was used mostly as a recreational product until doctors realized that people who smoked it felt no pain when injured.

In the 1840s, ether anesthetized patients during tooth extractions and surgeries.

After that, sevoflurane made from ether became popular, but nitrous oxide became popular.

this is still in use

Inhalational anesthesia is usually supplemented with intravenous anesthesia, which was developed in the 1870s.

Propofol, which is also a sedative, is used as an intravenous anesthetic, leading to unconsciousness, and opioids like fentanyl have analgesic properties.

These general anesthetics also appear to suppress electrical signals in the nervous system.

Normally, the brain's electrical signals are in a chaotic chorus as different parts of the brain communicate with each other.

This keeps me conscious

But when you're anesthetized, these signals slow down and become organized, and brain cells stop talking to each other.

I don't know the details of how this happens.

Some anesthesia binds to GABA-A receptors on neurons in the brain.

Negative charge flows into the cell to keep the channel open.

As the negative charge builds up, it interferes with the electrical signals sent out by neurons.

There are many of these channels in the nervous system, and they regulate the neural pathways that control movement, memory, and consciousness.

Many anesthetics inhibit multiple functions, and they don't just affect the nervous system.

Many anesthetics affect the heart and lungs Many anesthetics also affect the heart, lungs and other vital organs.

As with early anesthetics, including well-known poisons like hemlock and aconite, current drugs can have serious side effects.

Therefore, the anesthesiologist must carefully monitor the patient's vital signs and, if necessary, alter the formulation to ensure that the anesthetic works.

Anesthesia is complicated, but understanding how to use it has improved my surgical skills.

It allows surgeons to safely perform caesarean sections, open clogged arteries, replace diseased livers and kidneys, and perform other life-saving surgeries at any time.

New anesthesia techniques are developed each year, and more and more patients can tolerate the invasiveness of surgery.

I went to the hospital and got tested

I was diagnosed with high cholesterol and should take medicine to lower it.

So I get a bottle of medicine

Both patients and doctors believe the medicine should work.

The company that made the drug did a lot of research before applying for drug approval.

The FDA has meticulously and critically reviewed it before it approves it.

We know roughly how the drug works and what side effects it has.

that it should be okay

As we continue to talk, the doctor becomes a little concerned.

The doctor says, "He seems to be slightly depressed.

I think you should take another pill."

I now have two medicines.

This drug is also used by millions of people, has been studied by pharmaceutical companies, has been reviewed by the FDA, and is safe.

this should be ok

this should be ok

but wait

How much research has been done on using both at the same time?

it's really hard to do

not usually done

We rely exclusively on something called "post-market surveillance."

How do you know if you're having trouble taking the two drugs together?

What if there are 3, 5, 7 combinations?

Ask a person who has multiple illnesses how many kinds of medicine they are taking.

i am very interested in this issue

But why

I'm an informatics and data science guy, and I think the only promising way to understand these drug interactions is to use data from a variety of different sources, so that we can know if drugs are safe or unsafe to combine.

TELL US HOW TO DO DATA SCIENCE

The story begins with my student

Let's call him "Nick" because that's his name.

(Laughter) To Nick, a young student, I said,

"We need to understand how drugs work, alone or in combination, and we don't have a very good understanding.

But there's a great database that the FDA has created.

It's a database of adverse events."

It's literally available on a website that anyone can download right away, and it's a collection of hundreds of thousands of adverse event reports from patients, doctors, companies, and pharmacists.

This data is very simple: all the illnesses the patient has, all the drugs they are prescribed, and all the adverse events or side effects they experience.

It's not an exhaustive list of adverse events occurring in the United States, but we have data on hundreds of thousands of drugs.

So I said to Nick, "Let's look at blood sugar.

Blood sugar is very important, and we know it's involved in diabetes.

Let's see if we can learn anything about changes in blood sugar caused by drugs."

And send nick out nick's back

"Professor, based on the data in this database, I created a taxonomy of drugs by side effect, which you can use to tell if a drug changes blood sugar."

what he did was very simple

We compared a group of drugs that were known to alter blood sugar with a group of drugs that didn't change blood sugar.

Feeling tired? How's your appetite? What are your urination habits? ”

Taken together, these are very good indicators.

"You can guess with 93% accuracy whether a drug changes blood sugar."

"Isn't it amazing?"

I'm a young student. I have to build my confidence. (Laughter)

"The problem is

It means every doctor knows which drugs affect blood sugar, because that's very important.

It's a good result, but it's not really interesting, and it's not a paper."

(Laughter) "I knew you would say that."

nick is a smart student

"I thought it would come, so I did another experiment.

We looked in the database for signs of blood sugar changes in patients who were taking two drugs in combination, where the two drugs alone did not change their blood sugar, but when taken together, they were more likely to do so."

"I see, that's a good idea. Show me the list."

There were a lot of drugs out there that didn't really interest me.

There were two drugs that caught my eye: paroxetine, also known as Paxil, an antidepressant, and pravastatin, also known as pravachol, a high cholesterol drug.

"Oh, there are millions of patients in America taking these two."

In fact, as it turned out, at that time, it was estimated that 15 million Americans were taking paroxetine, 15 million Americans were taking pravastatin, and about a million people were taking both.

So there could be a million people out there with drug-related blood sugar problems, if Nick's machine learning jumbled up FDA data is correct.

"But I can't write a paper yet. What you're doing, called machine learning, is interesting to me, but I can't say it's an established empirical method in our field."

i need to do something more

I decided to take a look at Stanford's electronic medical records.

I had a copy in my lab, and I could have used it for research purposes after removing the personal information.

"Let's see if patients on these two drugs have blood sugar problems."

There were thousands of patients in Stanford's medical records who were on paroxetine and pravastatin.

we needed a special patient

Patients who first took one, had their blood sugar checked, then took the other, and had their blood sugar checked again within a reasonable period of time, like two months.

I searched and found 10 people

And 8 out of 10 had an increase in blood sugar after the second P, which we call the two drugs P&amp;P.

It didn't matter which one, and as soon as I took the second one, my blood sugar went up by 20mg/dl.

For reference, a normal person, if not diabetic, has a blood sugar level of around 90.

When it gets to 120 or 125, doctors start to suspect diabetes.

So a 20 rise is something to watch out for.

"Nick this is amazing

But unfortunately I can't write a paper on it yet. Just 10 people is just too few."

what should i do?

I decided to call my friends at Harvard in Boston and Vanderbilt in Nashville, both of which have electronic medical records similar to Stanford's.

We asked them to find patients who were taking the first P and the second P and measuring their blood sugar levels within the required timeframes.

Thankfully, Vanderbilt found 40 such cases in a week, and we saw the same trend.

We found 100 patients from Harvard University, and we saw the same trend.

Ultimately, they found 150 patients at three different medical centers who showed that the combination of these two drugs significantly increased blood sugar.

What's even more interesting is that we initially excluded diabetics who already had blood sugar problems.

It turns out that instead of 20 mg, it went up 60 mg in people with diabetes.

This is a big deal, and I said, "I have to publish this," and I submitted my paper.

All evidence is data FDA data Stanford data Vanderbilt data Harvard data

I haven't done any experiments myself.

But I got a little worried

while the paper is under peer review

I'm looking for someone who can do experiments.

i won't do it

Examine the patient, but don't use a pipette

I learned how to give drugs to mice.

One group of mice was given paroxetine.

another group was given pravastatin

A third group was given both.

And we found that mice also had blood sugar spikes of 20 to 60 mg/dL.

The paper was accepted on informatics evidence alone, but I added a note at the end, "By the way, when we administered it to mice, we saw an increase."

It's a great result.

there are still six and a half minutes left

(Laughter) I was thinking about this, and I don't remember who it was, but they said, "I wonder if any of the patients who took these two drugs noticed the side effects of hyperglycemia?

It looks like it's good to notice

How do you know? ”

"What will the patient do?

What if you start taking a new drug or two and something goes wrong?

what to do?

Why don't you add the keyword "side effect" to the name of the medicine you're taking and search Google for your symptoms? ”

So we said, let's ask Google to show us their search logs, so we can see if patients are doing any of those searches.

Unfortunately, our request was declined by Google.

very disappointed

I was having dinner with a colleague who works at Microsoft Research, and I told him that I wanted to do this kind of research, but Google turned me down, and I was overwhelmed.

He said, "We have a Bing search..."

(laughs) huh

that's good

In my heart, I — (Laughter) felt like I was talking to Nick again.

A man who works for one of the biggest companies in the world, and I was already in a flattering position.

And he says, "I may have misunderstood

It's not just that we have Bing search, but if you're searching in Internet Explorer, whether it's Google or Yahoo or Bing

We have 18 months of data for research purposes only."

"I don't even want that!"

He's a friend at Microsoft named Eric Horvitz.

So I set out to do research, and I came up with a list of 50 words that ordinary people with high blood sugar might search for: "I'm tired," "I don't have an appetite," "I urinate a lot," and "I pee a lot."

Now we have 50 phrases that we call "diabetes words."

First, when we examined the standard value,

We found that between 0.5% and 1% of all internet searches contained diabetes terms.

this is the standard

Paroxetine or Paxil -- they're the same thing -- when one of the words is present, the diabetic word rises to about 2 percent when the paroxetine word is present.

If you have pravastatin, it will be about 3% higher than the baseline.

If you have both paroxetine and pravastatin in the search terms, that goes up to 10 percent, a huge three- to four-fold increase, meaning that the terms diabetes or hyperglycemia are common in searches that include the names of both drugs.

When I announced this result, it got a lot of attention.

This is noteworthy because patients are indirectly talking about side effects through searches.

when we show this to the FDA

they are interested

We've worked with Microsoft and others to set up a social media monitoring program, and Microsoft has a good infrastructure to do that. We're looking at Twitter feeds, Facebook feeds, and search logs to look for signs of trouble when using drugs alone or in combination.

What can we get out of this? why did i tell this story

First, we now have promising big and medium-scale data to help us understand drug interactions and drug effects themselves.

how the medicine works

It means that a new ecosystem is emerging to understand how we can optimize drug use.

Nick continued his research and is now a professor at Columbia University.

In his doctoral dissertation, he examined hundreds of drug combinations.

We found a number of very important drug interactions, and we applied the same method to show that this is an effective way to find drug interactions.

there are a few things to think about

It's not like you can only use two drugs at once.

As I said before, there are patients who take three, five, seven, nine drugs.

Are the nine drug interactions being studied?

You can study them in pairs A and B A and C A and D and so on. Interactions may increase or decrease the effect or produce unexpected side effects.

I have no idea

Using data to understand drug interactions is an untapped and open research area.

There are two more lessons for me. I want you to think about the power we've gained from data, data from people who, through their pharmacists, their doctors, or their patients themselves, have volunteered to provide information about drug reactions and made it available for research in databases at Stanford, Harvard, and Vanderbilt.

We all have concerns about data.

We care about privacy and security, and we should.

need a secure system

But we can't just lock up the data. It's an incredibly rich source of discovery, innovation and inspiration in medicine.

And the last thing I want to say is that in this case, the results we found for the two drugs were a bit disappointing.

I have a problem using them together

blood sugar rises

It may turn someone who wasn't diabetic into diabetes. Be careful when you use the two drugs together, and you may want to re-prescribe them so that they are not used together.

but there is another possibility

We might have discovered that two or three drugs interact in a positive way.

We may find new medicinal properties that do not appear with drugs alone but appear when taken together. Instead of causing side effects, we may have new treatments for diseases for which there is currently no cure, diseases for which no treatment is effective.

If you think about the medications we have today, the big breakthroughs, whether it's HIV or tuberculosis or depression or diabetes, are all coming from a mix of drugs.

So the bright side of this, and the subject of the next TED Talk, is how we can use the same data to find combinations of drugs that produce positive effects, and that should give us new treatments and new insights into how drugs work so we can better treat our patients.

Thank you very much

(applause)

Beat the favorite An unexpected team win

The final penalty shot that decides the championship

Numerous training scenes full of energy

Many people love the glorious victories that unfold on the stadium, cheer on their favorite teams, and enjoy sports themselves.

But should we be so obsessed with sports?

Are sports actually as good for us as we expect them to be, or are they just fun pastimes?

What is the view of the scientific world?

First of all, exercise is thought to be good for the mind and body, and that's certainly true.

Exercise, especially when you're young, has many health benefits, including strengthening bones, removing bad cholesterol from your arteries, and reducing your risk of stroke, high blood pressure, and diabetes.

When you exercise, your brain releases various chemicals, including endorphins.

When these hormones are released, they can control pain and pleasure responses in the central nervous system, eliciting a feeling of euphoria known as the runner's high.

Increased endorphins and sustained exercise usually lead to better concentration, improved mood and improved memory.

So does going to the gym five days a week have the same effect as joining a sports team or competing in a competition?

And that's what's interesting about it, because research shows that if you have a favorite sport or team, it can do a lot more than just the physical and mental benefits of exercise.

Most notably, short-term and long-term psychological effects.

Some of them are the experience of being part of a team, the experience of team consciousness, for example, by trusting, relying on, receiving and helping others, and learning to move forward together toward a common goal.

Plus, team commitment and doing something fun can help you develop the habit of exercising regularly.

Participation in school sports has also been shown to reduce the risk of depression for up to four years.

It also greatly increases self-esteem and self-confidence.

There are several reasons

one of them is training

In particular, by studying under excellent coaches, training your body, and polishing your skills, you will strengthen your desire for growth.

I can say to myself, "Even if I'm not good at it now, if I keep practicing, I'm going to get better and eventually I'll be able to do it."

That kind of commitment helps in every aspect of life.

And then there's learning from failure, which is one of the most impactful long-term effects of sport on our outlook on life.

The experience of accepting defeat builds resilience and develops the self-awareness needed to overcome academic, social and physical challenges.

Even if the team doesn't win or keeps losing, the experience itself has real value.

Well, sports have their pros and cons.

Some teams will be too competitive and some teams will be less competitive.

Sometimes it's hard to find a sport that uses your strengths

I don't mind at all

But if you take the time to look for it, you'll probably find a sport that meets your individual needs, and if you do find it, there's a lot of good stuff.

You'll be part of a supportive team, build your self-confidence, train your body, train your mind, and of course, have fun.

The most basic role of fat in the body is to store energy for food.

A long time ago, natural selection left us with genes that allowed us to store the most fat and survive the harshest environments.

Chronic malnutrition was the norm for most of human history, so our genes evolved to store fat.

So when does body fat matter?

Until the 18th century, the adverse effects of being overweight were not documented in the medical literature.

Since then, technological advances and public health measures have combined to improve the quantity, quality and variety of food.

Healthy people thrive economically when there is a constant supply of good food.

With more spending comes more leisure time and more waist circumference.

By the middle of the 19th century, extreme overweight, or obesity, was recognized as ill, and a century later declared deadly.

So what's the difference between being overweight and being obese?

It's easier to understand if you calculate an index called BMI

For example, if you weigh 65 kilograms and are 1.5 meters tall, your BMI is about 29.

Obesity is defined as having an excess of body fat, with a BMI of 30 or higher being obese and a range of 25 to 29.9 being overweight.

BMI is a useful indicator of healthy weight, but you can't really know your actual body fat percentage without also taking into account things like your waist circumference and muscle size.

For example, athletes naturally have a higher BMI.

So how does obesity occur?

The most basic of basics, obesity is caused by an energy imbalance.

If you take in more energy from food than your body uses up, your body stores the extra calories as fat.

Most of the time, this imbalance is caused by a combination of circumstances and choices.

Adults should exercise at least 2.5 hours per week Children need 1 hour per day

But globally, 1 in 4 adults and 1 in 10 adolescents don't get enough exercise.

When high-calorie processed foods and increased serving sizes, combined with pervasive marketing, lead to a natural tendency to overeat.

Poorer communities are at even greater risk because of scarce resources and the lack of affordable access to healthy food.

In addition, our genetic makeup is also involved.

Studies looking at families and separated twins found a clear causal link between heredity and weight gain.

A recent study also found a link between the diversity of bacteria that live in the digestive tract and obesity.

Whatever the cause, obesity is a global epidemic and it's only going to explode.

Obesity greatly increases the prevalence of many diseases, including diabetes, heart disease, stroke, high blood pressure and cancer.

It affects people of all ages, genders and socioeconomic strata in developing and developed countries alike.

Given that childhood obesity has risen 60 percent worldwide in a short period of 20 years, this is an important issue that cannot be ignored.

Once you become obese, it becomes harder and harder to get back to being healthy.

Hormonal and metabolic changes make the body less sensitive to overeating.

Even if you lose weight, people who were formerly overweight will have a much harder time losing fat because they will burn fewer calories than people who were at their original weight doing the same exercise.

This is because as you gain weight, intracellular signaling becomes impaired, making it harder for your brain to track food intake and fat accumulation.

But there are some reports that well-managed long-term lifestyle changes can improve obesity-related health problems.

Sustained lifestyle changes to lose weight and invasive treatments like bariatric surgery can improve insulin resistance and reduce inflammation.

What once helped us survive is now hurting us.

As the world's population shrinks and our weight continues to rise, it's essential to our collective well-being to watch our diets in order to reach a healthy weight.

With the obesity epidemic affecting every country in the world for a variety of social and economic reasons, obesity cannot be viewed as an isolated problem.

More global preventative measures are essential to managing weight around the world.

In this dark world, the resistance you belong to is humanity's last hope.

Unfortunately, you were captured by tyrants and brought to the ancient Colosseum for public execution.

Before you were thrown into the dungeon, you saw many numbered passageways to the outside.

But the entrance to each is blocked by an electric barrier with a numeric keypad.

It seems that one of you will be able to take on this obstacle to escape, or tomorrow morning the other two will be eaten by a mutant monster.

The only one who can do it is Zara, who has outstanding logical thinking ability.

I secretly handed over the voice transmitter so that we could understand the situation here as well.

I heard Zara's footsteps echo down the hallway and stopped.

A voice tells you to type positive integers in ascending order, so the second number must be greater than or equal to the first number, and the third number must be greater than or equal to the second number.

You can ask for up to 3 hints, but if you give the wrong answer or say a single word, you'll be thrown back into the dungeon.

The first hint was that the product of three numbers is 36.

When Zara asked for a second hint, he replied that the sum of these three numbers was the same number as the passageway they entered.

a long silence fell

I'm sure Zara remembers the aisle number she entered, but you have no way of knowing it, and Zara can't say it out loud.

Zara could have entered the passcode at this point, but instead asked for a third hint, and the voice replied that the highest number in the array appeared only once. The voice said the highest number in the array appeared only once.

After a while, the buzzing of the electric barrier stopped for a few seconds, and Zara had successfully escaped.

But the voice transmitter I gave you went out of range, so this is all the information you guys were able to get.

Can you solve this riddle?

Pause on the next screen and think about the answer

3 2 1 I'm worried that I don't know the number of the passage where Zara entered, but let's think about it from the beginning.

First, let's take the first hint and write down all eight combinations that result in a product of 36.

One of these should be the correct answer, but which one?

Here comes the problem

Anyway, even if you don't know the answer, write down the sum of the three numbers

clicked here

All but two of the additions are different. If the passage number matched one of them, Zara wouldn't have to ask for a third hint, and would have known the answer right away.

Since you asked for the third hint, the passage number will be the one that appears more than once on this list: 13.

But which formula is correct? 1, 1, 6 or 2, 2, 9?

This is where the third tip comes into play.

The correct answer is 2, 2, 9 because the largest number appears only once.

As night fell, you escaped through Hallway 13 and joined Zara, who was waiting outside.

You have obtained your freedom through calculation and logic.

Now it's your turn to bring freedom to the world

What is the relationship between the French Revolution and NASA's $200 million accident in which an orbital satellite crashed into the surface of Mars?

it's actually everything

This clash was due to a conversion error between two weights and measures: the US Customary Units and the International System of Units, or the metric system.

So what does that have to do with the French Revolution?

let me explain

For much of recorded human history, units such as grain weight and hand length were not exact and varied from place to place.

Moreover, not only are the weights and measures not standardized by region,

The number system was also completely different.

In Europe, by the late Middle Ages, decimal numbers, of Hindu-Arabic origin, had replaced Roman numerals and their fractional notation.

With 250,000 units in France alone, it would have required a massive discontinuity to make the change widely disseminated.

And in 1789, that discontinuity happened.

The monarchy wasn't the only thing the leaders of the French Revolution wanted to overthrow.

They aimed at social change according to the rational principles of the Enlightenment movement.

When the new government came to power, the Academy of Sciences was convened to reform weights and measures.

The outdated standards of authority and old conventions were replaced by mathematical and natural relationships.

For example, the Greek word for measurement, the meter, was defined as the distance between the equator and the North Pole in ten millionths.

The new metric system was, as the Marquis de Condorcet put it, "for all times and all peoples."

The standardization of weights and measures had political advantages even over revolutions.

This allowed the nobility to manipulate local units and exploit rent from the commoners, while allowing the government to efficiently collect taxes.

They also weakened the power of the church by switching to a republican calendar with 10 days in the week and fewer Sundays.

Adopting the new system was difficult

it's actually pretty complicated

At first they used both new and old units, but the Republican calendar was later abandoned.

When Napoleon Bonaparte came to power, he allowed private businesses to use traditional weights and measures redefined in terms of the metric system.

But the metric system was used for official purposes and spread beyond the borders of France to continental Europe.

Although Napoleon's empire lasted only eight years, his legacy was long-lasting.

Some countries in Europe revived old weights and measures upon independence.

Other countries have understood the value of standardization in the age of international trade.

When Portugal and the Netherlands voluntarily switched to the metric system, other countries followed suit, and with their colonies, the system spread around the world.

As France's main rival, Britain defended its traditional units against revolutionary ideas.

But over the next two centuries, the British Empire also made a gradual transition, first accepting the metric system as an option and then gradually making it official.

But it was too late for the already independent Thirteen Colonies (before the United States).

The United States continues to use British units, a vestige of its colonial era, and is one of only three countries that have not fully embraced the metric system.

Despite our continuing efforts to metricize, many Americans are more comfortable with feet and pounds.

Ironically, some see the once-revolutionary metric system as a symbol of international submission.

Nevertheless, the metric system is used almost universally in science and medicine, and continues to evolve based on its original principles.

For a long time, standard units were defined by tightly controlled prototypes.

But thanks to increasing technology and precision, these inaccessible and unreliable prototypes have been replaced by universal constants, such as the speed of light.

Consistent weights and measures are essential to everyday life, and we can never be grateful enough for the great accomplishments of mankind.

Just as the metric system was born out of a political revolution, the metric system will continue to be crucial to future scientific revolutions.

I'm a textile artist, best known as the founder of the yarn bombing movement.

Yarn bombing is the use of knitted fabrics to create graffiti-like decorations on urban streets, or more specifically, to do it without permission, without authorization.

But more than 10 years ago, when I first started, I didn't have a name for this activity, and I didn't have any ambition or a grand vision of what I wanted to do with it.

I just wanted to give something warm and fluffy and human to the cold gray metal surfaces that we see every day.

First, I covered the door handle with yarn.

This is the first work

I never thought that something so small could change my life.

That's why the reaction around me was so surprising

I'm intrigued what else can I do

I was wondering if I could do something that would get the same response in public.

I tried covering the post of the road sign near my house with knitting.

it was a big hit

People who get out of parked cars and look intently People who tilt their heads and look intently People who take pictures People who take pictures next to the sign

The more you do it, the more reactions you get

totally obsessed

I got addicted

It was a great temptation

A new passion arose and the urban environment became my playground.

this is one of the early works

I was very fascinated by the idea of ​​improving the mundane, even the ugly, the dull, while improving it without taking away its identity or functionality, but just knitting it into a tailor-made garment.

that was fun

It was really fun to breathe life into something that was just an inanimate object.

and···

People laugh at this, but... (Laughter) Now I want to take it seriously.

I want to analyze

I wanted to know why I was so obsessed with it, why it was so hot, why it had such an impact.

and realized

In today's fast-paced, digitalized world, we all want and want something that feels familiar.

I think we're all numb. Living in a city that's too advanced, surrounded by billboards and advertisements and giant parking lots, we're numb.

So when you happen to stumble upon a sign wrapped in wool, it feels so out of place, and gradually and strangely, you feel a connection.

It's one of my favorite moments. I really want to share this moment with others.

my curiosity piqued

We started out with fire hydrants and street signs, but then we started thinking about what else we could do with yarn.

Anything on a bigger scale that seems impossible?

That's when I took care of the bus.

This changed the tide

This work will stay in my heart forever

Around that time, my work was gaining recognition, but I had never seen anything so large covered in knit.It must have been the first city bus in history to be covered in knit.

At this point, I experienced, or rather witnessed, an interesting phenomenon.

Yarn bombing was already out of my hands

I was flying around the world

people around the world were doing

How do you know, I've traveled to some part of the world, and in a country I've never been to, I don't do it, and road signs are covered with wool.

So while I set goals and pursued them in my art -- this is my most recent blockbuster -- yarn bombing developed at the same time.

Through these experiences, I began to see the power hidden in knitting, and realized that there is a language that can be understood around the world.

Through this old-fashioned, obscure hobby, I've found common ground with people I never thought I'd relate to.

As I tell my story here today, I want to tell you that there are hidden powers in the most obscure places, and that everyone has some skill that just isn't discovered.

When we take a look at our human tools, our hands, and think about what we can do -- build houses, make furniture, paint giant walls -- most of the time we're holding a remote control or a mobile phone.

I'm just as guilty

But think about it, what would happen if you put your phone down or your remote control?

what can you create with your own hands

People think I'm a master at knitting, but I was so bad at knitting that I couldn't even knit a sweater.

But in knitting, I did something interesting that had never been done before.

And I didn't set out to be an artist -- I mean I didn't have a professional education -- I was a math major.

I didn't expect this to happen, but it didn't happen by accident.

I tried to keep going, I fought, and now I'm proud to be an artist.

Everyone ponders the future, but it may not be as smooth as you think.

One day, if you, like me, were bored and knitted a door handle cover, you might change the world.

thank you

(applause)

Charles Osborne's hiccups began in 1922 when he fell under a pig.

For 68 years it didn't go away, and now the Guinness Book of World Records holds the record for the longest-lasting hiccups in the world.

In contrast, Jennifer Mee, a girl from Florida, could be considered the record holder for the fastest hiccups, having hiccupped 50 times per minute for over four weeks in 2007.

What Causes Hiccups?

Doctors say hiccups are caused by stimuli that cause the abdomen to expand, such as swallowing air, eating too fast, or gulping.

Other theories associate hiccups with intense emotions, or that they come from reactions to those emotions — laughing, crying, anxiety, excitement, etc.

So what happens when you have hiccups?

A hiccup begins as a sudden, involuntary spasm of the diaphragm, the dome-shaped muscle at the base of the lungs that is used to draw air in.

Almost immediately, the vocal cords quickly close, and so does the gap in the middle of the vocal cords, called the glottis.

The movement of the diaphragm draws air in rapidly, but at the same time it closes the vocal cords, preventing air from flowing into the trachea and into the lungs.

And then there's that characteristic "hic" sound.

The function of hiccups is still unknown.

No medical or physiological benefits have been found.

Why is the breath you try to inhale suddenly blocked before it reaches your lungs?

When human anatomy and physiology are not accompanied by a clear purpose, evolutionary biologists are at a loss.

Is there a hidden function behind this structure that no one knows about yet?

Or are they just evolutionary relics — vestigial remnants of once important uses that have survived to the present day?

One theory is that hiccups have been around for millions of years before humans even existed.

Lungs are thought to have evolved to take advantage of the abundant oxygen in the atmosphere, as early fish lived in warm, stagnant, oxygen-poor waters.

As the descendants of these organisms made their way onto land, they transitioned from gill-based ventilation to lung-breathing.

This is similar to the more dramatic transformation we see in modern frogs, the process from a tadpole with gills to an adult frog with lungs.

This hypothesis considers hiccups to be remnants of an ancient migration process from water to land.

As soon as the water was inhaled and forced out through the gills, it quickly closed the glottis to keep the water out of the lungs.

Supporting evidence for this theory is that the neural patterns that produce hiccups are nearly identical to the neural patterns that control respiration in amphibians.

Some scientists believe that the reason this reflex has survived into the modern human body is because it has great benefits.

True hiccups, for example, only occur in mammals, not in birds, lizards, turtles, and other animals that only breathe with lungs.

Additionally, hiccups occur in prenatal human fetuses and are much more common in infants than in adults.

Part of the reason for this is the unique parenting behavior of mammals.

The ancient hiccup response may have been carried over to mammals as a sort of exaggerated burp to expel air from the stomach.

The rapid dilation of the diaphragm allows more air to exit the stomach, and if the glottis is closed there, milk will not enter the lungs.

Sometimes, when hiccups go on forever, folk remedies are tried, such as sipping cold water, holding one's breath, putting honey or peanut butter in one's mouth, breathing in a paper bag, or surprising the person.

Unfortunately, none of the treatments have yet been scientifically proven to be particularly effective or stable.

As you can see, I only know the methods that definitely won't work!

Imagine you're on a quiz show, and the prize is diamonds or bottled water.

It's easy to choose

Diamonds are clearly more valuable

But what if you made the same choice, not on a quiz show, but after days of wandering in the desert, when you're dehydrated?

