A highly specialized woman interviewed each African woman for an hour, asking about the child she had borne.

How many children have you had?

Are you all alive?

If so, how old were you when you died?

So, we interviewed thousands of women, compiled the results, and published them as Demographic and Health Surveys.

But this research is expensive, so it can only be done once every three to five years.

It does give good precision numbers though

this is the limit

This colored line is the survey results.

This story is complicated, so let's keep it simple.

This is 1977, 1988, 1992, 1997 and 2002.

A United Nations expert presents the findings of the

And the predictions that they put into their database and used the mathematical formulas to come up with are these curves.

Look, it's the curve closest to this point

But be careful, predictions are just a series of past results that extend into the future.

The United Nations projected Kenya's 2008 infant mortality rate to be 128.

Horrifyingly, in the '90s, child mortality increased in Kenya.

it's tragic

But in June, I got an email from the Demographic and Health Survey, which was good data from Kenya.

was very happy

Here's a prediction based on new findings

It took three months, but the United Nations put the data into their servers. It's last Friday, and you can see the new projection curve. Infant mortality has fallen.

how is it okay, hey

That very Friday, I was in front of my computer, watching the curve from 128 to 84 deaths all morning.

it's a celebration

Now, how should we measure progress when we catch trends?

Let's take a closer look. This is how the United Nations does it.

Data for 2009, for the first time since 1990

I was told "0.9% and no progress"

this is not fair

I am also a professor, so I have the right to say

This is how it works: 10 years is enough to spot trends.

Two findings, you can see what's going on

was 2.4%

If you worked for the Ministry of Health in Kenya, I'd try to connect the two.

What I want to say is that we know the infant mortality rate.

know the latest trends

I took a closer look at it for the Millennium Development Goals.

And very importantly for Africa, the '90s were the worst, not just in Kenya, but all over Africa.

HIV infection peaked

There were side effects from the old malaria drugs until the new malaria drugs arrived.

After that, I started using mosquito nets.

Also, there were socio-economic problems, which are now largely resolved.

Look at this average, the average for sub-Saharan Africa.

The UN puts it down 1.8%.

It seems theoretical, but it's not so theoretical

You know, economists like money, they like to make money and make more and more.

Calculate the annual growth rate of the economy in %

We specialize in public health, we hate child deaths, we want to do much, much less child deaths

Calculate how many percent per year it has fallen, also expressed as a percentage

If economic growth is 4%, child mortality could be reduced by 4%, if only the public were interested and knew what to do with their resources.

Are these 19 years of statistics fair?

Something an economist would never do

I would divide it into two periods.

In the 90s, it was only 1.2% Only 1.2%

Now we've shifted to second gear. Africa is shifting from low gear to second gear.

But even that doesn't do justice to Africa, because it's the average, the average rate of decline in child mortality in Africa.

See my graph here

Here, the vertical axis is the number of infant deaths per 1,000 people.

The