Would you like to change your selection?

Why? Isn't it true that diamonds are more valuable?

This is called the "paradox of value," and it's best known for being described by economics pioneer Adam Smith.

What this shows us is that determining value is not as easy as it seems.

When I was on the quiz show, I was thinking about the "exchange value" of each object, what you get out of it later. But in times of emergency, like the desert story, it's "use value" is more relevant: how useful it is in the situation.

And because you only get one of the two, you also have to think about the "opportunity cost": what do you lose by giving up the other?

Anyway, if you can't make it out of the desert alive, it doesn't matter how much money you make selling diamonds.

To deal with the paradox of value, many modern economists lump all this together into the concept of "utility," which is how well a person's wants and needs are met.

The idea of ​​utility can be applied to everything from essential food to the joy of listening to your favorite music, and the magnitude of utility varies from person to person and situation to situation.

The market economy offers a simple way to measure utility.

Simply put, utility is how much are you willing to pay for it.

Let's go back to the desert example, but this time, let's say that every five minutes you get either a diamond or a bottle of water, whichever you prefer.

Most people would first get enough water to get them through the desert and then enough diamonds to carry them.

This is because of what we call "marginal utility," which means that when choosing between diamonds and water, we compare the value that extra water brings to the value that extra diamonds bring.

Do this every time you make a choice.

The first bottle of water is worth more than a number of diamonds, but eventually you will have enough water as you need.

After that, the extra water is just luggage.

That's when you start choosing diamonds over water.

This is not limited to necessities like water.

As with most things, the more you have, the less usefulness and joy the extras bring.

This is called the law of diminishing marginal utility.

You may be happy to buy your favorite food for two or three people, but when it reaches four people, you'll feel nauseous.

Or if you go to see the same movie over and over again, eventually you'll either get bored or you'll run out of money.

In any case, the marginal utility of getting another movie ticket is

It eventually goes to zero. Utility applies to all choices, not just purchases.

The intuitive way to maximize utility and avoid diminishing returns is to change how we use our time and resources.

After basic needs are met, in theory, people invest in each thing to the extent that it's useful or pleasurable.

Of course, how well people can maximize utility in real life is another matter.

But remember, ultimately, our value comes from ourselves, from our shared needs, from what we enjoy, from the choices we make.

Some time ago, I decided to try an experiment.

I decided to say "yes" to everything I didn't like for a year.

I let myself say yes to anything that made me feel anxious or that I was usually reluctant to do.

Want to speak in front of a lot of people?

no but yes

Want to be on live TV?

no but yes

do you want to try acting?

Absolutely no but yes yes yes

And then something amazing happened. I tried to do something that intimidated me, and my fear disappeared.

Fear of speaking in front of many people, social anxiety Papa! and went somewhere

The power of this one word was amazing

"Jesus" changed my life

"Jesus" changed me

But there was one particular "yes" that deeply touched my life in ways I never could have imagined.

I have three wonderful daughters, Harper, Beckett, and Emerson. Little Emerson somehow looks like a Southern waitress.

call everyone "honey"

(Laughter) "Honey mug mug I want some milk?"

(Laughter) My southern waitress asked me to hang out with her one night, and I was about to go somewhere, and I said yes.

This Jesus was the beginning of a new life for our family.

I vowed that for the rest of my life, whenever my children ask me to play, no matter what I'm doing or where I'm going, I'll always say yes.

It's not perfect, but I'm trying my best

And it's had a magical effect on me and my kids and my family.

And there are some wonderful unexpected side effects that I didn't fully understand until recently, but I would say that saying yes to playing with my kids saved my career.

My job is what many call a dream job.

I'm a writer. I make a living by writing stories.

dream job

it's not

I am a master - a "Titan"

dream job

I'm producing a TV show, and I'm an executive producer.

It will be a considerable amount of programs

This season (September to May), I have a responsibility to bring 70 hours of programming out into the world.

Four TV shows, 70 hours of airtime. (Applause) Three shows, sometimes four at the same time.

Each show created hundreds of jobs that never existed before.

The production budget for an episode is around $3-6 million.

Let's say 5 million dollars

Every nine days, we produce four new episodes. So every nine days, we have a show worth $20 million.

In America, my show airs every Thursday night.

Translated into 67 languages ​​in 256 territories around the world and broadcasted to over 30 million viewers.

My brain is global. 45 of those 70 hours I've not only produced, but I've also written.

4 TV shows, 70 hours of air time, 3 shows in parallel, sometimes 4, $350 million budget, campfires burning all over the world.

who else would do this?

no one, that's why i'm a titan

dream job

(Applause) I'm not saying this to impress you.

I know how you feel when you hear the word writer.

By telling you this, I hope that those of you who run companies, who work hard for your country, who work hard in classrooms, in shops and at home, will take my work seriously. You will understand that I am not sitting in front of a computer all day daydreaming.

It's work, it's work, it's real, it's blood, it's sweat, it's not tears

I work hard I love working

When you're working hard, when you're immersed -- you don't feel anything else.

My job is to build a country out of nothing

Staffing the troupe Drawing on canvas

Singing all the high notes, running a marathon

to be beyonce

All of this at the same time

i love to work

It's creative, it's mechanical, it's exhausting, it's exhilarating, it's fun, it's embarrassing, it's objective, it's maternal, it's strict, it's wise.

When things are going well, there's a kind of transformation within me.

A hum starts in your brain and it grows and grows, and it's like a road in front of you, and it feels like you can run anywhere.

When I try to describe ham, many people think I'm talking about writing, that I'm talking about the joy of writing.

don't get me wrong it's true

But Ham was out of nowhere until he started making shows, and he started working, working, building, assembling, creating, co-producing, discovering this sound, this flow, this ham.

Ham is more than writing

Ham is action and activity Ham is drug

Ham is music, ham is light and air.

Ham is God's whisper in your ear

When you have a hum like this, it just pushes you higher.

The feeling of working hard until you get it, no matter what the cost

it's called ham

Or maybe I'm a workaholic.

(Laughter) You could call it genius.

maybe ego

Maybe it's just the fear of failing

don't understand

All I know is that I'm not the type to fail I love ham

I want to tell you that I'm a Titan I don't want to doubt it

The point is, the more successful you are, the more shows and episodes you have, the more obstacles you have to overcome, the more work you have to do, the more responsibilities and duties you have to do, the more attention you get, the more weight you have and the more expectations you have.

The more I worked to be successful, the more work I got.

what i said about work

You mean you love to work, right?

The country I was building, the marathon I was running, the theater company, the canvas, the high notes and the hum, hum, hum

i love ham i love ham

I need a ham I'm a ham

Am I nothing but a ham?

The hum stopped shortly

overworked overworked worn out burnt out

the ham stopped

My three daughters are always working titans with single mothers.

Harper says, "Mom can't come, but you can text Nanny."

Emerson says, "Honey, I want to go to Shonda."

daughters are children of titans

it's a small titan

My daughters were 12, 3 and 1 when the ham stopped.

ham engine dead

I don't love my job anymore, my engine won't start

Ham will never come back

my ham is broken

I was doing Titan's work the same way I always was, working 15 hours a day, all weekend, no regrets, no surrender, Titan never sleeps, never quit, heart full of passion, clear eyes, nothing changed.

But there's no ham there

Only silence in me...

4 TV shows, 70 hours airtime 3 shows co-produced, sometimes 4 4 tv shows, 70 hours airtime 3 shows co-produced ...

i was the perfect titan

I can introduce you to your mother.

The world had the same colors, but I had no more fun

that was my life

everything i've done

i am ham ham is me

What do you do when what you do, what you love, becomes like chewing sand?

Right now, some of you may be thinking, "Cry as much as you want, crazy Titan writer."

(Laughter) But yeah, if you're creating or working or doing what you love, being a teacher or a banker or being a mother or being a painter or being Bill Gates.

What are you?

I?

Am I still a Titan?

If my heart stopped singing Can I live in silence?

Then a young southern waitress said,

I was just about to walk out the door, and it was already late, but my daughter said, "Mommy, why don't we play?"

When I started to say that I can't play, I realized two things.

One, I should say yes to everything, and two, my Southern waitress didn't call me "honey."

She no longer calls anyone "honey"

When?

I missed my Titan days and mourned my loss, but now, right here, my daughter is changing before my eyes.

"Mommy won't you play?" says the daughter

I answer "yes"

nothing special

We played together and my sisters also joined us.

I didn't do anything special

(Laughter) But it was special, because when you're stuck in a place where the pain, the panic, the hum, you can't do anything but be conscious.

concentrate

just stay still

The country I was building, the marathon I was running, the theater company, the canvas, and the high notes didn't exist.

There's sticky fingers and sugary kisses and little voices and crayons and that song! I don't know what the frozen girl is, but she says she'll become who she really is

(Laughter) Peaceful and simple.

The air in this place is special and I can barely breathe

i thought i was breathing

Play is the opposite of work

I was happy

something broke inside me

I heard the door slowly open in my brain, and the energy rushed in.

It's happening, not just for a second

I feel

Ham quietly returns

Not completely, but barely, quiet, and you have to listen carefully, but they're there.

It's not the ham it used to be, but it's still the ham.

I felt like I knew the secret of magic

Shall we try not to get carried away

all is love that's all

It's not magic, it's not a secret, it's love

what we forgot

ham ham at work ham titan ham it was just a substitute

If you ask me who I am If I have to tell you who I am If I describe myself in terms of shows, how many hours I've been on TV, and how world-class my brain is, I think I've forgotten what a real ham is.

Ham isn't about power, it's not about work

ham is a joy

A real ham is also love itself

Passion from being excited about life

A real ham is also trust and peace

Real hams don't care about past glories, responsibilities and duties, expectations, pressures, and cares.

Real hams are extraordinary and original

A real ham is God whispering in your ear But maybe God was whispering the wrong words God can't tell me I'm a Titan

it's just to love

Use a little more love, a lot of love

Whenever kids want to play, I'm going to say yes

For some reason, I made this a rule of thumb, to give myself permission to break free from the guilt of overwork.

It's a rule so I have no choice I don't have a choice I want to feel the hum

I wish I could take it easy, but I'm not good at playing

I rather don't like it

I'm not as interested in work as I am

I feel inferior and hurt when I face this fact

i don't like to play

i like to work i always work

I prefer to be at work than at home

It's hard to face this fact. Who would rather work than spend time with their family?

yeah it's me

let's be honest i call myself a titan

I would say there is a problem

(Laughter) And maybe one of the problems is that we're too relaxed?

(Laughter) Running around the yard, going this way, this way.

Dancing at a 30 second dance party

Sing a musical song and play with a ball

Let the soap bubbles fly and the children will burst them

I was awkward and delirious and almost confused.

I was always worried about my cell phone.

but it's okay

My little ones show me how to live and the ham of all things fills everything

I kept playing until I wondered why we stopped playing in the first place.

You can do it too. Whenever your child wants to play, just say yes.

Do you think I'm an idiot with diamond shoes?

Maybe so, but still try

I have enough time

How do you know? 'Cause you're not Rihanna or the Muppets

Children don't think it's very funny

(Laughter) All you need is 15 minutes.

My two- and four-year-olds only want to play with me for 15 minutes before they find something else they want to do.

It's a great 15 minutes, but it's still 15 minutes.

Unless I'm a ladybug or a candy cane, I'll be gone in 15 minutes.

(Laughter) As for my 13-year-old daughter, if I can talk to her for 15 minutes, I'm a good parent.

(Laughter) All you need is 15 minutes.

No matter how hard the day is, you can always set aside 15 minutes of uninterrupted time.

The important thing is that nothing gets in the way

Don't use your phone, do laundry, or do anything else.

Everyone who has a busy life needs to prepare dinner

I have to bathe the kids, but I can do it in 15 minutes.

My children are my happiness, my everything, but it doesn't have to be them.

This is not a story about playing with children, it's about joy.

playing in the broadest sense

For you too, these 15 minutes

find something you enjoy

Would you like to play on that stage?

I'm not perfect, I'm failing as much as I succeed, forgetting to see friends, read, and stare into space.

"Why don't we play?" reminds me to fulfill myself Back when I got my first TV job Back when I started training as a Titan Back when I started competing with myself in a way I didn't quite understand What I gave up on

Can trying to focus completely on yourself for 15 minutes be a problem? Only 15 minutes?

not at all

I didn't work, and that's exactly what got Hamm back, as if Hamm's engine only refueled while I was away.

Work is nothing without play

It took a while, but one day, a few months later, I felt like I had cleared my throat, and I found myself in the office filled with unfamiliar melodies and grooves.

Now - I love that ham, but I don't love it anymore

I don't need that ham anymore

I'm not that ham, ham is not me, I'm not anymore

I'm sticky fingers with soap bubbles and a meal with friends.

I'm such a ham

life has ham

love has ham

Work ham is part of me, but it just isn't everything anymore. Thankfully.

Being a Titan doesn't matter anymore, and I've never seen a Titan do "Hanachimonme".

Work less, play more, but somehow my world keeps spinning

My brain is still global and the campfire is still burning

The more they play, the happier they are and the happier the children are.

I feel like I'm a better mother the more I play

The more you play, the freer your mind

The more you play, the better you work

The more I play, the more I can feel the ham The country I'm building The marathon I'm running In the troupe On the canvas To the high notes And hum-hum Another ham Real ham Life is ham

Every time I feel more hum, I feel like myself I'm not this unfamiliar, unstable, uncocooned, clumsy, new, lively Titan

I'm starting to understand myself enough to feel this new hum

I'm a writer, I write stories, I envision them

That part of the job is living the dream

it's the dream part of the job

It's a dream job, so it's okay to have a little dream

I said yes to working less and playing more

you don't have to be a titan

Why do not we play together?

thank you

(applause)

[(English) Do you know where the pep rally is?] Which word in this sentence is the most difficult to translate?

"know" is easy

Many languages ​​and cultures that don't have the right word for "pep rally" will be able to find a similar expression.

The most difficult word is actually the most obscure "you"

It's deceptively simple, but it's hard to translate "you" correctly without a solid understanding of the context in which it's used.

For starters, how well do you know the person you're talking to?

In many cultures, there are degrees of formality.

A close friend, much older, much younger, a stranger, or a superior

Even if it's the same "you", everyone may be slightly different

Many languages ​​reflect these differences in their pronouns, and this is known as the "pronoun-honorific" distinction.

For example, in French, when you talk to your friends at school, you call them "tu" and when you talk to your teacher, you use "vous."

English used to have something similar.

It's a nostalgic "thou"

Ironically, "thou" was actually an informal pronoun used for close friends, and "you" was the more formal and polite type.

This distinction disappeared when the British decided to be courteous to everyone.

At the same time, the difficulty of translating "you" has not gone away.

In Hausa and Korana, which "you" is used depends on the gender of the listener.

And in many other languages, it depends on whether you're talking to one person or many, like German "du" and "ihr."

It's the same with English, and there are dialects that use "y'all" and "youse" for a lot of people.

The plural forms "vous" in French and "Вы" in Russian can be used for one person if they're much more important than you, like "we" for a monarch.

A few languages ​​have a special word for "you" between two people, such as the Slovenian word "vidva."

If you prefer something more complicated, you can mix formality, number, and gender all at once.

Spanish ``tu'' is unisex informal singular ``usted'' is unisex formal singular ``vosotros'' is masculine informal plural ``vosotras'' is feminine informal plural ``ustedes'' is unisex formal plural

Phew!

After hearing this, you'll feel relieved, because some languages ​​often drop second-person pronouns.

In Romanian and Portuguese, pronouns can be left out of sentences, because the conjugation of the verb makes it clear.

And pronouns in Korean, Thai and Chinese can be dropped without any grammatical clues.

Speakers often think it's better to let the listener guess from the context than to get the pronoun wrong and be considered rude.

Now, if you encounter a sentence like this out of context while translating... "It's not you and you over there, but you's job is to translate 'you' using only your power."

well please do your best

And to translate this video into different languages ​​- to the volunteers, sorry!

This is the process that should occur after intercourse up to conception.

The sperm swims through the vagina, through the opening of the cervix, up through the uterus, and into one of the two fallopian tubes.

If an egg released during ovulation is in the fallopian tube, it can be fertilized by a single sperm.

Contraceptives are designed to interfere with this process, and there are three main ways.

It's a way of blocking the sperm, sterilizing it before it reaches the uterus, or preventing ovulation.

"Block" is the easiest.

Male and female condoms prevent sperm from coming into contact with the vagina

Because of this blockade, unlike other birth control methods, it also prevents sexually transmitted infections.

Pessaries, cervical caps, and sponges, on the other hand, work by covering the cervix and enclosing the entrance to the uterus.

These contraceptive methods, also called barrier methods, can be used with spermicides, and are an example of the second category, "incapacitating."

Spermicides are chemicals that stop and destroy sperm.

Modern spermicides include foams, creams, jellies, pessaries, and even thin, translucent films that dissolve in the vagina.

These are inserted directly into the vagina before intercourse, and when used in conjunction with blocking methods such as diaphragms and condoms, they provide more reliable contraception.

The third category is anything that "suppresses" the egg from maturing in the ovary.

Because without an egg in the fallopian tube, there would be no sperm and nothing to fertilize.

Hormonal contraception, including pills, patches, depot shots and vaginal rings, releases synthetic progesterone and estrogen in various combinations.

This mixture of hormones suppresses ovulation, keeping the egg in its immature stage and sending it to the ovary.

Synthetic progesterone actually has a blocking effect as well.

By making the cervical mucus thick and sticky, it prevents sperm from easily swimming through.

There are other birth control methods that have multiple functions.

For example, many birth control rings and intrauterine devices contain synthetic hormones that inhibit ovulation.

Some also contain copper, which can incapacitate the sperm and prevent the egg from implanting in the uterus.

"Block" "Incapacitate" "Suppress" Which is the best?

Despite the differences, being good has to do with being easy and simple to use correctly.

For example, male condoms are 98 percent effective in preventing pregnancy when used correctly.

98% means that if 100 couples use it correctly in a year, only two will get pregnant.

But not everyone uses it correctly, and the actual contraceptive effectiveness is 82 percent.

Patches and pills are 99% effective when used correctly

But the actual efficiency is 91%

Spermicides are only 85% effective when used correctly, and only 71% effective in actual use.

Another important consideration in choosing a contraceptive method is side effects, which often strongly affect only women, not men.

Hormonal methods, in particular, can cause headaches, nausea, and high blood pressure, which varies from woman to woman.

Therefore, these methods require a doctor's prescription.

Contraceptive choice is a personal choice, and what works best for you now may change in the future.

Scientists continue to explore new methods, such as male pills that block sperm production.

In the meantime, there are so many options out there: blocking the sperm, neutralizing it, suppressing ovulation, keeping it away from the sperm.

How can I get what I want with just my words?

This is exactly what Aristotle answered more than 2,000 years ago in his "rhetoric."

Oratory, according to Aristotle, is the art of finding ways to persuade others.

And today, it's used in all communications.

Although Aristotle focused on public speaking, he wrote about three types of persuasive rhetoric.

"Statutory arguments," or arguments used in court, are like investigators at the scene of a crime, clarifying past facts and making decisions.

Oratory arguments, or expressive arguments, are statements about the current situation, much like a wedding speech.

To make change happen, we do it through what we call "parliamentary rhetoric," or rhetoric intended to encourage and retain.

Congressional arguments focus on the future rather than the past or present.

It's the rhetoric of politicians debating the implications of new legislation, like Ronald Reagan warning that Medicare would lead to socialism and that America's free age would be a story told to future generations.

But it's also the rhetoric of an activist who craves change, much like Martin Luther King, Jr. dreamed that his children would one day live in a country where they would be judged by their character, not their skin color.

In both cases, the speaker presents a possible future to the audience and seeks their help in avoiding or realizing it.

So what good is a good parliamentary argument good for besides the future?

According to Aristotle, there are three types of persuasion: ethos, logos, and pathos.

Ethos is how you convince your audience that you can be trusted.

In his 1941 address to the United States Congress, Churchill highlighted his virtues as a democratic activist, saying, "I have been a lifelong ally of the currents of nations on both sides of the Atlantic against privilege and monopoly."

Farther back, the Roman consul Cicero, who defended the poet Archias, touted his worldly tactics and political expertise: "These are the conclusions I have drawn from my liberal science studies and from a thorough training that I never thought was forced upon me."

And ultimately, you can show that you're impartial, that is, selflessness.

Logos uses logic and reason

This method uses rhetorical techniques such as analogies, examples, research citations and statistics.

But not just facts and figures

It's also the structure and content of the speech itself.

The point is to use factual knowledge, like Sojourner Truth's point about women's rights, to persuade your audience: "I have the muscles of a man, I can work like a man.

I've plowed, harvested, threshed, chopped down and reaped trees Can a man do more? ”

But advocates can also manipulate people by using false information that their audiences believe to be true, using claims that are still widely believed, such as vaccines causing autism, when in fact they are false.

And finally, the emotional pathos is the most effective method in this mass media age.

Rather than being right or wrong, pathos can be irrational and unpredictable.

It can easily rally people for peace or drive them to war.

Most of the ads -- from beauty products claiming to reduce physical anxiety to ads for cars claiming to feel empowered -- rely on Pathos.

Aristotle's rhetoric is still a powerful tool today, but determining which method to use depends on understanding not only the audience and purpose, but the appropriate place and time.

And also, importantly, when this persuasion method is used on you, you'll realize it.

A long time ago, 1.3 billion years ago, in a galaxy far, far away, two black holes caught in an inescapable spiraling motion pulled together and collided, turning three suns' worth of matter into pure energy in a fraction of a second.

At that moment, it shone brighter than the stars of all galaxies in the known universe combined.

It's a huge explosion

but it's a black hole

It's not like the energy was released as light.

All that energy was captured by space-time itself, making the universe vibrate with gravitational waves.

Let's take a look at the scale of the time we're talking about here.

1.3 billion years ago, when multicellular life finally appeared on Earth.

Since then, we've had coral reefs, fish, plants, dinosaurs, humans, and even the Internet.

And 25 years ago, a group of particularly ambitious people - Rainer Weiss at MIT, Kip Thorne and Ronald Draver at Caltech - thought it would be nice to build a giant laser detector to detect the gravitational waves produced by things like colliding black holes.

I thought a lot of people were crazy people.

A lot of people thought it was a brilliant convention-breaker, and the National Science Foundation decided to fund this crazy idea.

And after decades of conception, development, construction, and incredible effort, we've created the LIGO Laser Interferometer Gravitational Wave Observatory.

Over the last few years, LIGO has greatly improved its accuracy and dramatically increased its detection capabilities.

This is called improved LIGO.

In early September 2015, LIGO went live for final commissioning, with some remaining minor adjustments.

And on September 14th, 2015, just a few days after the detector started working, gravitational waves from that black hole collision passed through Earth.

through my body and yours

And it passed through LIGO's detector.

(Voice of Scott Hughes) There are only two things in my life that have moved me more than this: when my daughter was born --

That's when I had to say goodbye to my sick father.

This was the climax of my entire working life.

What I've been doing all this time is no longer science fiction! (Speaker) This is my good friend and collaborator, Scott Hughes, a theoretical physicist at MIT who has spent 23 years studying gravitational waves from black holes and signals that can be detected by observational facilities like LIGO.

Now let's talk a little bit about what gravitational waves are.

Gravitational waves are like ripples in the shape of spacetime.

When a wave passes through space and everything in it, it's stretched in one direction and compressed in the other.

That's why teachers who teach general relativity end up doing a funny dance in the classroom.

"Extend and spread, extend and spread"

The problem is that gravitational waves are extremely weak, ridiculously weak.

For example, the gravitational wave on September 14th -- well, everyone here was stretched and compressed when the gravitational wave came -- the stretch is about 1/10 to the 21st power for the average person.

It's a number with a decimal point followed by 20 zeros followed by a one.

And that's why I thought people were doing something wrong with the people working on LIGO.

Even with a five-kilometre-long laser detector -- that's crazy enough -- you have to measure the length of the detector to less than a thousandth of the radius of the nucleus.

It's a crazy story

Near the end of his famous textbook on the theory of gravity, LIGO co-founder Kip Thorne talks about the difficulty of detecting gravitational waves, saying, "To build such a detector, we have to overcome enormous technical challenges.

But physicists have ingenuity, and with the support of the public at large, any challenge can be overcome."

Thorne wrote this in 1973, 42 years before his success.

Now back to LIGO, as Scott used to say, LIGO is more like an ear than an eye.

what do you mean

In the case of visible light, the wavelengths are much smaller than the things you see around you, like your face or your cell phone.

And this is a very good thing, because just by looking at the light coming from different places, we can construct a sort of image, a map, of the things around us.

Sound is a different story

The wavelength of audible sound can be as long as 15 meters.

So it's very difficult to capture the shape of an object of interest, such as a child's face, with sound.

practically impossible

Instead, in the case of sounds, we infer the story behind the sound by listening to the pitch, the tone, the rhythm, the loudness.

Alice is talking

bob interrupted

stupid guy

gravitational waves are the same

Gravitational waves cannot simply describe the shape of objects in space.

But by listening to changes in wave size and frequency, we can hear the story they are telling.

For LIGO, the frequencies it captures are in the audible range.

So if you translate the wave pattern into sound, which is pressure waves in the air, you can literally hear what the universe is saying.

For example, there's a lot we can learn about black hole collisions by listening to gravity, something that my colleague Scott has spent a lot of time thinking about.

(Voice of Scott) If you have two black holes that aren't spinning, the sound is simply "Woop!"

When two black holes are spinning around at high speed, they sound similar, but with an added inflection that goes something like this: "Uh-huh-huh-huh."

It's like a waveform with the word rotation engraved on it.

(Speaker) Sept. 14, 2015 -- a day that will always remain in my memory. LIGO captured this sound (whooping sound), and if you hear it, it's unmistakably -- (Scott's voice) Two black holes, each about the mass of 30 suns, spinning at the speed of a mixer.

(Speaker) Let's take a moment to think about what this means.

Black holes are the densest objects in the universe. One weighs 29 suns, the other 36 suns, and just before they collided, they were circling each other at a speed of 100 revolutions per second.

Imagine how powerful it is

it's amazing

And we know it by listening

Here lies LIGO's enduring value

It's an entirely new way of observing the universe that has never been seen before.

It's a way to make us hear the invisible parts of the universe.

There are many things that we cannot see, whether in fact or in nature.

Take a supernova, for example. I would really like to know how a massive star explodes into a supernova.

We can learn a lot about the universe from supernovae.

The problem is that the interesting physics are happening in the core, which is covered by thousands of kilometers of iron, carbon and silicon.

You can't see through the light

But gravitational waves can pass through steel, like glass or whatever.

And I wish we could explore the Big Bang, the universe's immediate aftermath, but we'll never be able to see it, because the Big Bang itself is shrouded in its afterglow.

If it's gravitational waves, we should be able to go back in time and see them.

Most importantly, there must be something we've never seen, never seen, never even imagined, but can only discover by listening.

In fact, in that first event, LIGO discovered something we didn't expect.

That's exactly what my colleague Matt Evans at MIT, a key member of the LIGO collaboration, says (voiced by Matt Evans).

So big, so old, so ancient, that black hole is kind of like the dinosaur bones that paleontologists study.

It gives us a completely different perspective of what's in the universe, how stars are born, and how we came to be born out of that chaos.

(Speaker) Our challenge is now as ambitious as it gets.

Thanks to LIGO, we now know how to build a sophisticated detector that can hear the rustle and chirping of the universe.

Our job is to envision and build new observatories, a whole new generation of observatories on the ground and in space.

What could be more glorious than listening to the Big Bang itself?

It's our job to dream big

let's dream together

thank you very much

(applause)

Will the day come when human civilization will spread throughout the galaxy?

Can we leave our tiny blue planet and make homes in a myriad of distant star systems?

It's a question that can't be answered very quickly

There are about 300 billion stars in our Milky Way galaxy spread out within about 160,000 light years.

So far, only one spacecraft has been sent out of the solar system by humans, traveling at a speed of 0.006% of the speed of light.

At this rate, it would take over 2.5 billion years to go from one end of the galaxy to the other.

There is also the question of human survival.

There's a huge distance between stars

Humans cannot live sustainably on most planets, and even if they do, they require vast amounts of resources.

But a few decades ago, it was shown that it was theoretically possible not only to spread human civilization across the galaxy, but to do so fairly quickly without violating the known laws of physics.

This discovery was inspired by the work of mathematician John von Neumann, who envisioned an imaginary machine that could self-replicate and create new generations of itself.

This later became known as the von Neumann machine.

Now, if we were to apply this to space exploration, one idea would be to build this von Neumann machine on Earth and launch it into space.

This self-sufficient machine landed on a faraway planet

We'll mine the resources we can find, store the energy, send the new self-replicating machine to the nearest planet, and repeat the process.

As a result, millions of probes will spread out into space like ink in a tank.

Calculations show that a single von Neumann machine traveling at 5% the speed of light could grow to the lengths of the Milky Way galaxy within four million years.

It seems like a long time, but considering that our galaxy is 14 billion years old, by cosmic standards, it's a terrifyingly short period of time -- about the equivalent of about two and a half hours in a year.

Building a von Neumann machine requires undiscovered technologies like advanced artificial intelligence, miniaturization of machines, and better propulsion.

If we're going to expand human settlements across the galaxy, we'll need another technological leap forward: we'll have to be able to artificially generate organic organisms and bodies from elements and genetic information.

In any case, if in the next billion years a civilization different from mankind built similar machines and self-replicated them and headed for Earth, the galaxy would be teeming with machines by now.

So where are all the machines?

Some astronomers, like Carl Sagan, have argued that intelligent aliens wouldn't build self-replicating machines.

As the machines get out of control and keep replicating, they may eat the planet down to its core.

Others see the lack of machines as proof that alien civilizations don't exist, or that they'll be extinct before the technology they need to survive is developed.

But people still keep imagining, "What if we had machines?"

Science fiction writer David Brin writes about a world in which several different von Neumann machines co-exist and proliferate.

Some machines are designed to welcome new civilizations, while others are designed to find and destroy them before they pose a threat.

For example, Brin's short story "Lungfish" tells the story of von Neumann Machine observing the Earth and waiting until human civilization reaches a certain maturity.

Right now we have nothing but curiosity and hypotheses.

But next time you look up at the night sky, consider the possibility that billions of self-replicating machines are making their way among the stars of our galaxy toward you.

If it really exists, one of them will eventually reach Earth, or maybe it has already.

Your favorite band plays great, but you're bad at keeping things organized.

Even while on tour, he leaves his instruments in a mess and pisses off his manager.

On the day of the big concert, the band members wake up to find themselves trapped in a windowless, soundproof rehearsal room.

the manager explains the situation

"There are ten big boxes outside

Each box contains one of your instruments, but don't let the pictures fool you, it's a mess.

Allow me to go out one by one

While you're outside, you can look at the contents of no more than five of any box, until the guards take you back to the tour bus.

You can't touch the instruments, you can't tell the members what you saw

You can't mark the box, you can't shout

If everyone finds their own instruments, we can play tonight.

If you can't find it, you're out of the deal with the label.

Give me three minutes to think."

band members despair

After all, one member has only a 50% chance of finding their instrument by picking five boxes at random.

The odds of all 10 succeeding are even lower, just 1 in 1024.

But suddenly the drummer came up with a better way, and the odds of that happening are over 35%.

Do you know how?

Stop the video at the next screen if you want to think for yourself

3 2 1 The drummer said, "Everyone opens the box with the picture of their instrument first.

If you have your own instrument, you will succeed.

If not, look at the instrument in the box and open the box with the picture of that instrument.

Repeat until you find your instrument."

The members are skeptical, but to their surprise, they all find their instruments.

In a few hours, you'll be performing in front of thousands of adoring fans.

Why did Drummer's method work?

Members start with a box with their instrument painted on it and follow a series of steps to get to the box with their instrument.

Also note that if you continue, you'll return to the first box, so this is a loop.

For example, if the boxes are arranged like that, the vocalist opens the first box, finds the drums, finds the bass in the eighth box, finds the mic in the third box, and goes back to the first box.

This method works much better than randomly opening it, because since you start with a box with a picture of your instrument on it, everyone will have to limit their search to loops that contain their instrument, and there's a decent chance that all the loops will be five or less in length -- 35 percent.

Let's see how this probability is calculated

For the sake of simplicity, I'll use a simple case: four instruments, and each musician is only given two chances.

Let's calculate the probability of failure, which is the probability of opening three or four boxes before finding your instrument.

There are 6 loops for the 4 boxes.

An interesting way to count combinations is to draw a square, put an instrument in the corner, and draw a diagonal line.

Count how many loops are different from each other. Notice that these two are the same thing, because they're just starting at different points.

but these two are different

Using a triangle, we can visualize that there are eight loops of three boxes.

By thinking of the instruments to exclude, we can see that there are four triangles, and each of them has two paths.

In the end, out of 24 box combinations, 14 fail and 10 succeed.

This method works well when you have an even number of musicians.

When applied to the case of 10 musicians, the odds are about 35%.

A thousand musicians?

in a million people?

As n increases the probability approaches 30%

Success isn't guaranteed, but it's not hopeless, it just takes a little luck.

Ladies and gentlemen, if you liked this quiz, please try these two as well.

It starts off as a little discomfort, but then it becomes a sensation so strong you can't ignore it.

Ultimately, out of frustration with nowhere to go, the first thing that comes to mind is running to the bathroom and feeling 'ahhh'.

Humans need to urinate at least four to six times a day, and in our hectic modern life, sometimes we have to put up with it.

What obstacles does your body have and how long can you endure them?

The key is the function of the bladder, an egg-shaped sac inside the pelvis.

Together with the organs surrounding the bladder, it forms the urinary system as a whole.

You have two kidneys, two ureters, two urethral sphincters, and one urethra.

Urine is the yellow fluid that's constantly flowing out of the kidneys.

Your kidneys make urine from water and waste products in your body, which is then sent down two muscular tubes called ureters.

It then travels down the ureters into the bag-like bladder.

The muscular wall of the bladder is made up of the relaxed detrusor muscle, which causes the filled bladder to inflate like a balloon.

When the bladder is full, the detrusor muscle contracts.

The internal urethral sphincter automatically and involuntarily relaxes, releasing urine.

The expelled urine travels to the urethra and stops at the external urethral sphincter.

It works like a faucet

Tighten your sphincter muscles when you want to hold back urination

When you want to urinate, you consciously relax your sphincter muscles.

How do you know you want to urinate because your bladder is full?

The lining of the detrusor muscle is made up of millions of stretch receptors that respond when the bladder is full.

Signals from the receptors travel along nerves to the sacral portion of the spinal cord.

When the reflected signal is sent back to the bladder, the detrusor muscle contracts slightly, increasing the pressure in the bladder and telling you it's full.

At the same time, the internal urethral sphincter opens.

This mechanism is called the voiding reflex.

To delay the timing of urination, the brain counteracts this response by sending another command to contract the external urethral sphincter.

When 150 to 200 ml of urine accumulates, the muscle wall of the bladder stretches, so you know it's full.

At 400-500ml, this sensation becomes uncomfortable.

The bladder continues to stretch, but there is a limit.

1,000ml or more may explode

Most people become incontinent before this happens, but in very rare cases, when the need to urinate cannot be detected, the bladder ruptures painfully and requires surgery.

Normally, the desire to urinate stops the signal from the brain to the external urinary sphincter, causing it to relax and empty the bladder.

The external urethral sphincter is one of the pelvic floor muscles that support the urethra and bladder neck.

We're lucky to have pelvic floor muscles, because anything that puts strain on them, like coughing, sneezing, laughing, or jumping, can cause urine leakage.

Pelvic floor muscles prevent leakage until you are ready to urinate

But if you hold back too much, urinate too vigorously, or urinate without paying attention to your posture, you may over time weaken your muscles and overload them.

The result is overactive bladder, bladder pain, urinary urgency, and urinary incontinence.

I'm not very patient when it comes to my long-term health.

In the short term, your body and brain protect you, so you can choose your moments of bliss at your convenience.

An archaeological team recently unearthed human fossils that are about 15,000 years old and found something interesting.

Our ancestors had holes in their teeth

Cavities were caused by the same microbes that live in our mouths that plague us today.

Shortly after birth, these microbes live symbiotically with us.

It usually passes through the mother's mouth as a baby.

And when teeth erupt, bacteria naturally start to grow.

Depending on what you eat -- especially how much sugar you eat -- certain microbes can grow and cause tooth decay.

Food that's high in sugar causes an outbreak of bacteria in your mouth, a bacterium called Streptococcus mutans.

Like humans, this microbe loves sugar and uses this molecule as a basic building block and also as an energy source.

When consuming sugars, bacteria produce acidic by-products, such as lactic acid.

Streptococcus mutans can resist this acid, but unfortunately our teeth cannot.

Human teeth are covered with a protective layer of hard enamel, but they're no match for acid.

Over time, this dissolves the calcium and wears away the protective layer.

The acid gradually opens the way for the bacteria to reach the second layer of the tooth, a layer called dentin.

Because the blood vessels and nerves are buried deep inside the tooth, even if the tooth has spread, it doesn't hurt at this point.

But when the damage goes beyond the dentin, it allows more bacteria to infiltrate, exposing the nerve of the tooth and causing severe pain.

If left untreated, the entire tooth will erode, requiring extraction due to this sugar-loving bacteria.

The more sugar in your food, the more dangerous your teeth are.

Cavemen had little taste for sugar, so why did they have cavities?

If you eat a meat-based diet, you're less likely to get cavities because red meat contains very little sugar. But meat wasn't the only thing early humans ate.

The cavemen also ate root vegetables, nuts, and grains, all foods that contained carbohydrates.

When exposed to enzymes in saliva, carbohydrates are broken down into simpler sugars that can feed the hungry bacteria in your mouth.

So even though people ate less sugar than they do today, their teeth were still exposed to sugar.

But that doesn't mean they couldn't treat cavities.

Ancient ruins show that by about 14,000 years ago humans were already using sharpened flint to remove bits of damaged teeth.

They built primitive drills to remove any irregularities in the holes, and filled the cavities with beeswax just like modern fillings.

Today, we have much more sophisticated technology and tools, and fortunately for those of us who eat sugary diets and are vulnerable to damage.

After the Industrial Revolution, tooth decay increased rapidly because technological advances suddenly made refined sugar cheaper and more accessible.

Amazingly, 92 percent of Americans now have cavities.

Genes that cause weaknesses, such as soft enamel, make some people more prone to tooth decay, but most are caused by high sugar intake.

But as well as reducing sugar and starch intake, methods have been developed to minimize tooth decay.

Most toothpaste and most tap water contain trace amounts of fluoride.

Fluoride strengthens teeth and regenerates enamel, which protects teeth from acid.

As the decay progresses, fillings are used to close the eroded areas to prevent further deterioration.

The best way to prevent tooth decay is still to reduce sugar intake and maintain good oral hygiene to eliminate bacteria and nutrients.

For example, brushing your teeth regularly between meals, flossing between your teeth, and avoiding sugar, starches, and sticky foods that stick to your teeth.

Gradually, the number of sugar-loving microbes in your mouth diminishes.

Unlike the cavemen of yesteryear, today we have the knowledge to prevent the affliction of cavities.

you just have to take advantage of it

What was originally a hobbyist tool is on the verge of becoming a multi-billion dollar industry.

Research, environmental monitoring, photography, film, journalism, and these are just a few examples of commercial drone applications, made possible by capabilities being developed in research laboratories around the world.

For example, before drone courier services became a public concern, at the FRAC center in France, in front of an audience, an autonomous flying robot built a six-meter tower out of 1,500 bricks.

Tethered flying robots can fly at high speeds and accelerate in very small spaces.

Flexible structures can also be created autonomously.

Among the technologies that drones have mastered are how they carry packages, how they respond to loss of control situations, and how they interact with the outside world in general.

Today I'd like to introduce you to a new project I'm working on.

The idea is to push the boundaries of what's possible with autonomous flight.

For the system to work autonomously, it needs to collectively know the spatial position of each moving object.

In our lab at ETH Zurich, using an external camera for object localization has allowed us to focus on rapid development of highly dynamic tasks.

The demo you see today uses a new positioning technology developed by Verity Studios, a spin-off from our lab.

no external camera

Each vehicle has sensors that know where it is in space and computers that determine what action to take.

The only instructions we give from the outside are high-level instructions like "Take off" and "Land".

This is called a "tailsitter"

Fulfill two conflicting demands

Like any fixed-wing aircraft, it can fly horizontally more efficiently than its helicopter counterpart.

But unlike most fixed-wing aircraft, it can hover, which makes it easy to take off and land, and it's versatile.

But the benefits don't come for free

One of the downsides of tailsitters is that they're vulnerable to atmospheric disturbances like gusts of wind.

We are developing new control mechanisms and algorithms to compensate for this.

The basic principle is to be able to regain control from any situation, and to be able to improve performance from experience.

(Applause) Alright.

In research, we often ask ourselves fundamental, abstract questions that get to the heart of the matter.

For example, the question is: What is the minimum number of moving parts required for flight control?

There's a practical reason why I want to know the answer to this question.

Helicopters, for example, are familiar machines with thousands of moving parts that try to hurt people.

Decades ago, an airplane that an experienced pilot could successfully control remotely had only two moving parts: a propeller and a rudder.

Recently, we discovered that we can have one moving part.

This is a "monospinner," the simplest structurally controllable aircraft that we developed just a few months ago.

There's only one moving part, the propeller.

No flaps, no hinges, no ailerons, no actuators, no control surfaces, just one propeller.

It's mechanically simple, but to keep it stable and free to fly, the electronic brain inside does something complex.

Still, it's no match for Tailsitter's sophisticated algorithms, and you'll need to throw it well to get it to fly.

The odds of you throwing a good shot at me with all your attention are very slim, so let's just skip that and watch the video we shot last night.

(Laughter) (Applause) If the monospinner is an attempt at simplicity, this omnicopter with eight propellers is an attempt at excess.

What can you do with this surplus?

Noteworthy is its high symmetry

As a result, the direction becomes ambiguous.

brought amazing powers

Fly freely through space, it doesn't matter which way you're facing or how you're spinning

There's an inherent complexity to this, largely due to the airflow interference from the eight propellers.

Some parts can be modeled, but the rest must be learned from experience.

Please look

(Applause) For flying robots to become part of our everyday lives, they need to be extremely safe and reliable.

Over there, it's made up of two airframes with two propellers.

this one rotates clockwise

the other rotates counterclockwise

Together, they behave as one high-performance quadcopter.

If there's a problem with the motors, propellers, electronics, or battery pack, you can continue to fly with reduced performance.

Let's actually stop the operation of one aircraft.

(Applause) And the last thing you see is an attempt to create an artificial swarm.

A multitude of cooperating, autonomous vehicles opens up a new palette for aesthetic expression.

It's using a small, off-the-shelf quadcopter, and it's lighter than a loaf of bread.

Each one recognizes its own position and controls it autonomously, so there is absolutely no limit to the number of aircraft.

(Applause) (Applause) (Applause) I hope today's demonstration will inspire many to envision a revolutionary role for flying robots.

For example, that extremely safe flying robot has dreams of becoming a flying lampshade on Broadway.

(Laughter) The truth is, it's hard to predict the impact of nascent technology.

For those of us like you, the greatest reward is in the act and process of creation itself.

I've always felt that the universe we live in is so wonderful and full of wonders that creative, clever creatures can reshape it in such spectacular ways.

It's kind of a bonus that this technology has huge commercial and economic potential.

thank you

(applause)

Few people have had as much influence on the world and many of today's thinkers as Plato.

As one 20th-century philosopher once said, "All Western philosophers are nothing more than footnotes to Plato."

He founded the first Western university and was the teacher of the great thinkers of ancient Greece, including Aristotle.

But even one of the founders of philosophy wasn't perfect.

While his ideas were good, a few didn't stand the test of time.

Here's a rundown of his best and worst ideas.

Plato argued that the world is imperfect, and beyond that lies a perfect and immutable world of ideas.

An idea is an idealized version of the things and concepts around us.

It acts as a kind of instruction manual for our world.

In the world of ideas, there's the ideal tree, the ideal YouTube channel, the ideal justice, the ideal love, and so on.

Our reality consists of imperfect copies of ideal ideas.

Plato argued that the philosopher should ponder and try to understand this perfect idea to better steer our false reality.

It may seem silly, but the discontinuity between the apparent world and the greater truth behind it is one of the problems that has plagued philosophers the most.

Thousands of pages of theologians, philosophers and playwrights have debated the subject.

This question raises the question, "Should we trust the senses or the intellect to get to the truth?"

Plato's answer is intelligence

Without reason, there is no possibility of even speculating about ideas.

But intelligence didn't always lead Plato to success.

In trying to place humans among animals, he lumped us together with birds.

"Featherless bipeds" was his formal name.

Cynic Diogenes was disgusted by this definition and rushed into Plato's class with a shorn chicken and aloud, "Behold, this is the man Plato speaks of."

But let's go back to the good ideas

Plato was one of the earliest recorded political theorists and is considered, along with Aristotle, to be the father of political science.

In his view, being a ruler was no different from being any other craftsman, like a potter or a doctor, and he believed that only those skilled in that craft would be fit to be rulers.

Governance is the skill of contemplating ideas.

The utopia envisioned in Plato's The State has justice as its ultimate goal.

Plato's ideal city should pursue a harmonious balance between individual organizations and classes, and should be ruled by a philosopher as king.

Thousands of years ago, Plato also believed that women were equally capable of governing in this model city.

Unfortunately, his ideas about women were inconsistent, and elsewhere he compared them to children.

They also believed that a woman's womb was a living animal that moved around and caused disease.

This erroneous idea was embraced by Plato's contemporaries, and sadly continued to influence European medicine for hundreds of years.

Furthermore, he thought that society should be divided into three groups: producers, soldiers, and rulers, and that with some noble lie, everyone should be convinced of this structure.

The noble lie he put forward is that we are all born with gold or silver or an alloy of brass and iron in our souls, and that determines our role in life.

The idea of ​​this noble lie continued to be relied upon by some thinkers, and it became the archetype of 20th-century propaganda, and the idea of ​​the philosopher-king as its wielder gave rise to dictatorships.

Should Plato's status as one of history's greatest philosophers be tainted by the error of a few ideas?

no!

Plato provided a starting point for subsequent leaders and thinkers.

Over the centuries, we've had the opportunity to test these ideas, and either approve or reject them, through discussion and experience.

We continue to refine and modify and edit his ideas, which are the foundation of the modern world.

Three lions and three wildebeest escaped for their lives from wildfires that burned the grasslands.

In order to escape the raging fire that is approaching, you must cross the other side of the river where the crocodiles live.

Luckily, there was a raft on this river bank.

You can only carry two animals at a time, and to paddle across the river you'll need to ride a wildebeest or a lion -- at least one.

But I have one problem

If there are more lions than wildebeest on either bank, even for a moment, the lion's instinct kicks in and the wildebeest is eaten.

This includes the animals on the raft when it reaches shore.

What's the fastest way to get every single one to the other side? On the condition that wildebeest cannot be eaten by lions.

If you want to solve this problem yourself, stop here

3 2 1 until the answer If you get stuck in a problem like this, write down all the possible options at each point, and write down the options that follow from each one.

For example, there are five options for who goes first: 1 wildebeest, 1 lion, 2 wildebeest, 2 lions, or 1 of each.

If it's just one, it has to come back.

If two wildebeests cross first, the remaining wildebeest will be eaten in the blink of an eye.

So these options are ruled out

If you start with two lions, or one lion and one wildebeest, you can actually solve the problem with the same amount for both.

To save time, I'll focus on the second case.

Place one lion and one wildebeest

But when the wildebeest remained and the lions returned, there were three lions on the right bank.

Bad news for the two wildebeests that were left there.

So we have to let the lions stay on the left bank and the wildebeest go back to the right bank.

Then again we have the same five options, but one lion is already on the left bank.

If two wildebeest have gone, the other one will be eaten, and if both animals have gone one by one, the wildebeest on the raft will be attacked by more numerous lions as soon as it reaches the opposite bank.

I'm stuck, which means that on the third crossing, two lions must cross.

If you drop one, there will be two lions left on the left bank.

The third lion returns to the right bank, where the wildebeest awaits.

next?

There are two lions waiting on the left bank, so there's only one option: two wildebeest.

And then it doesn't make sense to have two more wildebeest come back, because it's back to where it was before.

If two lions return, there will be more lions than wildebeest on the right bank.

So if one wildebeest and one lion return, there will be one lion and one wildebeest on the left bank and two on the right bank.

It doesn't make sense to put them in one at a time, so next time it has to be two lions or two wildebeest.

If the lion goes, the wildebeest will be eaten on the left bank, so the lion will stay there and two wildebeest will cross.

Now that all the gnus have arrived safely at their destination, it looks like we're going to have a solution soon.

Now that one lion can go back and take each of its fellow lions to the left bank.

A total of 11 crossings, the minimum number of times everyone can cross the river safely.

If you send two lions to start with, you'll get the same solution, again 11 times.

Six barely escape the fire and start a new life on the other side of the river.

Of course, the danger is over, but how long their unlikely bond will last is another matter.

I was really looking forward to hearing that this year's theme was "Dreams", but my session was "Nightmare?"

(Laughter) That's certainly true when it comes to the climate crisis.

I have some bad news, but I have a lot more good news.

I pose three questions, and the answer to the first question inevitably involves a bit of bad news.

But wait, the answers to the second and third questions are really very positive.

The first question is, "Do we really have to change?"

Of course, the Apollo program and other things changed the environmental movement, and it really started the modern environmental movement.

The first Earth Day took place 18 months after people saw this "Earthrise" photo.

And by looking back at Earth from space, we've learned a lot about ourselves.

One of the things we've learned is confirmation of what scientists have been saying for a long time.

One of the most important facts about the climate crisis has to do with the sky.

As this picture shows, the sky isn't vast and infinite, as it seems from the ground up.

In reality, it's just a very thin atmospheric shell surrounding the Earth.

It's like the sewer of industrial civilization in our current social structure.

110 million tons of global warming pollution that creates the greenhouse effect is being spewed into the sky in 24 hours. It's free.

There are many sources of greenhouse gases, and of course I'm not going to consider them all.

Concentrate on the main agriculture, food and population related

Forestry, transportation, oceans, and permafrost thaw are also relevant.

I'm going to focus on the crux of the problem here, which is that we're still dependent on polluting carbon-based fuels, which account for 85 percent of the world's energy burned every year.

As you can see from this figure, the increase in emissions has accelerated since World War II.

Human-caused global warming pollution is accumulating in the atmosphere, and it now continues to capture the same amount of excess thermal energy every 24 hours as 400,000 Hiroshima bombs exploded 365 days a year.

I've done a lot of fact-checking, but this is a fact, even if it's an understatement.

Earth is a big planet, but (explosion) That's a lot of energy, let alone 400,000 times that amount every day.

That excess thermal energy heats the atmosphere and the entire Earth system.

let's see the atmosphere

This graph used to be a normal distribution of temperature.

The white areas are days with normal temperatures, and the period 1951-1980 was chosen randomly.

Blue means cooler than average days Red means warmer than average days

In the 1980s, the entire distribution curve shifted to the right.

A statistically significant number of hot days appear in the lower right corner.

In the '90s, the distribution curve moved further.

We find that over the last decade, there have been more days with extreme heat than days with cooler than average temperatures.

In fact, there are 150 times more hot days on the Earth's surface than there were just 30 years ago.

record-breaking temperatures, 14 of the 15 hottest years since instrumentation began

It's happening in this fledgling century.

last year was the hottest of all

Until last month, there were 371 consecutive months that were hotter than the 20th century average.

And last month was not only the hottest January, but the first time it was more than 2 degrees Fahrenheit (1.1 degrees Celsius) above average.

These high temperatures affect animals, plants, people, and ecosystems.

Globally, 93% of excess heat energy is stored in the oceans.

Scientists are now able to accurately measure the amount of heat buildup in the deep ocean, in the middle, at shallow depths of hundreds of meters, and at all depths.

and this is also accelerating

started more than a century ago

More than half of the rise has happened in the last 19 years.

this has consequences

The direct effect is that storms originating from the ocean are becoming more intense.

The waters of the Pacific Ocean, through which Super Typhoon Haiyan passed before hitting Tacloban in what was the most devastating storm ever to make landfall, were 3 degrees Celsius warmer than normal.

Pope Francis took the matter seriously and visited Tacloban shortly after.

Water temperatures in the Atlantic Ocean, through which Superstorm Sandy passed before hitting New York and New Jersey, were 5 degrees Celsius warmer than normal.

Second-order effects of global warming are now affecting everyone.

Warmer oceans are releasing more water vapor into the air.

Global average humidity has risen by more than 4%

So this stream of water vapor is created.

Brazilian scientists call it a "flying river"

Severe weather conditions are causing massive, record-breaking downpours, washing all the excess water vapor onto the land.

Photo taken in Montana

Check out this storm from last August.

We're driving past Tucson, Arizona.

The city is literally making a splash

This torrential rain is clearly abnormal

Last July, Houston, Texas, received 613 billion liters of rain in two days.

More than two days' worth of the maximum flow of Niagara Falls flowed into the town, and of course the city's functions were paralyzed.

These record downpours have caused historic floods and landslides.

This is from Chile last year

I can see the warehouse passing by

A tank truck is passing by

This is from Spain last September.

Now the nightly television news is like a tour of the Apocalypse.

(laughs) no really

The insurance industry has undoubtedly noticed that losses are increasing.

They're not mistaken about what's going on

causality needs to be debated

We used to think of direct cause and effect, one cause, one effect.

but this is a system issue

The great meteorologist Kevin Trenberth said, "Every storm is different now.

There's a lot of excess energy and water vapor in the atmosphere.

Every storm is different now."

The same excess heat robbed the ground of soil moisture, causing more severe, prolonged, and widespread droughts, many of which continue today.

It's killing vegetation and causing more fires in western North America.

there is a lot of hard evidence

Lightning is also on the rise, and as the thermal energy builds up, we're seeing quite a few lightning strikes.

These climate-related disasters also have geopolitical implications that contribute to instability.

Syria's historic climate-induced drought began in 2006. Sixty percent of Syria's farms were destroyed, 80 percent of its livestock died, and 1.5 million climate refugees flooded into Syria's cities, where they clashed with 1.5 million refugees fleeing the Iraq war.

Combined with other factors, the gates of hell have opened, and people are now trying to close them.

The U.S. Department of Defense has long warned of the consequences of the climate crisis, including refugees, food and water shortages and disease pandemics.

Now, we are witnessing the spread of microbial diseases from the tropics to high latitudes, in large part due to the transportation revolution.

Environmental changes are changing the latitudes and regions where these microbial diseases can spread, and changing the types of vectors like mosquitoes and ticks.

We have the Zika epidemic right now, but things are better in North America, because it's still a little too cold, and we have great public health systems.

But women in some parts of Latin America have been advised not to get pregnant for two years, which is remarkable because it's never happened before.

Last summer, the Lancet, one of the world's two leading medical journals, classified it as a current medical emergency.

There are many factors in this

Climate change is also linked to the threat of extinction

We are at risk of losing 50% of all species on Earth by the end of this century.

Terrestrial plant and animal species are now moving toward the poles at an average of 5 meters per day.

As for the Arctic, the storm that brought historic flooding to the American Midwest last December 29 raised Arctic temperatures up to 28 degrees Celsius above normal, causing the Arctic to thaw during the long, dark winter polar night.

When land ice in the Arctic melts, sea levels rise.

As shown in Paul Nicklen's beautiful photo of Svalbard

Melting in Greenland and especially Antarctica is even more dangerous.

The 10 cities most at risk by population from rising sea levels are mostly in South and Southeast Asia.

In terms of asset risk, Miami ranks first, with 390 trillion yen at risk of loss.

3rd place is New York Newark district

I was in Miami last fall on the highest tide during a supermoon.

Fish from the ocean swam through the streets of Miami Beach, Fort Lauderdale and Delray Beach.

Now this happens regularly at high tide.

It's called a "clear-sky flood" because it has nothing to do with rain.

Water is coming up from the drain pipe

The days of being able to view this with a partisan eye are long over, the mayor of Miami says on behalf of many.

The crisis is getting worse every day

we need to move across party lines

I want to salute these House Republicans. (Applause) Last fall, they bravely stepped out and took political risks to tell the truth about the climate crisis.

There's a lot more that I didn't even mention, as the climate crisis is costing us more.

It's a tremendous burden

Just one more thing, last month at the World Economic Forum in Davos, an annual survey of 750 economists announced that the climate crisis is now the number one threat to the global economy.

Central bankers like Bank of England Governor Mark Carney say most of the carbon reserves "cannot be burned."

"Subprime Carbon"

I won't say what happened to subprime mortgages, but it's the same thing.

If you look at all the fossil fuels that have been burned since the industrial revolution began, the dark part is the amount that has been burned in the last 16 years.

Confirmed fossil fuel reserves are equivalent to 3,100 trillion yen

According to the International Energy Agency, only the gray part of it is combustible.

The remaining 2,400 trillion yen cannot be burned

It's a crisis for the world economy

So the divestment move is not just a moral imperative, it has practical implications.

So the answer to the first question, "Do we have to change?"

"must change"

The second question is, "Can we change?"

I have good news

Sixteen years ago, the best forecast was that by 2010, 30 gigawatts of wind power could be installed worldwide.

The actual number is 14.5 times that number.

Wind power is growing exponentially

We can see that the cost has come down dramatically.

Take Germany, a country with strong industries, where the climate isn't all that different from Vancouver's, but on one day last December, 81 percent of all energy came from renewable sources, mostly solar and wind.

There are many countries where the average is more than half.

The good news is that energy storage, especially in batteries, is growing significantly, and the cost of dealing with intermittency problems has dropped dramatically.

The good news about solar power is even more exciting.

Fourteen years ago, the best estimate was that by 2010, we'd have installed one gigawatt per year.

By 2010, it was 17 times that number.

58 times more than last year

This year it will be 68 times

we win

we will be the winner

The solar exponential curve is steeper and more dramatic.

Ten years ago, it was here when I took the stage at TED.

In the midst of these exponential curves, we've seen breakthrough innovations.

(Applause) Over the last 30 years, costs have come down 10 percent a year.

and it keeps going down

We're crossing the point of grid parity now, and the business community is certainly noticing that.

The penetration rate of cheap solar power is starting to increase.

Grid parity is a crossroads where renewable power generation is understood to be cheaper than burning fossil fuels.

The turning point is a bit like the difference between 32 and 33 degrees Fahrenheit, or 0 and 1 degree Celsius.

It's more than a degree difference, it's the difference between ice and water.

It's the difference between a frozen market and a market with capital flowing to new investment opportunities.

This is the biggest new business opportunity in the history of the world, with two-thirds of the development investment coming from the private sector.

We are witnessing a surge in new investment

Since 2010, global investment in renewable power has surpassed fossil fuels.

Since then, the gap has widened.

The projections for the future are even more dramatic, even though fossil fuels are still 40 times more subsidized than renewable energy.

Add in the projections for nuclear power, and the change will be even more dramatic, especially given the many efforts being made to make it a safer, more acceptable, more affordable form of nuclear power.

So is there a precedent for such rapid adoption of new technologies?

There are many, but let's take the example of mobile phones.

In 1980, AT&amp;T's former "Ma Bell" commissioned McKinsey to study the world market for the new clunky mobile phones that were emerging at the time.

To the question, "How many units will you sell by the year 2000?"

McKinsey replied, "900,000 units."

By the year 2000, I'm pretty sure we sold 900,000 units in the first three days.

Sales that year increased 120 times.

There are now more mobile phone subscribers than there are people in the world.

Why was it so wildly unexpected?

I asked myself, "Why?"

(Laughter) I think there are three answers.

First, the cost fell faster than anyone expected, and at the same time, the quality improved.

leapfrog to new technology in low-income countries and regions without fixed telephone networks

A big spread is happening in the developing world.

But what about power grids in developing countries?

not so good

In many areas it doesn't even exist

There are more people in India who have no electricity at all than there are people in the entire United States.

Now it's happening: solar panels on thatched roofs and the new business models that make them available.

Muhammad Yunus provided a microcredit loan for this in Bangladesh.

this is the village market

Bangladesh is now one of the fastest deploying countries in the world, with an average of two vehicles installed every minute day and night.

We have everything we need. One hour of energy from the sun to Earth can meet the world's energy needs for a year.

It's actually a little less than an hour.

The answer to the second question, "Can we change?"

Yes of course

It's the most reassuring "yes"

The final question is, "Will we change?"

The Paris Agreement was a resounding success, and some of its provisions are binding, so regular checks will be very important.

The countries concerned are moving forward, not waiting.

China has already announced that it will introduce a nationwide cap-and-trade system starting next year.

They are expected to work with the European Union

America is already changing

These coal power plants were scheduled to be built in the last decade and were canceled.

These are decommissioned coal power plants.

These coal power plants have been announced for decommissioning.

all canceled

we are moving forward

If you look at all the investment in new power generation in America last year, almost three-quarters was in renewable energy, mostly wind and solar.

we are solving this crisis

The only question is how long will it take

To push for this change, it's important that we come together in large numbers.

Nearly 400,000 people marched in New York City ahead of the United Nations Special Session on Climate Change.

Thousands of people marched in cities around the world

so i'm very optimistic

like i said before we win

Let's close this story

When I was 13, I heard about President Kennedy's plan to land a man on the moon and bring him safely back within 10 years.

And then the adults said, "That's reckless, it's expensive, it's going to fail."

But eight years and two months later, when Neil Armstrong took his first steps on the moon, there was a big cheer in NASA's control room in Houston.

Here's a little-known fact: the average age of the systems engineers and air traffic controllers in the control room that day was 26, which means they were 18 when they heard about the challenge.

We are now facing a tradition of challenges to conscience that people have faced.

One of the greatest American poets of the twentieth century, Wallace Stevens, has a line that sticks in my mind: "After the final denial, there is the positivity. On that positivity hangs the future of the world."

When the abolitionist movement began, after receiving denial after denial,

it was affirmed

Women's suffrage and the feminist movement faced endless denials until they were finally affirmed.

The civil rights movement, the anti-apartheid movement, and the more recent movement for gay rights in America and elsewhere.

After the final denial, there is an affirmation.

When the great ethical dilemma is ultimately a choice between right and wrong, the outcome is predetermined, and it's our human nature.

We're getting to the 99% of people, so we're winning.

has everything you need

Some people still doubt people's will to act, but I would argue that the will to act is itself a renewable resource.

thank you very much

(Applause) Chris Anderson: Incredibly versatile.

You have this mindset of a scientist, and you have a talent for understanding all kinds of problems and expressing them in the most vivid terms.

You took the lead in this because no one else could do it.

It was great 10 years ago, and it's still great today.

Al Gore: It's an honor to hear you say that.

But let's be honest, I have a lot of very good friends in the scientific community who have been very patient and have sat down and explained it to me over and over again so that I could put it into plain language and understand it.

this is the key to understanding

Chris Anderson: In your story, the first half was very scary and the second half was very hopeful.

How do we know that the progress represented by the graph is enough to solve the problem presented earlier?

Al Gore: That's the tipping point — I've only been in business for 15 years.

What I learned there is that it seems to matter whether a new product or service is more expensive or cheaper than an existing one.

In the end, I realized that being cheap is a big deal.

(Laughter) A lot of things really change when you cross the line.

I am always amazed by these changes.

As the great economist Rudiger Dornbush said, "Things take longer than people think they do, but when they do, they happen faster than they thought."

that's exactly where we are

Some people use the term "solar singularity," which means that in most places, going below grid parity without subsidies is the default choice.

One of the announcements yesterday was about shared taxis, although there are moves to slow this down with legal restrictions.

i don't think it will work

There's a woman named Debbie Dooley, president of the Atlanta Tea Party.

She was asked to help tax and regulate solar panels.

Having recently installed solar panels on her home, she didn't know what she was asking.

(Laughter) So she partnered with the Sierra Club to create a new organization called the Green Tea Party.

(Laughter) (Applause) And I rejected the proposal.

So, finally, in answer to your question, it may sound a bit cliche and cliché, but as Christiana said 10 years ago, there are people in this audience who played a very important role in creating that exponential curve.

Some of them didn't do well financially, but they pushed this global revolution forward.

The people in this audience right now are doing the same thing knowing they can win.

It's all about how fast you win

Chris Anderson: Very powerful.

If this is the year that the partisanship changes, and as you said, the partisanship is gone, and with the people on the other side, backed by science, backed up by these investment opportunities, backed by the backing of winning, it's very exciting.

thank you very much

Al Gore: Thanks again for inviting me to TED.

thank you

(applause)

you work in a university library

One quiet afternoon, 1,280 books suddenly arrived

There's a long line of books, but they're out of order. Unfortunately, the automatic book sorting system is down.

To make matters worse, classes start tomorrow, which means that first thing tomorrow morning, students will be flooding in wanting these books.

How can I arrange the books in alphabetical order by then?

One way is to start with the two books at the end of the row.

If the two books line up correctly, I'll leave this one alone.

otherwise swap the two

Then compare the second and third books, do the same, and continue until the end of the row.

Eventually, you'll pick up the book that should be placed last, and you'll swap this book with the next one, and so on, until this book is at the end of the row where it should fit.

Then repeat the process from the beginning so that the penultimate book is in the correct position, and so on until all the books are in order.

This method is called a bubble sort

simple but time consuming

You have to compare 1,279 times in the first stage, and 1,278 times in the second stage, and so on for a total of 818,560 comparisons.

Even if it takes 1 second each time, it will take more than 9 days.

The second way is to first arrange the first two books correctly.

And then compare the third book to the second book.

If the 3rd book comes before the 2nd book in order, replace it, compare it with the 1st book, and replace it if necessary.

The first three books are now in order.

Continue to add the fourth and subsequent books, one at a time, in this order. Compare the new book to the previous one, swap if necessary, and place it in the correct position in the previously ordered books.

This method is called insertion sort.

Unlike bubble sort, you don't necessarily have to compare each book to every other book.

On average, each book is compared to only half of the books already organized.

In that case, the total number of comparisons is 409,280, which takes roughly five days.

Still too many comparisons

actually there's a better way

First choose a book randomly

We call that book a "partition" and compare it to all the other books.

Divide the column in two and put all the books that come before the partition on the left and the books that come after the partition on the right.

This saves a lot of time, because the book on the left no longer has to be compared to the book on the right.

Now, just look at the book on the left, and pick another "partition" at random, and divide it into the books that come before the partition and the books that come after it.

If you keep making mini-partitions like this, you'll end up with lots of short columns.

That's about 1,280 comparisons per partition.

With the partitions in the right place, you can divide the book into 128 columns of 10 books in about seven steps in 8,960 seconds.

Sorting short columns takes an additional 22 seconds each

This method, called quicksort, can sort books alphabetically in less than three and a half hours.

One caveat

You won't save any time if your partitions are misaligned

fortunately it doesn't happen very often

So quick sort is one of the most efficient ways currently used by programmers.

You can sort the items in an online store by price, or you can create a list of gas stations near a point, sorted by proximity.

Going back to the book example, Quick Sort gives you plenty of room to organize.

It was dangerous, but a day like this is not uncommon at the library.

Almost every year, machines are surpassing humans in new areas of work that was once thought to be possible only for humans.

Modern computers can beat humans at complex board games, transcribe speech in dozens of languages, and instantly recognize almost any object.

But future robots may be able to do more than that by reading human emotions.

So what's the problem?

If machines, and the people who control them, could accurately understand human emotions, they could help us on an unprecedented scale, or they could manipulate us psychologically.

But before we do that, let's think about how can we translate a complex concept like emotion into the only language machines can understand, numbers?

It's essentially exactly the same way our brain learns to discern other people's emotions.

American psychologist Paul Ekman has identified emotions shared by all humans across cultures that can be read from human facial expressions.

For example, a smile is perceived as joy by both modern city dwellers and Aboriginal peoples.

According to Ekman, anger, disgust, fear, joy, sadness and even surprise are equally recognized across cultures.

As we all know, computers are improving rapidly in their ability to recognize images, thanks to machine learning algorithms like neural networks.

This technology consists of artificial nodes that mimic our neurons, interconnect and exchange information.

In order for the neural network to learn, we give the system sample data, such as photos with tags such as "joy" and "sadness," divided into several categories in advance.

And the neural network learns how to classify from the sample data by adjusting the relative weights of certain features.

The more iterations it learns, the better the algorithm gets at recognizing new image data.

Much like the human brain, what we learn from past experiences shapes how we process new stimuli.

Recognition algorithms aren't limited to just facial expressions

Our emotions come to the surface in many ways.

Changes in body language, tone of voice, changes in heart rate, complexion, skin temperature, and even word frequency and sentence structure in writing.

You might think that training a neural network to recognize these things would be a long and complicated task, but when you see how much data there is in the world and how fast modern computers can process it, it makes sense.

From social media posts, from uploaded photos and videos, from phone recordings, to heat-sensing security cameras and wearables that detect physiological signals, the question is not how to gather enough data, but how to use that data.

Computerized emotion recognition can be useful in many ways.

Robots can use algorithms to recognize facial expressions to help children learn, or to give lonely people a sense of social interaction.

Social media is exploring ways to prevent suicide by using algorithms to find specific words and phrases in what users post.

Emotion recognition software can also help treat mental illness and provide low-cost automated psychotherapy.

But while there's potential, there's also a big fear that large networks of the future will automatically read photos, conversations, physiological signals.

What would be the impact on our privacy if these impersonal systems were used by companies to manipulate our emotions through advertising?

And what happens to our rights when those in power think they can identify potential criminals before committing them?

So far, robots have not been able to discern emotional nuances such as sarcasm, or the intensity of emotions such as joy and sadness.

But someday the day will come when we can accurately read our emotions and respond to them.

But whether robots will empathize with the fear of unwanted interference is another story.

Professor Fukanou, an eccentric scientist and well-known adventurer, has set out on a new challenge: to circumnavigate the globe non-stop in a plane of his own design.

That plane could fly over the equator at an incredible constant speed of one degree of longitude per minute and circumnavigate the world in six hours.

But there's one problem: the plane can only carry 180 kiloliters of fuel, and that's exactly half of its full range.

let's be honest

The professor could have probably designed a plane that could carry more fuel, but that wouldn't be fun.

Instead, I came up with a slightly more elaborate solution: I built three identical planes for this mission.

The professor added not only speed, but also great performance.

Any plane can make a sharp turn, and without slowing down, can transfer any amount of fuel to another plane in the air in an instant, as long as the planes are next to each other.

The professor will fly the first plane, and his assistants, Mr. Fugouri and Mr. Orokana, will each fly the other two planes.

However, only one airfield on the equator was allowed to be used for experiments, and it would be the starting and finishing point, and the only place planes could take off, land, or refuel on the ground.

How can the three planes fly so that the professor can keep flying, complete the entire journey, and achieve his dream, but no one should run out of fuel and crash?

[Pause here if you want to think for yourself]

[to answer: 3] [to answer: 2] [to answer: 1] According to the professor's calculations, it is possible to succeed in the nick of time.

The key is maximizing the assistance of your assistants and not wasting any fuel.

Even more symmetrically, we could choose to go east or west so that their path would be shorter, and let the professor go unaided for the longest time somewhere in the middle of the journey.

Here's how to fix it

At noon, heading west, we fly together in three planes, each with a full tank of 180 kiloliters.

After 45 minutes, or 1/8th of the way, each aircraft will have 135 kiloliters left.

Mr. Orokana fills up both the Professor's and Mr. Fugouri's planes with 45 kiloliters each.

With the remaining 45 kiloliters, Mr. Orokana heads back to the airfield and heads to the lounge for a break.

Forty-five minutes later, having completed a quarter of the way, the professor and Mr. Fugouri are back at 135 kiloliters of fuel.

Mr. Fugouri fills the professor with 45 kiloliters, leaving 90 kiloliters for him to return.

Professor Fukanou relaxes and plays his favorite album

be alone for a while

Meanwhile, Ms. Orokana eagerly awaits Ms. Fugouri's return, and her aircraft is fully fueled so that she can fly at any time.

Mr. Fugouri's plane won't land, Mr. Orokana will fly east this time.

At this point, exactly 180 minutes have passed, and the professor is halfway through the journey, leaving 90 kiloliters of fuel.

For the next 90 minutes, Professor and Orokana's planes are heading toward each other, meeting at three-quarters of the way.

Just as the professor's plane is about to run out of fuel, we meet Mr. Orokana's plane.

Orokana gives 45 kiloliters of the 90 kiloliters to the professors, leaving 45 kiloliters of each remaining.

But that's only half the amount needed to get back to the airfield.

Fortunately, just then, Mr. Fugouri's plane takes off with a full tank of fuel.

Forty-five minutes later, just as both planes are about to run out of fuel, Mr. Fugouri meets them at 315 degrees, and refuels each with 45 kiloliters, leaving 45 kiloliters for himself.

All three arrive at the airfield just as the fuel gauges point to zero.

As the press and photographers cheered, the professor promised to begin commercial flights immediately, if only he could figure out a way to keep the meal from being splattered.

Who do you think you are when you see me?

Religious woman? Expert?

female compatriots?

or a persecuted and brainwashed terrorist

Or someone who prolongs airport security checks

that's actually true

(Laughter) I don't blame you for your negative perceptions.

It's just that the media has portrayed someone who looks like me.

One study found that Islam and Muslims were portrayed negatively in 80% of news reports.

Most Americans don't know a Muslim

Don't you talk to Uber drivers?

(Laughter) For those of you who have never met a Muslim, nice to meet you.

tell me who i am

I'm a mom and a coffee lover, and my favorite is - double espresso with cream.

with an introverted personality

Pretending to be a health maniac

Religiously practices the Islamic way of life

But I'm not "born this way" like Lady Gaga.

it was a choice

When I was 17, I decided to come out.

No, I decided to start wearing the hijab and covering my head to say I'm "Muslim" instead of "gay" like my friends.

My feminist friends were astounded and said, "Why are you willing to persecute yourself?"

Funny thing is, at the time it was a 17-year-old feminist declaration of independence from the pressure of meeting perfect, unattainable beauty standards.

I didn't just accept my parents' faith.

wrestled with the Quran

I read the Qur'an, I pondered it, I questioned it, I doubted it, and I finally decided to believe it.

My relationship with God wasn't love at first sight

Every time I read the Qur'an, my faith grew, and little by little, I fell in love.

The rhythmic beauty sometimes moved me to tears.

I found myself in it and felt that God understood me

Have you ever met someone who looked after you, truly understood you, and loved you?

i felt so

And after that, I got married and started working as an engineer, as most good Egyptians do.

(Laughter) I was married, had kids, and was living the Egyptian-American dream.

And then came that dreadful morning of September 2001.

Perhaps many of us have a clear memory of where we were that morning.

I was sitting in the kitchen after breakfast, and as I was looking at the TV screen, the word "breaking news" jumped to me.

A plane crashed into a building, smoke was rising, people were jumping off the building.

What is this?

accident?

Missing equipment?

My shock quickly turned into anger

who did this?

When I changed the channel and listened, "...Muslim terrorists..." "...in the name of Islam..." "...from the Middle East..." "...Jihad..." "...we should bomb Mecca..."

Oh my God!

Not only was my country attacked, but in an instant, the stranger's actions brought suspicion from the people around me.

On that very day, we were moving across the middle of the United States to a new city to begin graduate school.

I remember sitting in the passenger seat, hunched as much as possible, and my family silently driving.

That night, we moved into an apartment in a new city, and it felt like a whole different world.

Then I read a warning article from the National Muslim Association, and I heard and heard words like, "Be vigilant."

didn't go out for a whole week

It's Friday of the same week, the day of Muslim congregational prayer.

There was another warning, "It's the first Friday after the incident. You'll be a target."

I was watching the news with all the doors and windows closed.

People's emotions were, as expected, outright. I've also seen news reports of attacks on Muslims and perceived Muslims, where they were dragged into the streets and beaten.

Mosque actually blown up

I thought we should stay home

but i felt something was wrong

People whose country was attacked are attacking their country again.

I can see that everyone was angry with the terrorists.

imagine i thought so too

It's hard to relax when you're constantly being asked to explain yourself.

I don't mind being questioned, I rather love it

But it's troublesome if you're accused

I actually hear these words today: "We have a Muslim problem in this country.

when should i remove it? ”

There are also moves to ban Islam and close mosques.

They describe us as a community, like a tumor in the body of America.

The only question is whether it's benign or malignant.

If it's malignant, it has to be uprooted, and if it's benign, it can be monitored.

I have no choice because the question is wrong

Muslims, like other Americans, are America's vital organs, not tumors.

(Applause) Thank you.

(Applause) Muslims are inventors and teachers, first responders and Olympians.

Will closing mosques make America safer?

There will be more parking spaces, but it won't deter terrorism.

Regular attendance at a mosque can actually lead to a more tolerant view of other people's beliefs and a more civic engagement.

The chief police officer in the Washington, D.C. area recently told me, "You don't actually get radicalized in mosques.

It goes on in basements, in bedrooms, in front of computers

What I've found in the process of radicalization is that it starts with the internet, but the first thing that happens is that they are cut off from their communities and even their families, so that extremist groups can brainwash them into saying, 'Terrorists are the real Muslims, and other believers who hate their actions and ideology are traitors and traitors.'"

So if we want to prevent radicalization, we need to keep people going to mosques.

Some people still say Islam is violent.

Groups like ISIS base their brutality on the Quran.

As a Muslim, as a mother, and as a human being, I believe we must do everything in our power to stop groups like ISIS.

If you see them as representing the faith of 1.6 billion people, you're giving in to their propaganda.

(Applause) Thank you.

ISIS has as much to do with Islam as the KKK secret society has to do with Christianity.

(Applause) Two groups claim to base their ideologies on their own scriptures.

But when I look at them, they're not inspired by what the scriptures say.

They find their own brutality in the scriptures.

A famous imam recently told me an amazing story.

A girl came to him because she was thinking of joining ISIS.

I was utterly astonished, and I asked him, "Was she in contact with the extremist leader?"

And he said the problem was quite the opposite. All the clerics who spoke with her shut her out and said, "Your anger and your sense of unfairness towards the world will only get you into trouble."

In the end, unable to find an outlet for his anger, he became an easy target for extremists, and they provided the solution.

This imam connected her with the scriptures and the community.

He taught a girl constructive ways to make the world a better place without blaming her for her anger.

What she learned at the mosque saved her from joining ISIS.

So far, I've talked about how Islamophobia is affecting me and my family.

But what about ordinary Americans?

How will it affect other people?

How does constant fear affect democracy? for free thought?

One study -- in fact, several studies in neuroscience -- found that when you're afraid, at least three things happen.

We become more accepting of authoritarianism, submissiveness and prejudice.

One study found that when subjects were exposed to negative news about Muslims, they became more tolerant of military attacks on Muslim-majority countries and policies that curtailed the rights of Muslim-Americans.

This is not limited to academia

If you look at the period between 2001 and 2013, when anti-Muslim sentiment prevailed, it happened three times, not during the terrorist attacks.

That was before the Iraq War and during the two presidential elections.

Contrary to expectations, Islamophobia was not just a natural response to Muslim terrorism.

It can be an overt manipulative tool that undermines the foundations of a free society with rational and knowledgeable citizens.

Muslims are like canaries in a coal mine

We're quick to recognize danger, but a dangerous substance called fear is consuming us all.

(Applause) Being collectively criminalized isn't just about always having to explain yourself.

Newlyweds Dare and his wife Eusol lived in Chapel Hill, North Carolina, and both attended school.

Dare is a sportsman

Attended dental school, talented and promising...

His sister would say something like, "He's the kindest, most generous person I've ever known."

When she visited him and saw his resume, she was surprised and said,

"When did my cute little brother become such a splendid young man?"

Just a few weeks after Suzanne visited her brother, his new wife and neighbors, Craig Stephen-Hicks murdered them. He also killed Yusol's sister Razan, who visited their apartment that afternoon, after posting an anti-Muslim post on his Facebook page in the manner of an execution.

He shot Dare eight times.

Bigotry is not only immoral, it can be deadly.

let's get back to you

What happened after 9/11?

Did you go to the mosque, or did you stay at home praying for your safety?

In reality, we had a conversation, and it may seem like a small decision, but for us it's about what kind of America we want our children to have, whether it's a place controlled by fear, or a place where we practice our religion freely.

so i decided to go to the mosque

I put my son in the car, put on my seat belt, and drove quietly and nervously to the mosque.

I got my son out of the car, took off his shoes, and stepped into the prayer room, where I stopped.

The prayer room was full

At that moment, the imam announced that he thanked the guests and welcomed them, because half the people were Christians, Jews, Buddhists, and atheists.

(Applause) This time, I just stood there.

These people chose courage and compassion over fear and prejudice to get here.

what would you choose?

What will you choose in a time of fear and bigotry?

Play it safe?

Would you like to join the circle of people who say you should be able to do something better than that?

thank you

(Applause) Thank you very much.

Helen Walters: Dahlia, you seem to have struck a chord with everyone.

But I think some people would like to argue that you give a TED Talk, you have a clear, sharp mind, you work for a great think tank, you're the exception, you're not normal.

What do you say to such people?

Dahlia Mogahead: Look at this stage, I want to tell you don't get confused I'm totally normal

no exception

my story is not uncommon

I'm as normal as you

If you look around at Muslims around the world, and I've done quite a bit of research, I can tell you with confidence that Muslims all over the world want normal things.

We all want our families to prosper, we want our jobs, we want to live in peace.

I am no exception

When you meet someone who doesn't fit the rules, it's often the rules that are the problem.It's not that they're breaking the rules.

Helen: Thank you very much. It's Dahlia Mogahead.

(applause)

Imagine for a moment "A duck giving a French class" "Playing a game of table tennis while circling a black hole" "A dolphin balancing on a pineapple"

You've probably never seen anything like this in real life, but you can imagine it instantly.

How does the brain create images of things it has never seen?

I don't think it's difficult because we're just used to it.

It turns out that this is actually a complex problem, requiring a high degree of coordination in the brain.

Because in order to create these new and strange images, the brain has to assemble familiar pieces into new shapes, like making a collage out of scrap photographs.

The brain has to juggle a flood of thousands of electrical signals and send them all at the right time.

When you look at something, thousands of neurons in the occipital cortex fire.

These neurons encode various features of objects: pointed, fruit, brown, green, yellow.

Synchronized firing strengthens the connections between a set of neurons and brings them together, called a population of neurons, which also explains the pineapple example.

In neuroscience, this is called Hebb's law, which states that neurons that fire at the same time will connect.

If you try to imagine a pineapple afterward, the whole group will ignite and the complete mental image will be assembled.

The dolphin image is encoded by a different neuron population.

In fact, everything you've ever seen is encoded by a set of neurons associated with it, and those neurons are connected by the synchronous firing just described.

But there's one thing this principle doesn't explain: the ability to imagine anything you've never seen before.

There is no population of neurons for dolphins to balance pineapples.

So how can you imagine that?

One hypothesis, mental integration theory, says that timing is still important.

When the neuronal populations associated with dolphins and pineapples are activated simultaneously, we perceive these two separate objects as a single image.

But something in the brain has to coordinate this firing.

One potential candidate is the prefrontal cortex, which is involved in all of the complex cognitive functions.

Neurons in the prefrontal cortex are connected to the posterior cortex by elongated cells called nerve fibers.

Mental integration theory suggests that, like a puppeteer on a string, neurons in the prefrontal cortex transmit electrical signals through these nerve fibers to multiple groups in the occipital cortex.

This activates each group in unison.

If a population of neurons fires at the same time, then you experience the synthesized image as if you'd actually seen it.

This conscious, intentional synchronization between different populations of neurons by the prefrontal cortex is called mental integration.

For mental integration to work, signals must reach both populations of neurons at the same time.

The problem is that some neurons are very far from the prefrontal cortex.

If the signal travels down both fibers at the same speed, there's no synchronization.

You can't change the distance you can connect, but the brain is especially developed in childhood, and it has ways to change the conduction velocity.

Nerve fibers are covered with a lipid called myelin.

Myelin is an insulator and can speed up the way electrical signals travel through nerve fibers.

Some nerve fibers have 100 layers of myelin,

Some have only a few layers

Fibers with thick layers of myelin can conduct signals more than 100 times faster than those with thin layers.

Some scientists now believe that these differences in myelination play an important role in equalizing conduction times in the brain and thus enabling mental integration.

Much of this myelination occurs in childhood, so from early in life our active imagination may be linked to brain development, where finely myelinated neuronal connections can generate creative symphonies throughout life.

Today, I'm going to talk to you about the future of human-driven transportation, how we can move more people in fewer cars to reduce congestion, pollution and parking, and how we can do it with technology in everyone's pocket.

yes it's a smartphone

not a self-driving car

Let's start by going back in time about 100 years.

Because there was Uber long before Uber.

If it had survived, the future of transportation would probably already be here.

Introducing "Jitney" to everyone

It was invented in 1914 by a man named L.P. Draper.

He was a car dealer in LA and had an idea.

As he was driving through the streets of my hometown of LA, he saw a streetcar, and there was a long line of people heading to their destination.

He thought, "Why don't you put a sign on your car and take a Jitney to your destination?"

People raced to ride, not just in LA, but all over America.

A year later, in 1915, Seattle had 50,000 passengers a day, Kansas had 45,000 passengers a day, and LA had 150,000 passengers a day.

For comparison, in LA right now, 157,000 people use Uber a day.

100 years have passed

They were the tram crew, which was the exclusive transport system at the time.

They were clearly unhappy with the Jitney Horde.

So I started a campaign to go to cities all over the country and have them put in place regulations to slow down the development of Jitney.

There were many regulations

Licenses were often expensive

In some cities, Jitney drivers were required to drive 16 hours a day.

Also, in some cities, each Jitney required two drivers.

There was also a really interesting regulation, which was to have lights in the back seat, to be installed in every Jitney to prevent a new kind of toxic behavior, flirting.

(Laughter) So what happened?

The Jitney was all the rage in a year.

By 1919, it had completely disappeared due to increased regulation.

It is unfortunate

because if you can't share a car, you have to own one

Because car ownership has skyrocketed, it's no wonder that in 2007, every person in the United States, men, women and children, had one car.

This phenomenon spread globally

In 2011, car sales in China surpassed those in the United States.

Of course, private ownership of such a car had a social cost.

In America, we waste seven billion hours a year in traffic jams.

$160 billion in lost productivity is lost in traffic jams, and one-fifth of all carbon dioxide emissions are released into the atmosphere from our cars.

But this is only 4% of the total problem.

Because even if you own a car, you don't use it 96% of the time.

As a result, up to a third of our land and space is used to house this hunk of iron.

There are even skyscrapers built just for cars.

This is the world we live in today

Many cities have been grappling with this problem for decades.

it's public transport

But in a city like New York, one of the most densely populated areas in the world, despite having one of the best public transportation systems in the world, 2.5 million cars cross the bridge every day.

I wonder why

Because public transportation still hasn't figured out how to get everyone on board to your doorstep.

In San Francisco, where I live, the situation is even worse, and it's even worse around the world.

When I started Uber in 2010, my goal was to be able to hail a car at the push of a button.

I didn't have grand plans.

But when I actually tried it, I found that there were a lot of people who wanted to call a car with the push of a button, and there were many cases where routes were duplicated.

I saw a lot of people trying to push the same button around the same time and go to roughly the same place.

So I started thinking, how do I combine two overlapping routes into one?

If they were combined, the fares would be considerably cheaper, up to 50 percent lower, and of course, in urban areas, you would be able to handle a lot more passengers with far fewer vehicles.

The big question here is, will it work?

Can the fare be so cheap that people are willing to carpool?

Fortunately, the answer was an overwhelming yes.

In San Francisco, before uberPOOL, a ridesharing service, everyone had their own car to go anywhere.

The lighter colored areas are where the cars are congested.

When we launched uberPOOL, the bright spots were almost gone.

There are fewer cars on the roads as more people move through the city in fewer vehicles.

uberPOOL seems to work

So we expanded to LA eight months ago.

Since then, we've cut traffic by 12.7 million kilometers and removed 1,400 tons of carbon dioxide from the atmosphere.

But I really... (Applause) Here's a statistic that I love. Look, I'm from LA, and I've been behind the wheel for years, wondering if there's anything I can do to improve it.

In China, everything is super huge, uberPOOL usage is 15 million per month, 500,000 per day.

Indeed we are growing rapidly now

In fact, the same thing can be seen in LA.

But we don't say in the company, "100,000 people are carpooling every week, it's a success."

I'm thinking, "How can we make it a million people?"

China could have millions

uberPOOL is a pretty good solution for city carpooling

But what about in the suburbs?

This is a street in LA where I grew up, in a suburban neighborhood called Northridge, with a long line of mailboxes.

Every morning, at about the same time, cars leave each house, most of them with only one person in them, and they all go to work in the city.

So the question was, how can we convert all these commuting cars -- there are literally tens of millions of them -- to carpooling?

A perfect fit for this is the recently launched uberCOMMUTE.

You wake up in the morning, you get ready to go to work, you drink your coffee, you get in your car, you open the Uber app, and in that moment, you're an Uber driver.

And Uber will pair you with your neighbors on your commute, which is really cool.

there is only one problem

It is "regulation".

"54 cents a mile" What do you think?

This is the government-determined cost of owning a car per mile.

Anyone in the country can put you in your car and take you anywhere quickly, but the fare must be 54 cents or less per mile.

If you charge 60 cents a mile, it's a crime.

But what if, at 60 cents a mile, there were 500,000 more carpools in LA?

What if 60 cents a mile increased the number of carpools across the United States by 50 million?

If it's possible, I'm determined to do it.

Reflecting on Jitney's Lessons

What if the Jitney hadn't been regulated in 1915 when it was popular and had continued to grow?

What would our city look like now?

The parking lot may have been a park

we missed the chance

But technology has opened up new opportunities.

I have high hopes for self-driving cars, but do we really have to wait 5, 10, 20 years to realize a new city?

With the technology in our pockets and smarter regulations, we can turn all cars into communal cars and take back our cities, starting today.

thank you

(Applause) Chris Anderson: Thank you.

Travis Kalanick: Thank you

Chris: The company you built is truly amazing.

Now, you've talked about a very small part of that, and one that has been particularly impactful, is the idea of ​​turning private cars into public transportation, which I think is great.

Let me just ask you a couple of questions, because everyone wants to know.

First, if I remember correctly, last week, when I tried to book an Uber from my phone, I couldn't find the app.

You made a very bold, drastic, big design change.

Travis: yeah

Chris: how was it

Who couldn't find the app that day?

Do you think this design change will bring people in?

Travis: First of all, I would like to say what we were trying to do.

I think it would be helpful to know a little bit about the history of this company.

We started out with black luxury cars.

At the push of a button, the Mercedes-Benz S-Class is coming.

What we were doing was kind of an immature luxury brand, so we made it look like a luxury car emblem.

And then, as we went global and expanded from the S-Class to the tricycles in India, it became important for us to be more accessible, to be more local, to be more connected to the cities where people live.

Symbolism is also important: the letter "U" makes no sense in Sanskrit or Chinese.

This is part of the changed intent

But when you present something like this, your hands get sweaty and everyone gets a little nervous.

But what I did see was an increase in the number of people opening the app, and I was intrigued to see what would happen if they opened it.

So the numbers were a little bit higher than we expected.

Chris: I see

By the way, you have a bit of a mystery.

Your supporters and investors, who have been backing you for a long time, seem to think that if there's any chance of eating into the mighty vested interests of the taxi industry and others, you've proven yourself to be one that has to come up with a fierce and unrelenting rival.

But some people feel that you're overdoing it. A year or two ago, there was a controversy that a lot of women were outraged about.

What was it like in the company at that time?

Were there any declines in performance?

What did you learn from it?

TRAVIS: I've been an entrepreneur since high school. As an entrepreneur, you face a lot of challenges. For us, a year and a half ago, it was a difficult time for us.

On the inside, we kind of felt like, despite everything, we were good people doing good things, but from the outside, we didn't know that.

We had a lot of work to do. For example, we started out as a small company, and just two and a half years ago we had 400 people, and now we have 6,500.

At this level of growth, you have to solidify your own cultural values ​​and always pass them on.

And we all have to constantly ask ourselves, "Are we good people doing good things?"

After confirming that, the next step is to get your message across.

We learned a lot, but I think we got through that period stronger than ever.

But it sure was a tough time

Chris: You seem to be able to challenge anyone wherever you turn.

Some Uber drivers in New York and elsewhere are furious about the fare changes, and they're saying they can't keep up because you changed the pricing.

Why... you said you started Uber in the first place because you could summon a car with the push of a button because it was so cool

It succeeded and is now impacting economies around the world.

Whether you want it or not, you have to become a global visionary to change the world.

But who are you really?

do you want to be?

Are you prepared to act as such a person?

TRAVIS: That's a lot of questions (laughter).

When I started UberX, it was 10% to 15% cheaper than the black luxury car version.

It's now half the price of a taxi in many cities.

From all the data we have, Uber drivers make more money per hour than taxi drivers.

If you cut fares, people will use Uber more times of the day, and they'll use Uber to places they didn't drive before.

So the driver has a much better chance of picking up another passenger when he returns, no matter where he drops the passenger.

And that would actually increase your income by increasing the hours you're driving on an hourly basis, and by increasing the amount of time you're profitable.

In some cities, we've cut prices five or six times, and each time, our income has increased.

And for New York, I have a blog post called "4 Septembers" where I compare incomes, September, the next September, and so on.

compare the same month every year

So revenues are increasing over time while fares are dropping.

Of course, there's an optimal price, and we can't keep going down.

Where lowering fares didn't increase revenue, we're putting fares back.

this is the answer to the first question

And as far as being enigmatic or whatever, I'm one of the entrepreneurs who get excited about solving difficult problems.

I often describe it as something like a math professor.

Mathematics professors are really sad when they don't have a puzzle to solve.

We at Uber love puzzles, and we're excited to face them and solve them.

But it's not just any problem.

Chris: In a few years, I don't know when, but in five years, let's say, we'll have a great self-driving car that will cost less than Uber today.

How would you explain it to the drivers, who will be over 1 million by then?

Travis: Excuse me. When are you talking about?

Chris: It's time for self-driving cars. Travis: Okay, sorry, I missed that.

Chris: What would you say to the driver?

TRAVIS: First of all, I think it's going to take a lot longer than the hype and media expectations.

this is the first

Second, the transition will take even longer.

There are places where self-driving cars work, and places where they don't.

It's worth the challenge

Because Google has been investing since 2007, and Tesla Motors and Apple will start, and automakers will start.

Such a world seems to be realized and should be realized

1 million people die each year in car accidents

And people all over the world spend billions, even trillions of hours in their cars driving with stress and anxiety.

Think about how much the quality of life would be improved if we could give people back their time and take away their anxiety.

there are many good things

We see this as a challenge, a challenge to move forward. Instead of resisting technology like the taxi industry and the streetcar industry, we should embrace it and participate in the future.

But how can we move forward?

Is there a way to work with city authorities?

Is there a way to prepare the training and education system for the transition period?

This transition period will take much longer than we expected.

But that will be the world of the future, and it will be a better world.

Chris: It's really amazing what you're building. Thank you for being so candid here at TED.

Thank you Travis: Nice to meet you

(applause)

Imagine a genius neuroscientist named Mary.

Mary lives in a black and white room She only reads black and white books The screen only shows black and white

Despite having never seen color, Mary is an expert in color vision and knows everything about the physics and biology of color vision that has ever been discovered.

She knows how different wavelengths of light stimulate the three types of cone cells in the retina, and how electrical signals travel down the optic nerve to the brain.

There, the signals create patterns of neural activity that correspond to millions of colors that most humans can distinguish.

Now imagine again that one day Mary's black and white screen fails and she sees apples in color.

For the first time, Mary can experience what she has known as knowledge for years.

Will she learn something new?

Are there any new perceptions about color perception that weren't captured in our knowledge?

In 1982, philosopher Frank Jackson proposed this thought experiment called "Mary's Room."

Even though Mary already knew all the physical facts about color vision, he argued that if the experience of color did something new, then the mental state, like the perception of color, could not be fully explained by the physical facts.

The thought experiment in Mary's room refers to what philosophers call a "knowledge argument," that there are non-physical properties and knowledge that can only be discovered through conscious experience.

Arguing knowledge denies the physicalism that anything, including mental states, can be physically explained.

Most of the people who listened to Mary's story would intuitively assume that seeing colors in action should be very different from learning about them.

So there must be properties in color vision that go beyond physical explanations.

Knowledge arguments aren't just about color vision.

Mary's room uses color vision as a representative of conscious experience.

If physical science can't fully explain color vision, it may not be able to fully explain other conscious experiences.

For example, even if you physically knew every detail of the structure and function of someone else's brain, you wouldn't be able to understand what it feels like to be that person.

These indescribable experiences have qualia, subjective qualities that cannot be accurately described or measured.

Qualia is unique to the person experiencing it, whether it's itching, loving, feeling uninterested.

Physical facts cannot fully explain these mental states.

Philosophers interested in artificial intelligence have used knowledge arguments to theorize that reproducing a physical state does not necessarily reproduce the corresponding mental state.

In other words, building a computer that mimics the function of every single neuron in the human brain does not necessarily result in a conscious brain.

Not all philosophers agree that the experiment in Mary's room is useful.

Some philosophers have argued that her extensive knowledge of color vision could have produced the same state of mind produced by actually seeing colors.

She doesn't see anything new because of the broken screen.

Other philosophers say that her knowledge was imperfect from the beginning, because her knowledge was based only on physical facts that could be communicated in words.

Years after this proposal, Jackson actually reversed his stance on this thought experiment.

He concluded that even Mary's experience of seeing red occurs in response to measurable physical events in the brain, not to unknowable qualia that physics cannot explain.

But we still don't have a definitive answer to the question of whether Mary learns anything new when she sees an apple.

Are there fundamental limits to what we can know that we cannot experience?

And does that mean that aspects of the universe beyond our comprehension will exist forever?

Or can science and philosophy help us overcome the limits of our intellect?

What are the signs of your destiny

In Western astrology, the zodiac sign is determined by your date of birth.

On the other hand, according to the ``seisho,'' which has been used in calendars since ancient times in China, destiny is expressed by animals determined by the year of birth.

There are various theories about the 12 animals that appear here and how they are arranged, but the most popular theory is that they are the result of a "great animal race."

Long ago, a deity called the Jade Emperor (Jade Emperor) ruled the heavens.The Jade Emperor decided to make the animals race to create a mechanism to tell time.

They decided to count the calendar years in order of arrival of the 12 animals that were the first to cross the river.

The mouse got up at sunrise and got off to a quick start, but was overtaken by horses, tigers and cows on its way to the river.

Rats are small and not very good swimmers, so I asked some big animals to give me a ride.

The tiger and the horse declined the offer, but the big-hearted cow offered to take the mouse across the river.

Nevertheless, just before the cow carried the mouse across the river, the mouse jumped off the cow's head and was the first to cross the river.

The cow then crossed the finish line, followed shortly by the mighty tiger.

Rabbits would be swept away if they swam, so they jumped quickly over rocks and driftwood and finished 4th.

Then came the dragon, which could fly straight over the river and cross it, but along the way, he helped a competitor and was delayed.

Followed by a horse galloping across the river

But as soon as the horse got ashore, a snake slid in.

Snake finished 6th while the startled horse involuntarily recoiled.

The Jade Emperor looked out over the surface of the river and saw sheep, monkeys, and chickens riding on a piece of driftwood.

When they finally got to the shore, they consulted each other about their rankings, and the sheep came in eighth, mostly because they encouraged the other animals and valued harmony, followed by the monkeys and the chickens.

Then the dog crawled up to the shore

The dog is a good swimmer, but he swam playfully, so he was very late and finally arrived in the 11th place.

The last one is the pig. It got hungry on the way, took a rest and took a nap, so the pig stumbled and finally reached the finish line.

So we've got the 12 animals that represent the year, and their order, and that order is built into the 60-year calendar.

Why is the cycle 60 years instead of 12?

The ancient Chinese calendar is a combination of two types.

One is the 12 animals that I mentioned earlier, the "Chinese Zodiac," or what is commonly called the "Chinese Zodiac."

Furthermore, it is combined with Tengan, which means the ten elements that form the trunk of the sky. Tengan is related to the Five Elements, which are the origin of all things.The five elements are Metal, which represents metal, Wood, which represents trees, Water, which represents water, Fire, which represents fire, and Earth, which represents earth.

All five of these elements have a yin and a yang, so it's a 10-year cycle.

The 12 animals that represent the branches of the earth, the "12 Zodiac Signs," and the elements of the Five Elements combined with the yin and yang elements make up 10 tenchi, that is, the "10 Heavens," and there are 60 possible combinations.

For example, a person born in 1980 will be called "Kanoesaru" by the monkey of the golden yang, and a person born in 2007 will be called "Hinotoi" by the pig of the shadow of fire.

In fact, there are other internal signs based on the month of birth, true signs based on the day of birth, and even secret signs based on the hour of birth.

In the Chinese calendar, it is said that the order of the animals that serve the heavens and represent the year was determined by a "great competition of animals."

For example, the Vietnamese zodiac has the cat in place of the rabbit, and the Thai zodiac has the legendary Thai serpent, the Naga, in place of the dragon.

Some people believe in horoscopes based on Chinese zodiac signs, some don't, but each country's unique culture is reflected in this way.

About seven million people die each year worldwide from heart attacks.

What causes heart attacks?

Like all muscles, your heart needs oxygen, but it doesn't get enough during a stroke.

Fat deposits or plaques form in the walls of the coronary arteries

Coronary arteries are the blood vessels that carry oxygenated blood to the heart.

Plaque grows with age and becomes lumpy, hardened, and inflamed.

eventually cause blood vessel blockage

When these plaques rupture, within minutes blood clots form around them, completely occluding the partially narrowed arteries.

Blood never reaches the heart muscle, and within minutes the oxygen-starved cells begin to die.

This is myocardial infarction or heart attack

Without treatment, the condition can deteriorate rapidly

Damaged heart muscle can no longer pump blood, and heart rhythm can be disturbed.

In the worst cases, seizures can lead to sudden death.

What are the symptoms of heart attack?

Chest pain, the most common symptom, is caused by oxygen-starved myocardium.

Patients describe it as "crushing pain."

The pain gradually radiates to the left arm, jaw, back, and abdomen.

But symptoms aren't always as sudden and dramatic as in the movies.

Some people get nauseous, some people get shortness of breath.

Symptoms may be less noticeable in women and older people

Weakness and fatigue may be the main symptom

And what's surprising is that for many people, especially those with diabetes, whose pain nerves are damaged, heart attacks can be asymptomatic.

When you realize that someone might be having a seizure, the most important thing is to act quickly.

If you can reach emergency medical services, call them right away.

This is the fastest way to get to the hospital

Also, taking aspirin thins the blood [it doesn't actually dilute it], and nitroglycerin tablets may help keep the heart attack from getting worse by widening the arteries.

When you get to the emergency room, doctors diagnose a heart attack.

Electrocardiograms are commonly used to measure the heart's electrical activity, and blood tests are used to assess myocardial injury.

The patient is taken to a state-of-the-art coronary intensive care unit to identify the blocked coronary arteries.

Cardiologists open blocked arteries with balloon angioplasty.

Often a metal or polymer stent is inserted to keep the artery open.

More extensive obstruction requires coronary artery bypass surgery

It uses veins or arteries in other parts of the body to bypass blocked vessels and create new blood flow routes.

These maneuvers reestablish blood circulation to the heart muscle and restore heart function.

We're making progress in treating heart attacks, but it's important to prevent them from happening first.

Genes and lifestyle factors influence the risk of developing the disease.

Fortunately, lifestyle changes are possible.

Exercise, healthy eating and weight loss all reduce the risk of heart attack, regardless of whether you've had one before.

Doctors recommend exercising several times a week, both cardio and strength training.

Heart-healthy diets are low in sugar and saturated fat because both are associated with heart disease.

So what should we eat?

Lots of fiber from vegetables, poultry and fish instead of red meat, whole grains, and nuts like walnuts and almonds all seem to help.

In addition, maintaining a healthy weight through a good diet and exercise regimen can reduce the risk of heart attack.

Of course, drugs can also prevent heart attacks.

Doctors often prescribe low-dose aspirin, especially for patients who have had previous seizures or who are at high risk of developing one.

Medications that control risk factors for heart attacks, such as high blood pressure, cholesterol and diabetes, can reduce the risk of developing one.

Heart attacks are common, but not inevitable.

Eat healthily, avoid smoking, avoid obesity, sleep well, and laugh a lot, all of which will keep your body's most important muscles beating.

Created by logician Raymond Smullyan and made famous by his colleague George Boulos, this riddle has been called "the hardest logic puzzle."

You and your companions have crash landed on an ancient planet.

The only way to escape is to befriend the three alien lords, Tee, F and Earl, by giving them the right artwork.

unfortunately you don't know who

You learn from the inscription that you can ask a total of three yes/no questions, and each question can only be asked by one lord.

Tee's answer is always right, Ef's answer is always a lie, Earl's answer is different.

but there is one problem

You understand the alien language enough to ask any question, but you don't know which of the two words "ozo" and "ur" is "yes" or "no."

But can you guess which alien is who?

[Stop here if you want to solve it yourself!] ]

3 seconds before the answer 2 1 This problem at first seems not only difficult, but utterly impossible.

What's the point in asking a question when you can't understand the answer or know if it's true?

but you can actually solve it

The key is to formulate the question carefully so that any answer is informative.

First, the problem of not knowing what "ozo" and "ur" mean can be solved by adding the words to the question, and then for each question, by adding a hypothetical conditional, it doesn't matter if the alien is lying.

To see it in action, think of our question as "2 + 2 = 4?"

Instead of just asking the question, ask, "If I asked you if 2 plus 2 is 4, would you say ozo?"

If "ozo" is "yes" and the lord is tee, I'll honestly answer "ozo".

But what if you ask Eph?

Ef will answer "ur" or "no" to the question in the conditional sentence, so he will lie and answer "ozo".

Also, if "ozo" is really "no," then the correct answer to the question in the conditional statement is "uru," and Tee and F both answer "ozo," for their own reasons.

If this mechanism confuses you, it's because it involves a logical structure.

Both double affirmations and double negations are affirmations.

As a result, by asking Tee or F a question like this, if the hypothetical question is correct, we'll always get an answer of "ozo," and if the question is false, we'll always get an answer of "ur."

Unfortunately, this doesn't help in Earl's case.

But don't worry, we can identify one alien lord who is definitely not Earl by the first question.

And we can identify him as Tee or F in the second question.

And once we know that, we can ask questions to determine who the other two are.

let's get started

To the alien standing in the middle, "If someone asked me if the lord on my left is Earl, would you say 'Ozo'?"

If the answer is "ozo," there are two possibilities.

If you're talking to Earl, the answer means nothing.

If you're talking to Tee or F, as we know it, and you get the answer, "Ozo," your hypothetical question is correct, and the lord on the left will be Earl.

In any case, I'm pretty sure the alien on the right isn't Earl.

Similarly, if the answer is "Ur," we know that the alien on the left is not Earl.

Next, we ask the alien, who turns out not to be Earl, "If someone asks you, 'Are you F?', the answer is 'Ozo.'"

You don't have to worry about random answers, so any answer can identify the alien.

You know whether the alien's answer is true or false, so you ask the alien, "Is the lord in the middle Earl?"

This process of elimination will identify the last person.

Satisfied lords will help you fix your spaceship and take off.

Even if the last question is forgiven and you ask Tee, "Is it a long way to Earth?" he replies, "Ozo."

Unfortunately, we still don't know what it means.

Any physical skill—whether it's ballet pirouette, playing an instrument, or even pitching a baseball—takes practice to master.

Practice is the repetition of a behavior with the goal of getting better, and practice makes it easier, faster, and more confident.

So what happens in the brain that makes practice better?

The brain is made up of two types of nervous tissue: gray matter and white matter.

Gray matter processes information in the brain and transmits signals and sensory stimuli to nerve cells, while white matter is mostly made up of adipose tissue and nerve fibers.

For the body to move, information must travel from the gray matter of the brain, down the spinal cord, and through chains of nerve fibers called axons to the muscles.

So how does practice and repetition affect activity in the brain?

Axons in the white matter are covered with a lipid called myelin.

And it's this myelin sheath that changes with practice.

The myelin sheath is more like an insulator in an electrical cable.

It reduces energy loss in sending electrical signals used by the brain, allowing signals to travel more efficiently along nerve tracts.

A recent study in rats suggests that repeated physical movements thicken the layers of myelin sheath that insulate axons.

And the thicker the layer, the stronger the insulation around the axonal chains, creating a kind of information superhighway that connects the brain to the muscles.

Many athletes, musicians, and so on, attribute their success to muscle memory, but muscles themselves don't remember.

Rather, the increased myelination of the nerve tracts may have given the athlete or performer a faster and more efficient nerve tract to their side.

Many theories attempt to quantify the number of hours, days, or years of practice required to master a skill.

We haven't found a clear numerical value yet, but it's common knowledge that you can't master it just by spending more time practicing.

The quality and effectiveness of practice is also important.

Effective practice is one that is consistent, focused, and targeted to the person's current capabilities and weaknesses.

So if effective practice is the key to progress, how do you make the most of your practice time?

Try these tips

focus on the task at hand

Minimize distractions by turning off your computer or TV and putting your cell phone on airplane mode.

In one study that observed the learning landscape of 260 students,

On average, students were able to complete the task for only six minutes.

Computers, smartphones, and especially Facebook were the biggest distractions.

Let's go slowly in slow motion at first

Coordination, both correct and imprecise, is built through repetition.

As you increase your speed little by little while doing quality repetitions, you increase your chances of getting it right.

Then, repeating it over and over again at set intervals is a practice practice common to top performers and others.

Studies show that many top athletes, musicians and dancers spend between 50 and 60 hours per week doing activities related to their skill.

Many of them divide their time available for effective practice into timed daily practice menus.

And finally, visualize the details vividly and practice them in your mind.

It's a bit surprising, but a number of studies suggest that once a body movement is established, it can be reinforced by simply imagining it.

In one study, 144 basketball players were divided into two groups.

Group A physically practiced one-handed free throws, and Group B practiced only in their minds.

When tested at the end of the two-week experiment, intermediate and veteran players in both groups had progressed about the same.

As scientists unlock the secrets of the brain, so too will our understanding of effective practice.

For now, effective practice is the best way to push your personal limits, reach new heights, and reach your full potential.

When I moved to Harare in 1985, social justice was at the heart of Zimbabwe's health policy.

After a long war of independence, a new government emerged and immediately declared socialist policies, making health care, primary education, etc. basically free.

We've significantly increased the number of community health facilities, which is quite impressive, with roughly 80 percent of the population within two hours' walk of a health facility.

When Zimbabwe became independent in 1980, 25 percent of children were immunized in the country.

Only ten years later, in 1990, it reached 80%.

I was really proud to be a part of this revolution.

You could see the excitement and unity of the people.

I felt like I was part of not just the African independence movement, but the world's leading public health movement, alongside some of the most talented local scientists, doctors, and activists.

But I had a terrible problem

In 1985, the year I arrived, Zimbabwe's first case of AIDS was reported.

I had seen some AIDS patients at Harlem General Hospital, where I was a resident in the early '80s, but I had no idea what was looming over Africa.

In the early days of my stay, the HIV infection rate was about 2%.

That skyrocketed to the point where one in four adults was infected 17 years after I left Harare.

By the mid-'90s, I was telling hundreds of people in their prime that they were HIV-positive.

I've seen colleagues and friends die, I've seen students and patients die.

In response, my colleagues and I started a clinic.

Demonstrate how to use a condom

Start sex education in schools and workplaces

Conducting case investigations and teaching prevention methods to partners of infected people.

I worked hard, and at the time I thought I was doing my best.

I thought I was doing excellent treatment, but now that I think about it, it was poor

But they weren't doing anything to call for structural reform.

Former UN secretary-general Kofi Annan has said frankly that his missteps drove Rwanda toward genocide.

In 1994, the year the massacre happened, he was UN peacekeeping secretary general.

Reflecting on the 10th anniversary of the genocide, he said, "At the time, I knew I was doing my best, but when the genocide happened, I realized that there was more I could have done, more I should have done.

The AIDS epidemic caught the medical community by surprise, and now that the World Health Organization estimates that 39 million people have died from AIDS so far, I am not alone in regretting that we should have acted sooner.

But during my time in Zimbabwe, I didn't see myself as an advocate for change or a political position.

I came here to use my professional skills as a clinician and as an epidemiologist.

In my heart, I thought my role was to take care of patients, to conduct research, to better understand the patterns of infection among the population, and hopefully, by doing so, we could stop the spread of this virus.

I was aware that socially vulnerable groups were disproportionately at high risk of developing AIDS and dying.

On sugar cane plantations, which looked more like feudal manors than any modern corporate organization, 60 percent of pregnant women were HIV-positive.

I taught them that infected people weren't sluts, but rather that they were a product of a male-dominated culture, forced seasonal labor, and colonialism.

White people suffered very little.

As health workers, we were painfully helpless, begging individuals to change their behavior, to use condoms, to have fewer partners.

The rate of infection was only going up, and while drugs were being developed in the West -- still the most effective treatment for AIDS -- they were out of reach for any public sector across Africa.

I didn't say anything about the lack of equal access to life-saving drugs, or about the political and economic systems that underlie the AIDS epidemic -- the mechanisms that have allowed such a massive epidemic.

I justified my silence. I told myself, "I'm not from this country, and if I sound the alarm, I could be deported. I can't do good work, I can't see patients, I can't do the research that's needed."

So I kept quiet, I didn't comment on the government's policy on AIDS at the time.

I didn't advocate my concerns enough

I'm sure many doctors and health care workers will not blame me.

A promise between a doctor and a patient, the Hippocratic Oath and its variants, established the sanctity of the relationship between doctors and patients.

I did everything I could, I did the best I could for every single one of my patients.

But I realized that epidemics like this were a reflection of the distortions in society, not just due to biological causes, but rather from practices that marginalize, exclude, and discriminate against the vulnerable: discrimination based on race, gender, sexuality, social class, and so on.

AIDS applies to this

It was the same with the most recent Ebola.

Medical anthropologists, such as Paul Farmer, who has worked on AIDS in Haiti, call this "structural violence." We call it "structural" because inequality is embedded in the political and economic fabric of our societies, and is often invisible to those with privilege and power.

If you want to help your patients in any way, you have to be aware of these social inequalities.

Calling attention is the first step to making public health work, so that we can bring allies together, pave the way together, and make real change.

So I'm not silent these days either.

I speak out about a lot of things, even when people feel uncomfortable saying it, even when I feel uncomfortable talking about it.

In many cases, it's about racial disparities, about institutionalized racism, things that shouldn't be allowed in this country anymore, much less in medicine and public health.

Because it exists, the price is that people are dying instead of reaching the end of their lives.

That's why it's so central to my mission as Director of the New York City Health Department to ring the alarm bells -- the racism in America's health care, the ongoing systemic and interpersonal violence -- the 250 years of slavery, the 90 years of Jim Crow, the 60 years of imperfect equality that have left America with a tragic legacy of violence against people of color.

Under 65, premature mortality is 50 percent higher for black men than for white men in New York City.

In 2012, black women had more than 10 times the maternal mortality rate of white women.

Infant survival rates have improved dramatically, but black infants are still nearly three times more likely to die in the first year of life than white infants.

New York is not special

Similar statistics can be found anywhere in the United States.

A recent New York Times analysis found that across America, there's a shortage of 1.5 million black men.

According to the article, today, more than one in six black men between the ages of 25 and 54 disappears from life, either in prison or at a young age.

There's a gross injustice that happens every day to young black men, the violence that's being protested, known as #BlackLivesMatter.

But it's important to remember that the incidence and consequences of common diseases that continue to occur at different rates -- such as heart disease, cancer, diabetes and AIDS -- are slowly and silently deadly diseases.

When the #BlackLivesMatter movement started, I was frustrated and angry because the medical community has avoided even using the word "racist" in research and work.

Every time I use this word, you must have something on your mind

In the face of medical students protesting in white coats and disguised as corpses, most of the medical community sat on the sidelines, even as persistent discrimination continues to shape disease and mortality.

My fear is that in the current trend towards personalized medicine and precision medicine, in our quest for more personalized treatments and in our pursuit of biological and genetic research, we inadvertently lose sight of the big picture, and that our everyday environment -- the environment in which we live, grow, work and love each other -- is the one that affects the health of so many people the most and harms the health of too many people.

As health care workers, we see gross inequities in our daily work, in our clinics and in our research. Homeless people are unable to follow their doctors because they have more pressing priorities. Transgender youth contemplate suicide because of a society too heartless.

The role of the doctor as a health care worker is not just to see the patient, but to be an advocate for caution and change.

Doctors, legitimacy or not, because of their social standing, they carry a lot of weight in what they say, and it shouldn't be wasted.

I regretted not speaking up in Zimbabwe, and I have made a pledge to myself that as Director of the New York City Health Department, I will make the most of every opportunity I have to raise awareness and work together to reduce healthcare inequalities.

I will also stand up against racism. I want you to lend me a hand. When you stand against gender discrimination, I will help you. I will help you with any other form of inequality.

Now is the time for us to stand up and collectively speak out against structural inequality.

You don't have to know all the answers to call for change

it just takes courage

The health of our patients and the health of us all depend on it.

(applause)

In ancient Greek mythology, Icarus, son of Daedalus, soared above Crete on wings made of wax and feathers, defying the laws of both man and nature.

Ignoring his father's warning, he flew higher and higher.

People on the ground said he looked like a god, and from above, he felt the same way.

But in the world of ancient Greek mythology, the line that separates gods and humans was absolute, and those who tried to violate it were severely punished.

It was the same with Icarus and Daedalus.

Years before Icarus was born, his father, Daedalus, had made a name for himself in his hometown of Athens as a genius inventor, craftsman and sculptor.

He invented the trade of carpentry and invented the tools for it.

He designed the first public baths and ballrooms.

His statues were so lifelike that Hercules mistook them for real people.

Daedalus was skilled and famous, but he was also arrogant and jealous.

Daedalus killed his nephew because he was a better craftsman.

As punishment, Daedalus was exiled from Athens and headed for Crete.

Thanks to his previous reputation, Daedalus was warmly welcomed by King Minos of Crete.

Daedalus continued to push the envelope while serving as the palace's technical instructor.

For the children of King Minos, he created mechanical toys that seemed to come to life.

He invented a ship's sail and mast that allowed humans to control the wind.

With each creation, Daedalus pushed the limits of mankind, the things that kept mankind from the gods until now, and he finally broke through them.

Pasiphae, the wife of King Minos, was cursed by the god Poseidon and had her heart stolen by the king's prized bull.

Cursed, she begged Daedalus for help in attracting the attention of the bull.

With a bold personality, he accepted.

Daedalus used wood to make a hollow cow, which looked like the real thing and fooled the other bull.

Lurking within Daedalus' creation, Pasiphae became pregnant and gave birth to a half-human, half-bull Minotaur.

Naturally, this enraged King Minos, and he blamed Daedalus for deviating so badly from the laws of nature.

As punishment, Daedalus was ordered to build an impenetrable labyrinth to keep the Minotaur trapped under the palace.

After that, King Minos put Daedalus and his only son, Icarus, in prison on top of the tallest tower on the island, where they would spend the rest of their lives.

But Daedalus was still a genius inventor.

As I watched the birds fly around the prison, I discovered a way out.

All you have to do is fly out of your prison, which was thought to be possible only by birds or gods.

Using feathers collected from flocks of birds perched on towers and candle wax, Daedalus fashioned two large pairs of wings.

When he had his son Icarus carry the feathers on his back, Daedalus warned him that if he flew too close to the sea, his wings would become damp and heavy and useless.

If you get too close to the sun, the heat will melt the wax and your wings will fall apart.

die in both cases

That's why it's important to keep flying in the middle in order to escape successfully.

After giving clear instructions, they both flew off the tower.

they were the first humans to fly

Daedalus carefully kept the intermediate course, but Icarus was dazzled by the pleasure of flying and obsessed with the idea that he had the power of the gods.

Daedalus could only watch with horror as Icarus rose higher and higher, and he had no power to change his son's miserable fate.

The heat of the sun melted the wax in Icarus' wings, and he fell.

Just as Daedalus, as a man, neglected, time and time again, what would happen if he did not know his place and violated the laws of nature, Icarus too was killed by his own arrogance.

In the end, both of them paid a high price for their deviation from moderation, Icarus with his life and Daedalus with his regret.

If you can't imagine life without chocolate, you're very lucky to have been born after the 16th century.

Until then, chocolate was only in Mesoamerica, in a very different state than it is today.

Around 1900 BC, the people of the area learned to process wild cocoa beans.

The earliest records show that cocoa beans were ground and mixed with corn meal and chili peppers to make a drink that was bitter and invigorating, frothy, rather than relaxing hot cocoa.

Now, you might think we're all hyped up about chocolate, but Mesoamericans do it better.

At that time, the cacao drink was considered a sacred food by the Mayans, Kukulkan, and by the Aztecs, it was believed to have been bestowed upon mankind by the feathered serpent god Quetzalcoatl.

The Aztecs used cocoa beans as currency, drinking them at royal feasts, rewarding victorious soldiers, and using them in ceremonies.

Europeans first learned about chocolate in 1519, when Hernán Cortés visited the palace of King Montezuma in Tenochtitlan, the Aztec capital.

Cortes' lieutenant records that the king had fifty cups of the drink brought and poured into golden vessels.

When settlers brought home a strange new variety of beans, it gained a reputation as an aphrodisiac by devout missionaries who thought local customs were questionable.

At first, due to its bitter taste, it was used as a medicine for ailments such as upset stomach, but when it was sweetened with honey, sugar, vanilla, etc., it quickly spread as a delicacy in the Spanish court.

Soon, every aristocratic mansion had its own container for chocolate.

This trendy drink was time-consuming to make in large quantities, and it wasn't easy to drink.

This encouraged the use of plantations and slave labor in the Caribbean and on the coastal islands of Africa.

The introduction of the cocoa press by Kuhnrath van Houten in Amsterdam in 1928 changed chocolate forever.

Van Houten's invention was to separate the fat part of cocoa, the cocoa butter.

This left us with cocoa powder, which could be melted into a drink or mixed with cocoa butter again to create a solid chocolate similar to what we have today.

Eventually, Swiss chocolatier Daniel Peter mixed powdered milk, and this was the invention of milk chocolate.

By the 20th century, chocolate had ceased to be a luxury item of the elite and had become a common confectionery.

To meet the enormous demand, we had to grow more cocoa, which only grows near the equator.

Now, instead of slaves being brought from Africa to plantations in South America, cocoa production has shifted to West Africa, with two-fifths of the world's production coming from Côte d'Ivoire in 2015.

The cocoa bean industry has grown, but there are still terrible human rights violations.

Many of the plantations in West Africa that supply companies in the West employ slaves and children, and some estimates put more than two million children involved.

It's a complex problem that persists despite efforts by major chocolate companies to work with African countries to reduce child labor and other undesirable forms of labor.

Today, chocolate has established a unique presence in the conventions of modern civilization.

Combined with its local culture and colonial ties and the power of advertising, chocolate retains an aura of something sensual, decadent and forbidden.

But knowing this fascinating and sometimes brutal history and the reality of modern production can help us understand the origins of these relationships and what lies behind them.

The next time you open a chocolate wrapper, remember that everything about chocolate has never been sweeter.

Humans can only survive about 100 hours without water.

But there are organisms that can survive for decades without water.

These tiny one-millimeter creatures can survive in the hottest or coldest places on Earth, and can even withstand high levels of radiation.

It's a tardigrade, like a chubby eight-legged gummy bear, but one of the toughest creatures on the planet.

Most organisms need water to live

Water enables metabolism, the process of biochemical reactions within cells.

But organisms such as tardigrades, known as tardigrades, can circumvent this limitation through a process called anhydrobiosis, Greek for life without water.

It's weird, but it's not just tardigrades.

Bacteria, single-celled organisms called archaea, plants, and other organisms that can tolerate drought.

Many tardigrades survive dryness in what is called a "barrel."

It curls up into a ball, retracts its head and eight legs into its body, and waits for the water to return.

When water levels run low, the tardigrade enters a "barrel" state and begins synthesizing special molecules that act as an intercellular matrix that fills the tardigrade's cells to replace the lost water.

DNA, proteins, and cell membranes, which are vulnerable to desiccation inside the cell, are stored in this matrix.

We think that's what keeps these molecules locked in place and prevents them from unraveling, breaking down, or fusing together.

When the tissue re-fills with water, the matrix breaks down and reverts back to its original intact, normally functioning cells.

Water bears can withstand extreme stresses other than drought, such as being frozen or heated above the boiling point of water, but also high levels of radiation and the vacuum of space.

So there's some erroneous speculation that tardigrades are extraterrestrials.

It's fun to imagine, but there's scientific evidence that life on Earth has evolved over a long period of time.

In fact, thanks to this evolution, over 1,100 species of tardigrades are known, and there are probably more species yet to be discovered.

Tardigrades are so hardy that they are ubiquitous.

Lives on all continents including Antarctica

Its ecosystems are diverse, including deserts, ice sheets, oceans, freshwater rainforests, and even alpine peaks.

Tardigrades are also found in familiar places, such as in moss and lichens in gardens, parks, and forests.

All you need is a little patience and a microscope to find it.

Scientists are studying whether tardigrades can use their desiccation "barrel" state to withstand other loads.

If we can understand how tardigrades and other organisms stabilize delicate biomolecules, we might be able to apply this knowledge to stabilize vaccines or develop resilient crops that can adapt to global climate change.

Studying how tardigrades survive in the vacuum of space will help scientists understand the environmental limits for life to survive and help protect astronauts.

Along the way, tardigrades may also provide important answers: Can life survive on planets with harsher environments than Earth?

There are trillions of bacteria, viruses and fungi living in and on our bodies, and having a good, balanced relationship with them is good for our health.

Together they form the gut microbiome, a rich ecosystem that performs a variety of functions in the body.

The bacteria in your gut break down food your body can't digest, produce vital nutrients, regulate your immune system, and protect your body from harmful bacteria.

While we still don't know exactly which good bacteria are necessary for a healthy gut, we do know that maintaining a wide variety of bacteria is important for a healthy microbiome.

Many factors, like our environment, drugs like antibiotics, or even whether we're having a caesarean birth or not, all affect our microbiome.

Diet is also one of the most influential factors in our gut health.

We can't control all of these factors, but by being mindful of what we eat, we can help regulate our microbial balance.

Dietary fiber, found in fruits, vegetables, nuts, legumes, and whole grains, is the best fuel for your gut bacteria.

When microbes digest fiber, short-chain fatty acids are produced that nourish the intestinal epithelium, improve immune function, fight inflammation and reduce cancer risk.

The more fiber you ingest, the more fiber-digesting bacteria colonize your gut.

In a recent study, researchers experimented with swapping high-fiber diets consumed by rural South Africans for high-fat, meat-intensive diets among African-American groups.

After just two weeks, a high-fat, low-fiber western diet resulted in increased colonic inflammation and decreased butyric acid in a group of rural Africans.

Short-chain fatty acids are thought to reduce the risk of colon cancer

At the same time, the group that followed the high-fiber, low-fat diet had the opposite effect.

How does eating low-fiber processed foods worsen gut bacteria?

Low fiber means less fuel for your gut bacteria, which starves them to death.

As a result, bacterial diversity is reduced, leaving starved bacteria.

In fact, some bacteria can even start eating the mucus on the surface of your gut.

We also know which specific foods influence gut bacteria.

A recent microbiome study found that fruits, vegetables, tea, coffee, red wine, and dark chocolate were associated with increased bacterial diversity.

These foods contain polyphenols, naturally occurring antioxidant compounds.

On the other hand, foods high in milk fat, such as whole milk and sugary sodas, are associated with reduced bacterial diversity.

How the food was prepared also matters

Fresh, minimally processed foods are usually high in fiber and provide high-quality fuel.

Short-steamed, stir-fried or raw vegetables are usually healthier than fried foods.

There are other methods of manufacturing foods that introduce gut-healthy bacteria, called probiotics.

Fermented foods are rich in probiotics such as beneficial Lactobacilli and Bifidobacteria

Originally used as a method of preserving food before the invention of the refrigerator, food fermentation is still practiced as a tradition around the world.

Foods like kimchi, sauerkraut, tempeh, and kelp tea bring variety and vitality to our diet.

Yogurt is also a fermented food that brings bacteria to your gut.

However, not all yogurts are good for you.

Something high in sugar and low in bacteria may not be beneficial to your health.

This is just a general guideline

More research is needed to understand the full picture of how these foods interact with the microbiome.

There's a positive correlation, but it's difficult to look directly inside the gut.

For example, we don't know for sure whether these foods directly cause changes in diversity, or whether there are more complex things going on.

We're just beginning to explore the great wilds of our gut, but little by little we're beginning to understand just how important our microbiome is to our digestive health.

The great news is that we have the power to revive our gut bacteria.

Filled with fiber, fresh and fermented foods, you can trust your gut to stay healthy.

Your research team discovered prehistoric viruses preserved in permafrost and extracted them for study.

After working late into the night, just as I was about to lock the doors of the lab, an earthquake suddenly struck and the power went out.

The emergency power supply kicks in, and an audible alarm tells us that the worst has happened, and all the sample jars have broken.

The virus remains inside the room for now, but unless it's killed off, the vents will soon open, releasing an airborne plague.

Without hesitation, you grabbed your suit and were ready to save the world.

The lab has 16 four-by-four rooms, with an entrance in the northwest corner and an exit in the southeast corner.

Each room is connected to the next by an airlock, and the virus has spread to all rooms except the entrance.

To kill it, you must enter each contaminated room and pull the emergency self-destruct lever.

But there are pitfalls

Once you enter a contaminated room, the security system kicks in and locks you in, so you can't get out without pulling the trigger lever, and once you've activated it, you can't get back into the room.

You try to write out possible routes on paper, but it seems that you are left with at least one room that you cannot pass to reach the exit.

How can I kill the virus in all the infected rooms and still survive and report the incident?

If you want to think for yourself, stop here.

Up to the answer 3 2 1 If you first come up with a graph of possible movements on the grid, you're thinking in the right direction.

This puzzle has to do with the Hamilton cycle problem, named after the 19th-century Irish mathematician William Rowan Hamilton.

The task of the cycle problem is to determine whether a given graph has a Hamiltonian cycle.

This is a route that visits all points exactly once.

Classified as NP-complete problems, this kind of problem is notoriously difficult when the graph gets big enough.

It's easy to check whether a route proposed as a solution is correct, but there's no reliable or easy way to search for a solution, and there's no way to determine if there's a route.

Furthermore, it's not even clear if a computer can stably find a solution.

This puzzle has a twist on the Hamilton cycle problem in that the starting point and the ending point are specified.

But before you waste tons of graph paper, you have to understand that a true Hamiltonian cycle problem has no correct starting and ending points like this.

This is because the number of rooms is an even number both vertically and horizontally.

In any grid with such an arrangement, the Hamiltonian cycle with diagonal start and end points has no solution.

I'll give you one way to understand why.

Consider a checkerboard with even sides

Black and white alternate each time you pass through a room.

This grid also has an even sum of squares, because the product of the multiplication of two even numbers is an even number.

So an even-sided Hamiltonian cycle that starts in black ends in white.

On the other hand, if it starts in white, it ends in black.

But in a grid with an even number of sides, diagonal corners will have the same color, which means it's impossible to start a Hamiltonian circuit at one corner and end at the opposite corner.

It looks like your luck has run out, but that's not the case if you read the rules carefully and notice one serious exception.

There's the fact that once you flip the switch in a contaminated room, the room is destroyed and you can never go back.

But there is one uncontaminated room, the entrance.

So you can leave the entrance room without pulling the lever, destroy either room on either side, and then come back.

The corner room may be contaminated through the opening of the airlock, but that's okay, just destroy the entrance room the second time you enter.

From there, there are four successful paths to the exit. Destroying this room first gives you the same options.

Congratulations, you've averted a apocalyptic pandemic, but I'm tired of this stressful job.

How about a "Traveling Salesman" that was recently recruited?

The microscopic nematode C. elegans, a common research worm, has a short lifespan of just a few weeks.

In contrast to turtles, which live for over 100 years

Whereas mice and rats reach a lifespan of four years, bowhead whales, the longest-lived mammals on the planet, can die after reaching 200 years of age.

Like most organisms, after reaching sexual maturity, most animals slowly decline, a process called aging.

So what does aging mean?

The factors driving this process are diverse and complex, but ultimately senescence results from cell death and dysfunction.

When we're young, we replace dead and dying cells by constantly regenerating them.

But as we get older, this process slows down.

In addition, older cells cannot function as well as younger cells.

Our bodies decay, resulting in sickness and death.

But if this is a consistent truth, why is there such a big difference in aging patterns and lifespans in the animal kingdom?

The answer depends on several factors, including environment and body size.

These factors put powerful evolutionary pressures on animals to adapt and create differences in the aging process between species.

In the cold, deep waters of the Atlantic and Arctic Oceans, for example, the Greenland shark that lives there can live to be about 400 years old or more, and the Arctic sea shell known as the hard clam can live up to 500 years.

Perhaps the most impressive of these marine ancients are the Antarctic glass sponges, and perhaps the most impressive of these marine ancients are the Antarctic glass sponges, which can survive for over 10,000 years in the frigid waters.

In such a cold environment, heart rate and metabolic rate slow down.

Researchers believe it also slows down the aging process.

In this way, the environment can also lead to longevity.

When it comes to body size, usually, but not always, larger species live longer than smaller species.

Elephants and whales, for example, live longer than mice and rats and voles, and these creatures live much longer than smaller flies and worms.

The lifespan of small animals such as worms and flies is constrained by the mechanism of cell division.

Most of these animals' cells cannot divide or replace themselves when damaged, so they don't last long.

Body size is also a powerful evolutionary driver in animals.

Small creatures are easily predated

Mice, for example, can't survive a year in the wild.

So they evolved to counter short lifespans with evolutionary defenses such as growing and reproducing faster.

Larger animals, on the other hand, are better at avoiding predation, giving them more time to mature and reproduce multiple times during their lifetime.

Exceptions to the size rule include bats, birds, moles, and turtles, and in all cases, they have their own adaptations to escape predators.

But even animals with similar size and habitat characteristics that characterize their lifespans can age at very different rates.

In this case, genetic differences, such as how cells respond to threats, are the main causes of lifespan differences.

So all of these factors combine to varying degrees in each animal to create the diversity we see in the animal kingdom.

What about humans?

At present, the average human lifespan is 71 years, which is far from being the longest-lived animal on Earth.

But we're very good at increasing life expectancy.

In the early 1900s, humans only lived an average of 50 years.

Since then, humans have adapted by controlling many of the factors that lead to death, such as "environmental exposure" and nutrition.

Through management and other means of increasing life expectancy, we humans are perhaps the only species on earth that can control death, which is our destiny.

Why do we buy certain products or choose certain brands?

This is a question advertisers are asking all the time, and it's not an easy question to answer.

But there's a useful way to help companies find answers to these kinds of questions, called a "focus group."

Until the 1940s, market research was often quantitative, using things like sales figures and consumer polls to look at consumer trends.

But during World War II, this changed.

Sociologists Robert Merton and Paul Lazarsfeld decided to examine the impact of unprecedented wartime propaganda on ordinary citizens.

Instead of asking a lot of people to answer direct questions in a quantitative way, they conducted interviews one-on-one, sometimes in small groups, and allowed more open discussion.

Later, this method was brought into the advertising industry by consultants, one of whom was the Austrian-born psychologist Ernest Dichter, who coined the term "focus group."

This new method was a form of qualitative research that focused on the nature of people's preferences and thoughts.

Qualitative research doesn't tell you what percentage of people buy a particular product or brand, but it tells you a lot more about who the people are, what makes them buy, and even the subconscious motivations behind them.

Instead of definitive business or sales conclusions (as in quantitative research), focus groups (which are qualitative research) were used in exploratory research to generate new product ideas and marketing based on a deeper understanding of consumer habits.

For example, early focus groups showed that, contrary to popular opinion at the time, wives had more influence over which cars to buy than husbands, so Chrysler began selling cars directly to women.

Dr. Dichter himself conducted a focus group for Mattel to find out what kind of dolls girls want.

The result was the original Barbie doll.

What do you do in a focus group

First, the company recruits six to 10 participants, people who meet certain criteria that fit the purpose of the study.

For example, mothers of five- to seven-year-olds, or teenagers who plan to buy a new cell phone in the next three months.

This is often done through a professional recruiter who maintains a roster of people who have agreed to participate in a focus group for some kind of reward.

During the session, participants are asked a variety of questions by the moderator, asking for their opinion on a particular product, or asking them to share how they feel about an advertisement.

Some seemingly irrelevant questions are sometimes asked, like, "Would you liken your brand to an animal in a zoo?"

The goal is to get useful information about the participants' perceptions that traditional quantitative questions don't provide.

Many variations are possible on these basics.

You can have two or more moderators in the group who take opposing positions on the questions, or you can have an investigator take a stand and slip into the focus group to see how the participants' responses are affected.

The whole process may also be observed by researchers using a magic mirror.

Focus groups can produce useful insights, but they also have limitations, and one of the main limitations is the effect that the simple act of observing can have on what you observe.

This principle is called "interference by the observer."

Participants' responses depended on the investigator's presence, social pressure from group members, and even just knowing they were part of the focus group.

And because researchers usually use small samples in specific settings, it's hard to generalize results.

Findings investigators gain from focus groups are usually validated through real-world trials and data collection.

These are numerical measures of things like the number of potential customers and the price at which they're likely to buy.

This process is changing as technology evolves.

Focus groups have remained largely unchanged for decades.

Perhaps when it comes to big and important questions, nothing beats the answers you get in honest interactions.

Standing in front of the goal and preparing to play, suddenly a violent itch runs through the back of your head.

We've all been frustrated by a nasty itch, but have you ever wondered why you're itching in the first place?

A normal person experiences a lot of itching every day.

Itching can be caused by many different things, including allergic reactions, dryness, and certain illnesses.

Or you can have a mysterious itch that appears for no reason at all, or just talking about itching can make you itch.

You're scratching your head right now, right?

Anyway, let's look at one of the most common causes - insect bites.

When a mosquito bites, it injects a compound called an anticoagulant into its body, which helps keep blood from clotting.

We are mildly allergic to this compound, which causes the release of histamine, a chemical that dilates capillaries.

This increases blood flow, which helps boost the body's immune response to this perceived threat.

This causes the skin to swell, the same reason pollen causes puffy eyes.

Histamine also activates nerves associated with itching, which is why insect bites make you want to scratch.

But we still don't know enough about the itch sensation itself.

In fact, much of what we've learned comes from studying the mechanism of itch in mice.

Researchers found that itching signals in the skin of mice are sent through some of the nerves associated with pain.

These nerves dedicated to itch produce "natriuretic polypeptide B," a signal that travels through the spinal cord to the brain, where the itch sensation is produced.

The movement of the nail against the skin during scratching produces a weak pain signal that overrides the itch sensation.

It's like distracting and creating a sense of security.

But does itch actually have an evolutionary purpose? Or is it just harassment?

The prevailing theory is that our skin has evolved to be acutely aware of touch in order to deal with dangers from the outside world.

please think about it

Our reflexive scratching action removes potentially harmful things that may be lurking in our skin: noxious stingers, biting insects, tendrils of poisonous plants.

This may be why we don't feel itching inside our bodies. Like our intestines, we are safe from these external threats. Imagine how infuriating internal itching can be.

In some people, problems in pathways involved in pruritus development lead to excessive itching that can be a real threat to their health.

An extreme example is a psychological disorder called delusional parasitosis, in which the patient moves his or her body up and down the skin, believing it to be infested with ticks or fleas, and scratching incessantly.

There's also a phenomenon called phantom pruritus, which can occur in amputee patients.

These injuries severely damage the nervous system, disrupting the body's normal nerve signals and creating sensations in limbs that no longer exist.

Doctors are now looking for ways to treat this kind of pruritus.

Amputees can use a mirror to mirror their remaining limb and scratch that leg.

This creates an illusion in the brain that the imaginary itch has been satisfied.

Oddly enough, it actually works.

Researchers are also studying the genes involved in itch and are developing treatments to block the itch pathway in severe cases.

If the itch you can't scratch feels like your own hell experience, so does Dante.

The Italian poet wrote about hell, where people are punished with eternal itch.

What do these animals have in common?

more than you think

They are mammals that include more than 5,000 species and are classified in the class Mammalia.

All mammals are vertebrates and have a backbone.

But mammals have many common traits that distinguish them from other vertebrates.

It's warm-blooded, covered in fur and fur, breathes lungs, and feeds its young with milk.

But despite these similarities, mammals also have biological differences, most notably in the way they give birth.

First, the most common are placental mammals.

This group includes humans, cats, dogs, and giraffes -- this group includes humans, cats, dogs, and giraffes -- this group includes humans, cats, dogs, and giraffes -- this group includes humans, cats, dogs, and giraffes -- and this group includes -- the largest animal on earth, the blue whale.

In mammals, the placenta is a blood-filled, tissue-filled disc that attaches to the uterine wall and supports the development of the embryo.

The placenta is what keeps the fetus alive during pregnancy.

The mother's direct blood supply delivers nutrients and oxygen directly into the fetus's body through the umbilical cord, and waste products are removed.

Placental mammals can remain in their mother's womb longer than other mammals.

Blue whale cubs, for example, spend almost a year inside their mother's womb.

The placenta keeps the fetus alive until the time of birth, when the umbilical cord breaks and the newborn begins to breathe, circulate, and expel waste on its own.

Newborn 7m long calves can already swim

A calf spends its first six months drinking 225 liters of thick, fatty milk every day.

Now, the second type of mammal is the marsupials that live in Australia.

A newborn marsupial baby is so small and delicate that it must continue to grow inside its mother's belly pouch.

Take the quoll, the world's smallest marsupial, for example. A newborn quoll weighs only 18 milligrams, which is about the weight of 30 grains of granulated sugar.

Kangaroos, another marsupial, give birth to only one baby per litter, the size of a jelly bean.

The baby crawls down the middle of the mother's three vaginas, has to climb up into the mother's pouch, and continues to suckle for the next six to 11 months.

Baby kangaroos return to suckle even after they leave their warm, safe havens.

Sometimes a mother kangaroo takes care of three cubs.

One mother kangaroo can simultaneously raise one kangaroo in the womb and another in the pouch.

If things go wrong, mother kangaroos can even put their pregnancies on hold.

Then you can produce two different kinds of milk, one for the newborn and one for the slightly older pup.

The word "mammalia" means the breast, which is somewhat misleading, because the nipples that kangaroos milk from are inside the mother's pouch, and they don't even have breasts.

The same can be said for the third, and certainly the weirdest, birthing monotreme.

There were once hundreds of species of monotremes, but now there are only five species left: four species of echidna and one species of platypus.

Monotreme means "one hole" Uses only one cloaca for reproduction, excretion and oviposition Uses only one cloaca for reproduction, excretion and oviposition Uses only one cloaca for reproduction, excretion and oviposition

Like birds, reptiles, fish, dinosaurs, etc., these species lay eggs rather than live births.

The egg is wrapped in a soft shell, and when the baby hatches, it sucks milk through pores on the mother's body until it's grown enough to feed itself.

They have egg-laying and other adaptations that we associate with non-mammals, like the platypus, which has webbed feet and a beak, and male feet with venom-secreting claws — and yet they're mammals.

That's because they share common traits that define mammals and are evolutionarily related to other members of the class Mammalia.

Whether placentals, marsupials, monotremes, however bizarre, each unique animal and its method of birth has been handed down for thousands of years, giving rise to an abundance of new life and diversity, building the mammalian kingdom.

I want to tell you the story of when I was stuffed in the trunk of a Mazda Roadster and was about to be kidnapped.

The day after I graduated from art school, I was selling unnecessary items in the garden.

Then a man in a red roadster came along and started looking at what was for sale.

buy my art work

He was alone in the city that night, driving across the United States, and he was going to join the Peace Corps.

So we went out for drinks, and he shared his passion for changing the world.

It's getting late and I'm tired

As a cue, I asked the wrong question, "Where are you staying tonight?"

His answer made matters worse: "Actually, I don't have a place to stay."

In my heart, I thought, "I'm sorry."

"What should I do?

We were together all along

Should I offer to stay with you?

But we just met, and you said you were going to the Peace Corps, but I don't know if you're really going, and I don't want to end up stuck in the trunk of a Roadster.

It's so narrow! ”

And then I heard myself saying, "I have an airbed, so you can stay in my living room."

A voice in my head says, "Hey what?"

I was lying in bed that night looking at the ceiling and thinking, "Oh, what did I do?

A stranger is sleeping in the next room!

What if I am an anomaly? ”

I got so nervous that I slipped out of bed and quietly made my way to the door and locked the room.

Luckily he wasn't crazy

We've been in touch since then

My work, which he bought at a garage sale, hangs in his classroom as a teacher.

That was my first experience as a host, and it completely changed my way of thinking.

The people you were taught to label as "suspicious strangers" as children may be friends you haven't met yet.

It became more and more normal for me to have someone stay in my house on an air bed, and when I moved to San Francisco, I took the air bed with me.

two years later

I was unemployed, almost broke, my roommate moved out, and my rent went up.

And then I heard that there was a design conference going on in town, and all the hotels were full.

I've always believed that turning fear into fun is the gift of creativity.

That's what I pitched to my best friend and new roommate, Brian Chesky, "Hey, there's a way to make a little bucks. Turn your house into a 'designer hotel.' Give young designers who come to town a place to stay with Wi-Fi, a small workspace, a futon, and breakfast."

How are you? ”

We built a simple website, and "Air Bed and Breakfast" was born.

Three lucky guests ended up sleeping on a $20 airbed on a wooden floor.

But they liked it and so did we.

Even our ham and Swiss cheese omelets felt special when we made them for our guests.

We took them around the city, said goodbye to the last guest, locked the door, and Brian and I looked at each other.

Maybe you've discovered it's possible to make friends while renting!

things started to turn

Former roommate Nathan Blecharczyk joins as co-founder of technology.

The three of us worked hard to see if we could turn this into a business.

Our pitch to investors is, "We want to create a website where people can publish photos of their most personal places, places like bedrooms and bathrooms that they would normally hide when they have guests.

And then he invites complete strangers over the internet to come stay at his house.

Great success! ”

(Laughter) We were waiting for our spaceship to take off.

nothing happened

No sane person would fund a service that allows complete strangers to stay in their homes.

Because

Because I've been taught since childhood that strangers are dangerous.

When faced with a problem, people rely on what they know best, and what we knew was design.

Art school teaches us that design isn't just about looks, it's about the whole experience.

We've learned to design things, but what we're trying to create here is a great deal of trust between people we've never met.

Can it be achieved by design?

Is it possible to create a design that creates trust?

I want you to experience what the trust that we were trying to achieve is like.

I've prepared a 30-second experiment to push you out of your comfort zone.

Thumbs up if you want to do it

take out your cell phone

Please unlock your phone when you take it out

Now give that unlocked phone to the person on your left.

(Laughter) The slight sense of panic that you're feeling right now -- (Laughter) is the same thing that a host feels when they first reveal their home.

The only thing more personal than your phone is probably your home.

Not only can you see your email, but you can see your bedroom, your kitchen, your bathroom.

So what does it feel like to have someone else's phone unlocked?

a lot of people feel very responsible

Many of our guests feel the same during their stay.

Our company exists because of it.

By the way, who owns Al Gore's cell phone?

(Laughter) Why don't you tweet that you're going to run for president?

(Laughter) (Applause) So let's give the phone back to its owner.

Now that you've experienced the trust issues we faced, I'd like to share with you some of the things I discovered along the way.

What if we changed the design of the current experiment a little bit?

What if the person next to you started by introducing himself and giving his name, where he was from, the names of his children and his dog?

What if that person was highly rated by 150 people? "You're the best person if you let me have an unlocked phone!"

(Laughter) How would that change how you feel when you leave your phone?

I've found that a well-designed reputation system is the key to building trust.

it didn't really work at first

Bad reviews are hard to write

Then I discovered that it's a good idea not to publish until the guest and host reviews are complete.

The next thing I'm going to tell you about is what I discovered just last week.

In a joint study with Stanford University, we looked at how trust varies according to how similar a person is to us in terms of age, background, and environment.

Not surprisingly, research has shown that people prefer people who are similar to themselves.

The greater the difference, the less reliable

that's a natural social prejudice

What's interesting is what happens when you add reputation, in this case using reviews.

If the number of reviews is 3 or less, there will be no effect.

With 10+ reviews, the story changes completely.

a good reputation beats likeness

Good design can overcome the deepest ingrained prejudices.

We've also learned that building the right amount of trust requires the right amount of disclosure.

This is the difference in acceptance rate depending on the first message sent from the guest to the host.

If all you say is too short, like just "hello", your acceptance rate goes down.

On the other hand, if you tell them too much, like, "I'm having a rough time with my mother..." -- (Laughter), the acceptance rate goes down.

There's just the right amount: "I like the paintings there. I'm going on vacation with my family."

How can we ensure that the right amount of disclosure is done by design?

We use the size of the input field to indicate the appropriate length and encourage people to talk about themselves.

We staked our company's fate on the hope that the "stranger is dangerous" bias could be overcome with good design.

What we didn't realize was how many people were ready to let go of this prejudice.

This graph shows the growth in penetration

There are three factors at work here.

First of all, I have incredible luck.

Second, there is the effort of the staff.

Thirdly, there are needs that have not been met until now.

It went very well

Of course, there were times when things didn't go well.

No guests allowed Throw a party and mess up the house

A guest was forced to wait in the rain

In the beginning, I was a customer service representative, and complaint calls came directly to my cell phone.

I was on the front lines of betrayal of trust.

There's nothing more painful than a phone call with complaints like that, and just thinking about it makes my heart hurt.

Disappointment in someone's voice was, and still is, the greatest force that keeps us improving.

Thankfully, less than a fraction of 1% of the 123 million nights that have been offered have been in trouble.

I was shown that I was right to trust you.

And when that bond of trust is established, it can feel magical and wonderful.

A guest staying with a host in Uruguay had a heart attack.

The host rushed him to the hospital

I even donated blood for surgery.

Let's read the review at that time

(Laughter) "It's a really nice house, and it's perfect for a traveler who might have a heart attack because of lack of exercise.

(Laughter) It's a beautiful place, and there's a good hospital right next door.

(Laughter) Javier and Alejandra will instantly become your guardian angels and save you from strangers.

If you're dying, they'll drive you to the hospital as fast as you can, and wait in the waiting room for you to undergo bypass surgery.

Bring me a book so I won't be lonely alone

extended my stay at no extra charge

Highly recommended! ”

(Applause) Of course, that doesn't happen all the time.

This connection beyond financial transactions is what the sharing economy is all about.

Admittedly, when I first heard about the "sharing economy," I was hooked.

How can sharing and commerce coexist?

So let me be clear, this must be a commercial transaction.

But it would be inaccurate to just call it the "rental economy."

The sharing economy is human-connected commerce.

Everything changes when people share a part of themselves.

Most travel today feels like fast food, in favor of efficiency and homogeneity at the expense of authentic local experiences.

What if travel was like a lavish buffet of indigenous experiences?

No matter where you go, there's a marketplace where locals offer a variety of things, and you can go from hideaway to izakaya and drink to your heart's content.

What if you could learn to cook from a five-star restaurant chef?

Today, homes are designed around the idea of ​​privacy and segregation.

What if homes were designed from the ground up to be shared?

What do you look like?

What if the culture of sharing became commonplace in the city?

I envision a communal city of the future that brings community and connection instead of isolation and fragmentation.

It's already happening in Seoul, South Korea.

Hundreds of government parking spaces are shared with residents.

A husband and wife in a house with an empty room where a child has left home accepts students who need a place to live

There are also incubators that support the next generation of startups that will create a sharing economy.

Tonight, on our service alone, 785,000 people in 191 countries are staying in other people's homes or welcoming others into their homes.

This doesn't seem to be as crazy as we've been taught.

We didn't invent anything new.

Hospitality has existed since time immemorial.

There are many similar websites

So why is our service so successful?

What I've learned is that aside from luck and timing, it's possible to take an element of trust and design around it.

Design can overcome even the deep-seated prejudice that strangers are dangerous.

this is amazing

I can even feel the emotion

That's what I think of every time I see a red roadster

Design can't solve all the world's problems

But if the power of design can create this kind of change, I wonder what else we can design.

thank you

(applause)

Tango played by the evolution of animal reproductive organs

What do you think you're seeing right now?

Turns out it's a "duck vagina", you're right

Ducks don't look particularly weird from the outside, but they reproduce in this strange, intricately shaped, corkscrew-shaped organ.

Similar strangely shaped reproductive organs are found in insects, mammals, reptiles, fish, spiders and snails.

There seems to be no other organ that evolves as rapidly or as diversely as reproductive organs.

On the surface, this makes sense, because evolution happens through reproduction.

The more offspring you leave behind, the more spread your genes will be.

Because the reproductive organs are the means of reproduction in animals, any improvements there are immediately visible.

But what's the point of having such a decorative genitalia?

After all, the function of the reproductive organs seems simple.

The penis releases the sperm, the vagina receives it and carries it to the egg.

The male has a pipette and the female has a funnel.

But that's actually not the case.

For example, the cockroach's penis looks nothing like a pipette, it looks like the remains of an exploded wall clock.

The Vagina of the Mushroom Beetle looks like something out of a Dr. Seuss picture book.

In all living things in the animal kingdom, the reproductive organs are very complex, even more complex than their function requires.

That's because the reproductive organs do much more than exchange sperm.

Many males, like crane flies, also use their genitalia for courtship.

In some species found in South America, males have a washboard-like structure on their penis that they rub against to create music that echoes inside the female during mating.

It is believed that if a female crane fly likes this quirky love song, she will give birth to the male.

This is how the genes for the most musical penis spread, and the evolution of the worm's penis spread rapidly.

Similarly, some beetles have drumsticks on either side of their penis.

During mating, the drumsticks stroke and pat the body of the female.

Some ungulates, like sheep and cows, use a whip-like part on the left side of the penis to stimulate the senses during mating.

But if females can make judgments only through mating, how do they choose a mate?

Female adaptability comes to life here.

In fact, fertilization and implantation are different, and female reproductive organs take advantage of this difference.

Some dung flies, for example, have pockets inside their vaginas that hold separate sperm from different males, sorted in order of attractiveness.

Males use their penises for courtship, and females are in charge of sorting sperm, which is why their reproductive organs have evolved to such a complex shape.

And there's another reason: the genitalia are also the arenas where conflict between the two sexes unfolds.

As a female, the goal is to fertilize the sperm of the most suitable males, thereby imparting genetic diversity to the offspring.

For males this is a disadvantage

As a male, I want all of the female's eggs to be fertilized with my own sperm.

So the cycle of adaptation, the battle of evolution, is the battle of control.

The tip of the black widow spider's penis is disposable and remains inside the vagina to prevent sperm from entering other males.Bedbug males do not pass through the female's genitalia and inject sperm directly into the abdomen with a syringe-like penis.

Females have countermeasures so they don't get outmaneuvered.

Some bed bugs have evolved new genitalia on the right side of their abdomen, where males often inject.

By doing so, you allow your reproductive organs to sort out the unwanted sperm.

The duck's vagina is a clockwise spiral, and when the male inflates the long counter-clockwise spiral penis inside, if the female doesn't like it, the penis will be expelled just by contracting the muscles of the vagina.

The genitalia are so diverse not only for the sake of our interest, but also because there is a tango of furious sexual evolution between species, and the evolution of animal genitalia over millions of years will continue to play a tango for millions of years to come.

1796 Thomas Jefferson received an unidentifiable box of bones.

Its long, sharp claws reminded me of a lion, but its arm bones suggested a larger animal, about three meters long.

Thinking it might be a large, unknown species of North American lion, Jefferson warned explorers Lewis and Clark to be wary of this enigmatic predator.

But this Jefferson skeletal box isn't Lion's.

It belonged to the extinct giant sloth

Prehistoric ground sloths appeared about 35 million years ago.

Dozens of species lived across North, Central and South America, along with other ancient creatures such as mastodons and giant armadillos.

Ground-dwelling sloths, such as the two-toed sloth, were about the size of cats, but many others were gigantic.

The Megalonyx that Jefferson saw weighed about a ton, but they were still small species compared to Megatheriums, some of which, like elephants, weighed as much as six tons.

They roamed forests and savannahs, using their powerful arms and sharp claws to pull up vegetation, climb trees, and feed on grass, leaves, and prehistoric avocados.

In fact, if it weren't for giant sloths, we might not have avocados today.

Smaller animals couldn't swallow the large avocado seeds, but sloths could, so they spread the avocado tree over a wide area.

Ground sloths thrived for millions of years, but about 10,000 years ago they began to disappear, along with other giant mammals of the Western Hemisphere.

Researchers believe that ground sloths were driven out during the Ice Age, or because other species, perhaps humans, emerged and fought when most sloths were beginning to go extinct.

A few small sloths survived and settled in trees.

Six species remain today, and they live in the rainforest canopies of Central and South America.

Hanging in trees is a good way to avoid predators, and there are enough leaves to eat.

But this diet has its drawbacks.

Animals use the energy they get from food to move around, keep warm, keep their organs functioning, and perform all other activities necessary for survival.

But leaves don't contain much energy, and it's very difficult to extract that energy.

Most herbivores supplement their diet by eating higher-energy fruits and seeds.

But sloths, especially three-toed sloths, live almost entirely on leaves.

They evolved a finely tuned strategy to deal with this restricted diet.

First, they extract as much energy as possible from food.

Sloths have a compound stomach that takes up one-third of their body size, allowing them to digest food in five to seven days or weeks, depending on the species.

Their secret is to use as little energy as possible.

One way to do that, of course, is not to move too much.

They spend most of their time eating, resting and sleeping

Comes down from the tree only once a week for a bathroom break

Sloths don't move very fast.

It takes about five minutes to cross an average parcel road.

This unhurried lifestyle means sloths don't need much muscle.

In fact, they have about 30 percent less muscle mass than other animals for their size.

Sloths also use less energy to keep themselves warm, because they can tolerate changes in body temperature of up to about 5 degrees Celsius, which is less than cold-blooded reptiles, but more than most mammals.

These physical and behavioral adaptations minimize the sloth's energy expenditure or metabolic rate.

Three-toed sloths have the slowest metabolism of any mammal.

The next slowest is the giant panda, followed by the two-toed sloth.

Slow movement allowed them to thrive in treetop habitat.

Likewise, they've made their bodies wonderful habitats for other organisms, among which algae can provide a bit of protective color and may also serve as snacks.

Sloths may not be huge anymore, but they're still extraordinary.

Today is a very good day for pirates

Amaro and his four companions, Bert, Charlotte, Daniel and Eliza have discovered a great deal of gold. A treasure chest filled with 100 gold coins.

However, according to the pirate's law, the treasure must be divided.

As captain, Amaro proposes a way to distribute the gold coins.

Then all the pirates, including Amaro, vote for or against the idea.

In case of a majority vote or a tie vote, the coins will be distributed according to the proposal.

When the opposition reaches a majority, Amaro is blindfolded and walks the board of a pirate ship and is dropped into the sea, with Bert taking over as captain.

Bert, now captain, proposes a new distribution plan, and the remaining pirates vote again.

But when Bert's plan was rejected, Bert was destined to walk the plank from now on, and Charlotte took over as captain.

The process is repeated, passing the captain's hat to Daniel and then to Eliza, ending with either a resolution or one pirate remaining.

Naturally, everyone wants to earn as much gold as possible and at the same time survive.

But it's also the nature of pirates, and they don't trust each other, so they can't collude with other pirates beforehand.

Pirates are bloodthirsty, so if they know they're going to end up with the same amount of gold anyway, they'll vote because they want to see the captain walk the plank.

All pirates are good at reasoning, and they know that others are just as good.

Now, what sort of distribution should Amaro propose to survive?

Pause the video at this point if you want to solve it yourself.

To answer: 3 To answer: 2 To answer: 1 Based on my intuition, it seems to me that Amaro should increase the chances of his proposal being accepted by offering most of the gold coins as a bribe to the others.

But there's actually a better way than that. Why?

As I said before, pirates understand each other to be good at reasoning.

When we vote, we don't just consider the proposal, but we also take into account the possible consequences and all possible developments.

And because the order of the votes is known in advance, each can infer exactly how the other will vote in any given situation, and can vote accordingly.

Finally, Eliza has the most possibilities to consider, so let's follow her thought process.

In the end, you'll probably think backwards and reason logically about the possibility that only she and Daniel are left.

Of course, Daniel would suggest that she get all the gold coins, but Eliza won't be able to overthrow his proposal with her own negative vote, so she'll do anything to avoid this situation.

Now we go back to the previous decision-making point, the point that Charlotte proposes with the three remaining pirates.

If her proposal doesn't get a majority vote, Daniel gets power, he gets all the gold coins, and Eliza gets nothing.

In order to get Eliza's vote, Charlotte needs to be able to hand over just a little more than zero, that is, just one gold coin.

Now that Eliza's consent has been obtained, Charlotte doesn't have to give anything to Daniel.

What if there are 4 pirates left?

Captain Bert can pass a plan by getting just one vote.

Daniel knows he doesn't want Charlotte to be in control, so to get his consent, he gives Daniel a piece of gold and nothing to Charlotte and Eliza.

Now, let's go back to the beginning, where all five pirates have a vote.

After considering all the other scenarios, Amaro knows that if he falls into the sea, the power will pass to Bert, which is bad for Charlotte and Eliza.

Give 1 gold coin to each of the two people and you will get 98 coins.

Bert and Daniel know they're going to vote against it, and Charlotte and Eliza reluctantly vote for it, because they know the alternative to it is even worse.

The game of pirates involves an interesting concept in game theory.

The first is the concept of "common knowledge," where each of us knows what someone else knows, and we use that knowledge to predict what other people will reason about.

And the final distribution plan is an example of a "Nash equilibrium", where each participant knows the strategy of the others and chooses their own strategy based on that knowledge.

None of the participants individually can benefit from changing their strategies, even if the outcome is worse for everyone than they could possibly get from working together.

As a result, it seems that Amaro has most of the gold coins.The other pirates may need to use their brilliant logical abilities to come up with better ways, such as changing the irrational laws of pirates.

A few years ago, I did something very brave, some would say stupid.

I ran for the House of Representatives

I've been working as a fundraiser and facilitator for a long time, and I've stayed out of politics, but deep down, I've always wanted to be involved.

The incumbent in my constituency has been in office since 1992.

She never lost an election, and no one really tried to challenge her in the Democratic primary.

But I thought, this is the way to go, to make a difference, to change the status quo.

But the poll results weren't great.

My pollster told me that running for office would be insane and unwinnable.

But I decided to run, and in 2012, I became the rookie candidate for the New York City election.

I swore that I would surely win

Endorsed by the New York Daily News, the Wall Street Journal took a picture of me on Election Day, and CNBC reported that it was the hottest race in the nation.

I collected money from everyone I knew, including Indian aunts who were happy just because an Indian woman was running for office.

But the election showed that the polls were right, and I only got 19 percent of the vote, and the newspaper that had touted me as a "political rising star" reported that I wasted $1.3 million for just 6,321 votes.

Please don't do the math

was humiliating

Mind you, this is not about the importance of failure.

It's not about taking a step

I told you about the election because then, at the age of 33, I did something really brave for the first time in my entire life. I didn't care if I was perfect.

This isn't just me. Many of the women I've talked to have said that they've only chosen jobs that they know they can do well. No wonder.

Because many girls are taught to avoid risks and failures.

Smile cutely, put safety first, get all A's

Boys, on the other hand, are taught to play naughty, pedaling high on swings, climbing to the top of jungle gyms, and diving head first.

By the time you're an adult, whether it's negotiating a raise or asking someone out on a date, you're in the habit of taking risks.

being rewarded by it

It's even been said, "In Silicon Valley, you'll only be taken seriously after you've had two failed startups."

After all, girls are raised to be perfect and boys to be brave.

Some people worry about the government deficit, but I'm more concerned about the courage deficit.

I think the reason we're not doing well, whether it's the economy or society, is that we're not teaching girls to be brave.

This lack of courage has led to the underrepresentation of women in science and technology, in executive positions, in boardrooms, in Congress, in most important places.

In the 1980s, psychologist Carol Dweck looked at how smart fifth-graders deal with tasks that are too difficult.

It turns out that smart girls give up quickly.

The higher the IQ, the easier it is to give up.

On the other hand, smart boys can challenge difficult problems.

feel worthwhile

Double your effort

What does that mean?

In fifth grade, girls outperform boys in every subject, including science and math, so it's not a question of ability.

It's a matter of the difference in attitudes that boys and girls take to challenge.

And this isn't a story that ends in fifth grade.

According to HP research, men who meet 60% of the requirements will apply for jobs, but women who do not meet 100% of the requirements will not apply.

100%

This study is often cited as evidence that women need to be more confident.

I think it's more evidence that women are socially conditioned to be perfect and overly cautious.

(Applause) The social conditioning of women to be perfect even when they're ambitious and stepping forward makes them more risk-averse in their career choices.

With 600,000 jobs in computing and technology today, women are being left behind. Our economy is missing innovations and problems that women would solve if women were socially conditioned to be brave rather than perfect.

(Applause) In 2012, when I started a company to teach women to code, I realized that by teaching them to code, I was socially conditioning them to be brave.

Programming is a never-ending process of trial and error. You have to put the right commands in the right places, and a single semicolon separates failure from success.

Programs constantly stumble and fall apart, and it takes many tries to reach that magical moment when what you were trying to create comes to life.

patience is required

imperfections must be reconciled

When I teach, I can immediately see the fear that girls have about not being right and not being perfect.

All Girls Who Code teachers will tell you the same story

In my first week of programming, a girl said to me, "I don't know how to program."

When I look at the screen, all I see is an empty text editor.

If the teacher didn't know anything, he'd think the girl was just staring at a screen for 20 minutes.

But if you click the "undo" button a few times, you'll find that the student wrote the program halfway and erased it.

The child tried to write it, and it got to a good point, but something went wrong.

And I would rather show nothing than show what I've been able to do.

perfect or nothing

It turns out that girls are really good at programming, but just teaching them how to code is not enough.

A friend of mine, Lev Bree, a professor at Columbia University who teaches an introductory class to Java, told me about a time when a student consulted him.

In the case of male students, when they have a problem with an assignment, they come to me and say, "Teacher, there seems to be something wrong with my program."

If it's a girl, they say, "Teacher, I think there's something wrong with me."

We need to counteract this social conditioning of perfection while building solidarity among women so they know they're not alone.

Because structural problems aren't something you just have to try harder to fix.

I don't know how many women I've heard say, "I can't raise my hand. I'm afraid to ask questions. I'm embarrassed if I'm the only one who doesn't understand and the only one who's struggling."

If they have a support network that teaches them to be brave and encourages them, they can do amazing things, and I see it every day.

For example, two high school girls at my house created a game called "Tampon Run," yes, those tampons, that challenge the taboos of menstruation and sexism in games.

A Syrian refugee child wanted to show his love for his new homeland and created an app to help Americans go to the polls.

A 16-year-old girl created an algorithm to find out if a tumor is benign or malignant, hoping it might help her father with cancer.

These are just three examples out of thousands of girls who have been socially conditioned to be imperfect and have learned to keep trying and persevere.

Whether they're trying to be a programmer or the next Hillary Clinton or Beyoncé, they won't linger on their dreams.

And those dreams have never been more important to this country than now.

For the American economy, or any economy that wants to grow and truly innovate, we can't afford to waste half our population.

We have to socially condition girls to be imperfect, and right now.

I can't wait until they're 33, like I did, for them to be brave.

We need to teach people to be brave early in their school and work lives, when they're most likely to make an impact in their own lives and in the lives of others.

So I want you to tell every young woman you know, to your sisters, to your nieces, to your employees, to your co-workers, that by embracing your imperfections, by teaching them that it's okay to be imperfect, by helping them live with it, and by helping young women find the courage to build a better world for themselves and for everyone else.

thank you

(Applause) Thank you.

(Chris Anderson) Thanks Reshma

You have a very strong vision, you have a vision

please let me know how it is

How many girls are currently participating?

(Reshma Sajani) In 2012, I was teaching 20 girls.

Now in 2016, I'm teaching 40,000 people in all 50 states.

(Applause) That's a really encouraging number. Last year, only 7,500 girls graduated from computer science.

It's because the current situation is so bad that we can make such big changes in such a short period of time.

Chris: So you're working with the companies of the people here. Where are the graduates coming from?

(Reshma) We have about 80 sponsoring companies. Twitter Facebook Adobe IBM Microsoft Pixar Disney Everyone does.

If your company isn't there yet, I'll go get it, and I urge all tech companies to take the Girls Who Code classroom.

Chris: You've also heard good reviews from the companies that hired you, saying that having a gender balance in the tech department yields good results.

(Reshma) Great results.

Not including women is silly. 85% of consumer purchases are made by women.

Women are six times more likely to use social media than men

The internet is more about women. We have to build the companies of tomorrow.

If you have a diverse team and you have great women in tech, you're bound to create something amazing, and I see it every day.

CA: You've seen everyone's reaction, and I think what you're doing is very important.

Everyone in the community is rooting for you Good luck

(reshma) thank you

(applause)

Have you ever wondered how your body processes painkillers like ibuprofen?

As the medicine slides down your throat, it relieves headaches, backaches and throbbing ankle sprains.

But how do you get where you need to be in the first place?

The answer is that the drug travels through the bloodstream, circulates through the body, and acts at the site of pain before the organs and molecules try to neutralize the substances from outside the body and flush them out.

This process begins in the digestive system

Let's say you take an ibuprofen tablet to relieve the pain in your ankle.

In a few minutes the pill will begin to dissolve with stomach acid.

Dissolved ibuprofen reaches the small intestine and is transported through the wall of the intestine and into a network of blood vessels.

These blood vessels connect to veins, which carry the blood and everything in it to the liver.

The next step is to pass through the liver

As the blood and drug molecules travel to the liver's blood vessels, enzymes try to neutralize the ibuprofen molecules.

Molecules of ibuprofen that break down, called metabolites, lose their effectiveness as an analgesic.

At this stage, most of the ibuprofen is not broken down.

through the liver and through the veins into the circulatory system

As little as 30 minutes after you take the drug, some of the drug you take reaches your bloodstream system.

This blood flow loop is carried throughout the body, including the heart, brain, kidneys, and back to the liver.

When the ibuprofen molecule reaches the site of the peak pain response, it binds to specific target molecules that are part of the pain response.

Pain relievers such as ibuprofen thus block the production of molecules that transmit pain signals.

As the analgesic molecules accumulate, the pain-relieving effect increases, reaching a maximum in about an hour or two.

The body then begins to effectively eliminate ibuprofen, and its blood level halves roughly every two hours.

Once the ibuprofen molecule leaves the target tissue, the bloodstream carries it away again.

Once back in the liver, some of the total drug is converted into metabolites that are then filtered into the urine by the kidneys.

The loop that circulates from the liver through the body to the kidneys is done at a rate of one lap per minute, each time the drug is neutralized and filtered out.

The basic steps of taking an oral drug are pretty much the same for any drug, but the speed of this process and the amount of drug that enters the bloodstream varies from drug to drug, depending on the person and how it enters the body.

The dose on the drug label is helpful, but it's the average for a sample of subjects and doesn't apply to everyone taking the drug.

Taking the correct amount is important

If the dose is too small, the effect will be inadequate.

too much can be toxic

This applies to any drug

It is difficult for children to determine the correct dosage.

That's because the process of processing drugs changes rapidly as we grow.

For example, levels of liver enzymes that neutralize drugs are highly variable between infants and young children.

This is just one of many influencing factors.

Genes, age, diet, disease, and pregnancy also affect how efficiently the body processes drugs.

One day, routine DNA tests will be able to determine what dose is right for you, including your liver's processing capacity, but until then, read the labels when you take your medicines, talk to your doctor or pharmacist, and stick to the dosages and instructions you're given.

After wandering aimlessly through the woods all day looking for edible grains and herbs, exhausted cleric and farmer Shen Nong was poisoned 72 times.

But before he could die from the poison, a leaf blew into his mouth.

He took a bite of it and regained his spirits. And so the tea was discovered.

Or so it's been said for a long time

Although tea is not actually a detoxifier, the story of Shen Nong, the mythical founder of Chinese agriculture, sheds light on the importance of tea to the ancient Chinese.

Archaeological evidence suggests that tea was first grown in China some 6,000 years ago, or 1,500 years before the Pharaohs built the Great Pyramids of Giza.

The early Chinese tea plants were the same variety that is grown all over the world today, but they were drunk in a very different way.

Tea was consumed as a vegetable or cooked with grain porridge.

It wasn't until 1,500 years ago that tea changed from being a food to a drink, as people realized that when heat and steam were mixed, the green color of the leaves produced a complex and colorful flavor.

After hundreds of years of experimenting with brewing methods, the rudimentary method was to heat tea, flatten it into a portable shape, grind it into a powder, and pour boiling water over it to make a beverage called mucha, or matcha.

Matcha became so popular that a veritable Chinese tea culture blossomed.

Tea was the subject of books and poetry, the favorite drink of emperors, and the object of expression for painters.

Artists painted tea bubbles in a whimsical way, much like the espresso art you see in modern coffee shops.

In the 9th century, during the Tang dynasty, a Japanese monk brought the first tea tree to Japan.

The Japanese eventually developed their own tea rituals, which led to the birth of the Japanese tea ceremony.

And in the 14th century, during the Ming dynasty, the Chinese emperor changed the standard method of tea production from pressing and flattening the tea to loose loose leaves.

At that point, China still had a virtual monopoly on the world's tea plants, and tea had become one of China's three main exports, the other two being porcelain and silk.

This gives China tremendous power and economic clout because tea is being consumed all over the world.

This spread began in earnest around the early 1600s, when Dutch traders brought vast amounts of tea to Europe.

Queen Catherine of Braganza, a Portuguese noblewoman, is widely credited with her marriage to Charles II in 1661, who popularized tea among the English aristocracy.

At that time, Britain was in the midst of expanding its colonies and on the cusp of becoming the new power to rule the world.

And as Britain expanded, so did the interest in tea around the world.

By 1700, tea was selling for ten times as much as coffee in Europe, and tea plants were grown only in China.

The tea trade was so lucrative that fierce competition among Western trading houses gave rise to the world's fastest sailing vessel, the Clipper Ship.

They all fought to maximize their profits, to be the first to Europe, to bring back the tea.

At first, the British paid in silver to buy Chinese tea.

When it proves too expensive, the Brits suggest paying with something else: opium.

This has caused people to become addicted to drugs and has caused public health problems within China.

In 1839, Chinese officials ordered their soldiers to destroy a huge British opium ship, in what could be described as a protest against British influence over China.

This act triggered the First Opium War between the two countries.

Heavy fighting raged on the Chinese coast until 1842, when the defeated Qing dynasty handed over Hong Kong to Britain, and unequal trade resumed.

The war weakened China's international standing for more than a century.

The British East India Company also wanted to grow its own tea and gain more control over the market.

So he asks botanist Robert Fortune to secretly steal tea from China.

He disguised himself and ventured through the mountains of tea growing in China until he brought tea plants and experienced workers to Darjeeling, India.

From there, the tea plant spread further, spurring the rapid spread of tea as a daily luxury item.

Today, tea is the second most consumed beverage in the world after water, and it is consumed in as many ways as there are cultures on the planet, from sugary Turkish Rize tea to salty Tibetan butter tea.

What do the atmospheric post-punk fans have in common with the ancient Germanic tribes?

not much

But why are they both called "goths"?

A strange coincidence? Or a deep connection, separated by centuries?

The story begins in ancient Rome

As the Roman Empire expanded, its fringes were threatened by semi-nomadic raids and invasions.

Especially powerful were the Germanic Goths, of which there were two groups: the Visigoths and the Ostrogoths.

Some of the Germanic peoples remained hostile to Rome, while others were incorporated into the imperial army.

When the Roman Empire split in two, these mercenaries played a major role in policing borders and fighting for power within the country.

In the 5th century, Odoacer led a mercenary rebellion, captured Rome, and exiled the Western Roman emperor.

Both Odoacer and Theodoric, the Ostrogoth who came to power, ostensibly submitted to the authority of the Byzantine emperor and maintained the Roman tradition.

But the Western Roman Empire was never revived.

Its territory was fragmented into small kingdoms ruled by the Goths and other Germanic peoples, who assimilated into the local culture, although the names of many peoples can still be seen on maps.

Thus ended classical antiquity and began the so-called Dark Ages.

Although Roman culture never completely disappeared, its influence diminished and new art styles emerged, one that emphasized religious symbolism and allegory over proportion and realism.

Stylistic changes also extended to architecture, and in France, the Saint-Denis Cathedral was built in 1137.

Pointed arches and large windows accentuate the structure and decorativeness of the building.

Because of this structure, the interior is light and airy, in contrast to classical architecture with its solid walls and massive columns.

Over the next several centuries, it became the model for cathedrals all over Europe.

But trends change

The Italian Renaissance reassessed ancient Greece and Rome, and saw the more recent styles as crude and inferior.

Giorgio Vasari first used the word Gothic in 1550 in his Biographies of the Artists with the intention of demeaning the barbarians who destroyed classical civilization.

The name Gothic stuck and soon became associated with the darkness, delusion and simplicity of the whole Middle Ages.

But as times change, so does the sense of newness.

During the 18th-century Enlightenment, scientific reason was paramount.

Romantic writers like Goethe and Byron rebelled against this, pursuing idealized visions of ancient natural landscapes and mysterious supernatural forces.

Here the word gothic reappears to refer to a brooding literary genre within romanticism.

It was first used by Horace Walpole to describe the plot and overall mood of his 1764 novel The Castle of Otranto.

Many of the elements contained in this novel have become genre staples, spawning classics of this kind and numerous films.

Since then, the name Gothic has been associated with literature and cinema, but in the 1970s a new musical scene emerged.

Influenced by The Doors and the Velvet Underground, British post-punk bands such as Joy Division and Bauhaus The Cure combined the brooding lyrics and harsh sounds of punk with Victorian and classic horror imagery and androgynous glam fashion.

By the early 1980s, music magazines began calling these bands gothic rock, and the style of music played in dimly lit clubs gained popularity and made its way to major labels and MTV.

Despite sometimes being viewed negatively and stereotypically by the media, Gothic music and its fashions still have a strong underground following.

Sub-genres such as Cybergoth, Gosabilly, Gothic Metal, Steampunk, etc.

The history of the word Gothic contains thousands of years of countercultural activity, with barbarians becoming kings, tall spiers giving way to massive pillars, and artists finding beauty in darkness.

At every stage, revolutions have taken place, and civilizations have looked to the past and tried to change the present.

In 1898, the Curies discovered radium.

Radium is said to have healing power and has been added to various things such as toothpaste, medicine, water, and food.

Its bright green color was also used in cosmetics and jewelry.

It wasn't until the mid-20th century that it was realized that its radioactive hazards were so great as to overwhelm its aesthetic beauty.

Unfortunately, historically, there have been other pigments other than radium that were seemingly harmless or useful but turned out to be very dangerous.

Objects with this sad quality include three colors that have long been used to adorn objects and bodies: white, green, and orange.

Let's start with white

As early as the 4th century BC, the ancient Greeks were making bright white pigments out of lead.

What's the problem?

Lead is directly absorbed by the human body and is distributed through the blood, soft tissues and even calcified tissues.

Once in the nervous system, lead displaces calcium and interferes with its normal function, leading to problems ranging from learning disabilities to high blood pressure.

Yet this toxic pigment persisted across time and culture.

Until the 19th century, it was really the only way to make tempera or oil white paint.

Artists who grind lead nuggets into powders to make paints are now exposed to toxic dust.

The heavy use of this pigment led to what is now known as lead poisoning, known as "artist's colic."

Symptoms complained by lead painters included paralysis, depression, coughing and eye problems that led to blindness.

Yet the density, opacity, and warm hues of white lead had an irresistible appeal to Vermeer and later Impressionists.

Its brilliance was unmatched, and white lead continued to be widely used until it was banned in the 1970s.

That sounds bad enough, but the danger is negligible compared to some more widely used pigments.

Two synthetic green pigments, Scheele green and floral patina, emerged in the 18th century.

Because it was much brighter and more gorgeous than the dull green color made from natural pigments, it quickly became popular as a paint, and was used in dyes for textiles, wallpapers, soaps, cake decorations, toys, sweets, and accessories.

These green pigments were made from an arsenic compound called copper arsenite.

When the human body is exposed to arsenic, it impairs cell communication and function.

High levels of arsenic directly cause cancer and heart disease.

As a result, 18th-century textile mill workers were often poisoned, and women in green dresses were said to have collapsed from exposure to arsenic on their skin.

It is said that bedbugs do not live in green rooms, and it is even speculated that Napoleon died of arsenic poisoning from sleeping in rooms with green wallpaper.

The toxic nature of these greens was hidden until the arsenic-based recipe was revealed to the public in 1822.

And a century later, it was used as an insecticide.

Synthetic green pigments were the most widely used and most dangerous colors, but at least they weren't as radioactive as radium.

But there's also a color that used to be radioactive, orange.

Before World War II, it was common for ceramic tableware manufacturers to use uranium oxide as a glaze.

This compound produced bright reds and oranges, and if it weren't for the radioactivity it would have been very attractive.

Of course, radiation wasn't known until the late 19th century, and it wasn't until much later that we learned of its cancer hazards.

In the United States during World War II, uranium was confiscated by the government for the purpose of developing bombs.

In 1959, the Atomic Energy Commission loosened regulations, and depleted uranium returned to ceramics and glass factories.

Some of the orange plates made over the next decade still have toxic marks on their surface.

Radioactivity has been detected, especially in vintage Fiesta wear.

While it's not dangerously radioactive if you keep it on your shelf, the Environmental Protection Agency warns against using it in your diet.

Synthetic food colors can still be a problem, but science is helping us keep dangerous colors out of our surroundings.

Deep inside Yale University's Beinekee Rare Books and Manuscripts Library, there's a 240-page one-of-a-kind book.

Recently carbon-dated to the 1420s, the parchment book has what looks like handwritten round letters and hand-drawn illustrations that look like they were drawn straight out of a dream.

Real and fantasy plants Floating castles Bathing women Astrological charts Zodiac rings Faced sun and moon with text

This 24-by-16-centimeter book is called the Voynich Manuscript, and it's one of the biggest unsolved mysteries in history.

The reason is

because no one can decipher it

The name of the book comes from Mr. Wilfrid Voynich, a Polish bookseller who found it at a Jesuit college in Italy in 1912.

he was perplexed

who wrote it?

where was it made?

What is the language of these strange characters What does the thrilling picture mean?

What secrets are hidden?

He bought the book from a cash-strapped priest in college and eventually brought it to America, where American experts have been pondering for more than a century.

Cryptographers say the document has all the characteristics of an existing language, just a language no one has ever seen before.

The reason why it looks like an existing language is that in real languages, the same sequence of letters appears with a certain frequency, but even in the language of the Voynich manuscript, there are patterns that make it hard to believe that they were arranged randomly.

Other than that, we know very little more than we can see.

Letters vary in style and height

Some characters are borrowed from other languages, but many are original.

The tall letters are named "Gallows".

The manuscript is embellished throughout with beautiful swirl ornaments.

It appears to have been written by two or more people, and the paintings are by a different group.

Over the years, three theories have emerged about the text of the manuscript.

The first theory is that it is written in code, a secret code deliberately devised to hide a secret.

The second is a false document, which is said to have been written haphazardly to make money from a gullible buyer.

Some speculate that the author was a medieval charlatan.

Some say Voynich himself wrote

A third theory is that the text is in an existing language, but written in a script that no one knows.

Medieval scholars may have created a new alphabet to use for unwritten languages.

In that case, the Voynich Manuscript might be something like the Rongorongo script, which was used on Easter Island and is now unreadable now that that culture has collapsed.

No one can read the Voynich Manuscript, but we can't help but explore what it says.

Those who believe that the manuscript is an attempt to create a new written language think that it may be an encyclopedia of the knowledge of the culture that created the manuscript.

Some believe it was written by the 13th-century philosopher Roger Bacon, who studied the universal laws of grammar.

Some fringe theories say it was written by a group of Italian witches, or even by Martians.

After 100 years of trial and error, scientists recently got a faint clue to this mystery.

The first discovery was the aforementioned radiocarbon dating.

And modern historians have also traced the book's provenance through Rome and Prague to 1612, when the manuscript was supposedly passed from Holy Roman Emperor Rudolf II to his physician, Jacobus Sinapis.

In addition to these historical discoveries, linguistics researchers say they have tentatively identified some of the words in the manuscript recently.

The letters next to the seven stars might be "Tauran," referring to the name of the constellation Taurus -- the Pleiades star cluster, which is made up of seven stars.

Is this word "Centaurun", the plant in the picture, Centarea?

Maybe— but progress is slow.

If you could crack the code, what would you discover?

A dream diary of a fifteenth-century illustrator?

Sheer shit?

Lost wisdom of a forgotten civilization?

what do you think

A shrine maiden walks into the dungeon

The spectators lining the streets hear her plead not guilty

I can't help it

because he's already been found guilty in court.

what is the verdict?

buried alive

In the dungeon there is bread and water and milk and oil.

She's given a lamp, a bed, and a blanket, but she'll never leave it alive.

The priestess stops at the entrance, pleads her innocence one last time, and goes into prison, never to be seen again by the people of Rome.

This priestess is one of Rome's six vestal virgins, each carefully selected as a child from a noble Roman family.

Her death leaves us with five shrine maidens, and we need to choose a new shrine maiden.

Six-year-old Lycinia watched the spectacle, never knowing that a few days later she would be chosen as the next Vestal virgin.

Her age, aristocratic ancestry and healthy appearance made her a favorable candidate for the service of the goddess Vesta in the eyes of the Romans.

Her parents are proud that their daughter was chosen.

Lycinia was afraid, but she has no right to choose.

I have to serve the Goddess for at least the next 30 years.

The first ten years are considered a training, learning how to become a Vestal virgin.

The most important duty is to protect the fire of the virgin goddess of the furnace, Vesta, without sleeping.

Vesta doesn't have statues like the other Roman gods.

Instead, Vesta was represented by a fire that burned day and night, inside the Temple of Vesta, by the forum (public square) in the center of Rome.

Like all Vestal priestesses, Lycinia takes turns guarding and tending fires each day.

This fire represents two things

The first is the security of Rome as world champion.

The Romans believed that when the fire was extinguished, Rome would be in danger.

This fire also symbolized the Vestal Priestess's continued virginity.

For the Romans, the virginity of a priestess was not only a sign of chastity, the integrity of the soul and body, but also of ritual purification.

So Lycinia knew that the fire must never be extinguished.

Her life, the lives of her fellow priestesses, and the safety of Rome itself depend on it.

Lycinia learns to draw water daily from a nearby spring to purify the temple.

We learn about the Fasti, the calendar of sacred rituals, and watch an elder priestess make a sacrifice.

By the time her training is complete, she will be 16.

Lycinia understands that the way she should behave reflects the God she serves.

When it's my turn to draw water, I keep my eyes down

When I make a sacrifice, I concentrate fully on the task.

Lykinia devotes all her energies to becoming the best priestess she can be.

She fears that one day her life will be required to save the nation from danger.

You never know when Lycinia will be accused of incestum, or impureness, and forced to make sacrifices, innocent or not.

Lycinia now fully understands why her predecessor was buried alive.

10 years ago, the Vestal fire went out.

The shrine maidens knew they couldn't keep it hidden.

The future of Rome depends on it.

The shrine maidens go to the head of the priesthood to investigate why the fire went out.

Someone has appeared to say that one of the shrine maidens is no longer a virgin.

that was the beginning of the end

The named priestess claimed her innocence, but that wasn't enough.

she was tried and found guilty

The death of the Priestess is to protect Rome, yet Lycinia weeps for what is lost and what she now knows.

The way you walk is paved by the deaths of others, and your life may be taken away by the simple act of a fire going out.

Around 1159 A.D., a mathematician named Bhaskara II drew up plans for a wheel made of curved mercury vessels.

He explained that as mercury flows into the bottom of each tank, it always makes one side of the wheel heavy, and the wheel keeps spinning.

The balance is lost and the wheel spins forever.

Bhaskara's sketch is one of the earliest blueprints for a perpetual motion machine, a device that would operate indefinitely without an external energy supply.

A windmill that creates its own wind and continues to rotate

Imagine a light bulb whose light it emits powers itself.

Devices like these have captured the imagination of many inventors because they might change the relationship between humans and energy.

For example, if we could build a perpetual motion machine and incorporate humans as part of that perfectly efficient system, we might be able to sustain life indefinitely.

there is one problem

that none of them work

Because every perpetual motion idea violates one or more of the laws of thermodynamics, the branch of physics that discusses the relationships between different forms of energy.

According to the first law of thermodynamics, we can neither create nor lose energy.

You can't get more energy than you put in from outside.

From these laws, we can immediately deny the perpetual motion machine, because machines can only extract as much energy as they are given from the outside.

There is no extra energy left to power your car or charge your cell phone.

But what if you just want to keep the machine running?

Inventors have provided many ideas

Based on the imbalance of balance, Bhaskara II's wheel has many variations, such as a rolling ball or a weight attached to a pendulum.

none of them work

Any moving part that makes one side of the wheel heavier will move the center of gravity below the axle.

With the center of gravity lowered, the wheels just swing from side to side like a pendulum, and then come to a stop.

What about another approach?

In the 17th century, Robert Boyle came up with the automatic watering pot.

It's based on the theory of capillary action, which is the force between the liquid and the surface that pulls the water up in a narrow tube, continuing the circulation of water between the vessel and the tube.

But if the force of capillary action were to overcome gravity, it might wick the liquid up, but it would also prevent it from falling into the vessel.

There is also a version with magnets and ramps like this.

The sphere is attracted to the magnet at the top and falls through the hole, repeating the cycle.

This fails in the same way as automatic watering pots: the magnet will hold on to the sphere when it reaches the top and won't let go.

Even if it does manage to keep moving, the force of the magnet will gradually weaken and eventually stop.

If these machines were to keep going, they would create extra energy that would violate the first law of thermodynamics so they wouldn't stop.

At first glance, some of them seem to keep moving, but in reality they draw energy from an external energy source.

Even if an engineer could design a machine that didn't violate the first law of thermodynamics, it would still never work due to the second law.

According to the second law of thermodynamics, energy spreads due to things like friction.

Machines in the real world have moving parts and interactions with air and liquid molecules that generate a small amount of friction and heat, even in a vacuum.

Heat dissipates energy, and when energy escapes as heat, less energy is available to the system, and eventually the machine shuts down.

As we've seen, these two laws of thermodynamics jeopardized the whole idea of ​​a perpetual motion machine, and the dreams that this meant of producing energy with perfect efficiency.

But we don't understand the universe, so we can't say we can't build a perpetual motion machine.

We may discover strange types of new matter that force us to rethink the laws of thermodynamics.

Or maybe there's a perpetual motion machine at the tiny quantum scale.

It seems certain that our quest will never stop

Right now, the only thing that stays in motion forever is our quest.

Sometimes I feel very sorry for myself as a European.

Over a million people have arrived in Europe in the last year seeking help, and our reaction has been, frankly, poor.

It's already full of contradictions

We all mourned the tragic death of two-year-old Alan Kurdi, but since then, more than 200 children have continued to drown in the Mediterranean Sea.

While international agreements allow for shared responsibility for hosting refugees, they acquiesce to the fact that tiny Lebanon hosts more refugees than Europe as a whole.

We deplore the existence of smuggled ships, but we make them the only route of asylum to Europe.

We're excluding people who are economically and demographically aligned with our labor needs in the face of labor shortages.

It's against Islamic fundamentalism, it's professed to be liberal, and yet it's a repressive policy of detaining young refugees, separating children from their families, and seizing refugee property.

Don't you think it's funny?

How did we come to have such an inhumane response to humanitarian crises?

I don't think it's because people don't care, at least I don't want to believe that's the reason.

I think it's because politicians lack a vision, a vision that adapts the international refugee policy that was created more than 50 years ago to the changing age of globalization.

So I want to go back to the basics and ask two very fundamental questions that we all need to think about.

First, why is the current system not working?

and how can i fix this?

The modern refugee system was created by these people in the immediate aftermath of World War II.

In the first place, the goal is to give people a place to go, a place where they can live in safety and dignity until they return, when the state collapses or, at worst, turns the blade on the people.

It was built for exactly the kind of situation we see in Syria today.

Through the 1951 Convention Relating to the Status of Refugees, an international agreement signed between the governments of 147 countries, and through the United Nations High Commissioner for Refugees, an international organization, they committed to the mutual acceptance of refugees in their own territories -- people fleeing conflict and persecution.

But today this system doesn't work.

In theory, refugees have the right to seek asylum.

The reality is that our immigration policies are blocking our way to safety.

In theory, refugees have the right to seek assimilation in their place of refuge and be able to return to their homes.

In reality, you're stuck almost forever.

In theory, refugees are part of the responsibility of every country in the world.

In reality, because of geography, countries bordering conflict zones host the vast majority of the world's refugees.

The system doesn't work because the rules aren't right

It's because we're not applying the rules properly to the changing world, and we need to rethink that.

So how does the current refugee system actually work?

Let me explain

But I'm going to talk from the refugee's point of view, not from an institutional, top-down point of view.

First, imagine a Syrian woman.

call me Amira

A woman who represents a lot of people in the area.

Amira, like 25 percent of the world's refugees, is a woman with a child. The reason she can't go back home is because the city she used to live in is in this state.

I'm not in a position to go home

But Amira has no way to resettle in a third country, because it's like a lottery that only 1% of the world's refugees win.

So Amira and her family face an almost impossible choice.

There are only 3 basic options

The first is to bring my family into a refugee camp.

There is help, but the future for Amira and her family is almost non-existent.

Refugee camps are desolate, barren lands—many in the desert.

In the Zaatari refugee camp in Jordan, gunshots are heard at night on the border with Syria.

There are restrictions on economic activity

Poor quality of education

And around the world, about 80 percent of refugees in camps stay like this for at least five years.

Life there is miserable, and maybe that's why only 9 percent of Syrians actually choose this path.

Then there's the option of going to the cities, like Amman or Beirut, in neighboring countries.

This is the option chosen by 75% of Syrian refugees.

But even there we face great difficulties.

Refugees usually don't have the right to work in these urban areas.

I don't get much help

In this case, Amira and her family are left with little to nothing after all their savings have been spent, and a life of urban poverty awaits them.

A third option — more and more Syrians are choosing it

It's a phenomenon we're seeing in Europe today, when people risk their lives for a glimmer of hope for their families, making a very dangerous journey to another country.

These first and foremost choices are presented to refugees all over the world, limiting them to three options: camps, urban poverty, and dangerous travel.

For refugees, this is what the international refugee system is all about.

But it's an illusion to think that this is the only way

I think there is room for reconsideration

The reason we're limited to these options is because, in our minds, we think that this is the only path a refugee can take, and that's not true.

Politicians see the refugee problem as a "zero-sum" problem, where if we do something for refugees, it costs citizens.

We tend to have a common assumption that refugees are a burden, a burden on society.

Conversely, there are ways for refugees to contribute to society.

What I'm trying to say is that there are ways to broaden the range of choices for refugees while still benefiting everyone -- the host countries, the communities, our societies, and the refugees themselves.

I think there are four ways that I'm going to talk about that can fundamentally change the way we think about refugees.

All four have one thing in common: the way they're taking advantage of globalization, liquidity and market opportunities, and changing the way we look at the refugee problem.

The first idea is to create an enabling environment for refugees. It starts with a very basic realization: refugees are human beings just like everyone else, just in extraordinary circumstances.

A colleague from Oxford University and I started doing research in Uganda, looking at the economic activities of refugees.

We didn't choose Uganda because it's the world's leading host country.

Because we have a very good policy.

Unlike other host countries around the world, Uganda has provided refugees with economic opportunities.

It gave refugees the right to work and freedom of movement.

It's had amazing results, both for refugees and refugee settlements.

In Kampala, the capital, 21 percent of refugees had businesses and employed workers, and 40 percent of those employed were citizens of the host country.

So refugees were creating jobs, hiring citizens of host countries.

Even in refugee camps, we've seen wonderful examples of thriving private businesses.

For example, in a refugee settlement called Nakivale, Congolese refugees are involved in a business that sells and sells digital music.

A Rwandan refugee started a business that brought computer games to young people on repurposed game consoles and televisions.

Despite the harsh environment, innovative efforts are being made, and this photo is of a Congolese named Demukey.

I arrived in the township almost penniless, but I wanted to be a filmmaker.

He started a community radio station with friends and colleagues, rented a video camera, and now makes videos.

I co-produced two documentary films at the request of my team, and it's been a successful business with very little money.

We should use examples like these to guide our response to refugees.

Instead of seeing refugees as necessarily dependent on humanitarian aid, we need to offer them the opportunity to thrive as human beings.

Of course, clothing, bedding, a place to sleep, food are all important in an emergency, but we need to look beyond.

Opportunities must be provided such as communications, electricity, education, labor rights and access to capital and banks.

We take it for granted that we can benefit from the global economy. Refugees can and should do it.

The second is an idea about economic zones.

Unfortunately, not all refugee-hosting countries in the world follow Uganda's policy.

Most countries don't welcome refugees into their economy the way Uganda does.

But there are practical solutions that can be adopted.

Last April, I went to Jordan with my colleague, development economist Paul Collier. During my stay, I brainstormed and talked to the international community and the Jordanian government to figure out how to get Syrians to work in a way that aligned with Jordan's domestic development strategy.

An idea for an economic zone that explored the possibility of hiring refugees along with hiring Jordanians in the host country.

Just 15 minutes from the Zaatari refugee camp, home to 83,000 refugees, there is an economic zone, the King Hussein bin Talal Development Zone.

The Jordanian government has invested over a million dollars in connecting the area to a power grid and a road network, but it lacks two things: labor and foreign investment.

What if refugees could work here? What if you could raise your family without being confined to a camp, acquire skills through vocational training, and then return to Syria?

I thought this would be beneficial for Jordan, because as a middle-income country, Jordan's development strategy requires the development of domestic manufacturing.

It's good for refugees, but it's also helping to rebuild Syria after the conflict.

I published this proposal in the political magazine Foreign Affairs.

caught the eye of King Abdullah

Two weeks ago at the Syria Assistance Conference in London, it was announced that it would be piloted this summer.

(Applause) The third idea that I would like to propose to you is a matching system between the state and the refugees, which can lead to happy results like this picture, where a Syrian refugee takes a selfie with Chancellor Angela Merkel.

It's not often that we ask refugees what they want or where they want to go, but it's possible to hear what refugees have to say and everyone can benefit from it.

Developed by economist Alvin Ross, the concept of matching theory is that parties' preferences determine the final pairing.

My colleagues Will Jones and Alex Teitelboim explored how to apply this concept to refugees by asking refugees to list the destinations they would like to visit in order of preference, while at the same time asking host countries to prioritize the types of refugees they want based on job skills, language, and other criteria, and bring them together.

Now, of course, we should consider factors such as diversity and vulnerability in our quota criteria, but we can also think of that as a way to increase our matching rate.

The concept of matching has been used successfully, for example, in college quotas for students, kidney donors and patients, and it's in algorithms used on dating sites.

Why don't we take this to expand options for refugees?

It can be used on a national scale, because one of the big challenges we face is convincing local communities to accept refugees.

Now, for example, in my country, England, we often do the stupid thing of sending engineers to the countryside and farmers to the cities.

So market matching allows us to match the aspirations of both sides and listen to the needs and desires of both the host population and the refugees.

And the fourth idea is the humanitarian visa.

Most of the tragedy and chaos in Europe is completely avoidable.

It's caused by a fundamental contradiction in Europe's refugee regulations, which means that in order to become an asylum seeker in Europe, you have to take that dangerous journey and arrive without any preparation.

But why do we need that kind of travel?In this age of low-cost airlines and consular services,

These trips should be totally unnecessary, but last year they killed more than 3,000 people on European borders and within Europe.

The simple story is that if refugees were allowed to travel normally to Europe and become asylum seekers, this would be avoided. The way to do this is called a humanitarian visa, where you can get a visa from a neighboring country's embassy or consulate, and then you can simply pay your own travel expenses and travel to Europe by ferry or plane.

€1,000 to cross from Turkey to the Greek islands using smugglers

Cheap flights from Bodrum to Frankfurt from €200

There are big advantages to opening up these options for refugees.

So many lives will not be lost, the refugee smuggling industry itself will become a commercial slump, and chaos will disappear from the front lines of Europe, like the Greek islands.

It's policy, not rationality, that's blocking these steps.

This idea has been implemented

Brazil pioneered this approach, with more than 2,000 Syrians obtaining humanitarian visas to enter Brazil and receive refugee status upon arrival.

All Syrians who have taken advantage of this system have obtained refugee status and received official refugee status.

There is also historical precedent

Between 1922 and 1942, 450,000 Assyrians, Turks, and Chechens traveled across Europe using their Nansen passports as an international identity card to claim asylum in other European countries.

The Nansen Office for International Refugees won the Nobel Peace Prize for this practical strategy.

All four of the ideas I just talked about are ways to increase the options for the hypothetical refugee Amira I mentioned earlier.

It's a way to broaden the range of options for refugees, so that they don't have to be limited to the first three unreasonable options, but still benefit other people.

In conclusion, we desperately need a new vision, one that understands that expanding options for refugees doesn't have to be a burden.

The idea that refugees are necessarily a burden is wrong.

Although it is a humanitarian duty, refugees are skilled, talented and motivated people who have the power to contribute to society if given the opportunity.

In the coming era, there will be no end to the number of people migrating in the world.

What's happening in Europe will continue for years to come.

Refugees are still on the move, they're constantly wandering in search of a place to live. We should look for rational and practical ways to deal with this situation, not based on the old theories of humanitarian aid or philanthropy, but on the opportunities created by globalization and market volatility.

I want to appeal to all of you, to all of you politicians, to wake up and face this challenge.

thank you

(applause)

If you want to see Marie Curie's manuscript, you'll need to sign a liability waiver and wear protective clothing to protect yourself from radioactive contamination.

So is Madame Curie's body, whose coffin is lined with lead to contain the radiation that was the center of her research and the cause of her death.

Growing up in Warsaw, Poland, under the rule of Imperial Russia, Mari, whose original name was Maria Skłodowska, was a brilliant student, but faced a major obstacle.

Being a woman, she was denied higher education, so she resisted and joined The Wandering College, a clandestine organization that secretly educated Polish youth.

I worked as a tutor, saved money, and eventually moved to Paris to study at the prestigious Sorbonne University.

There Mari earned degrees in physics and mathematics, lived mostly on bread and tea, and sometimes passed out from hunger.

In Paris, Mari met the physicist Pierre Curie, who gave her his laboratory and his heart.

Mari was still anxious to return to Poland.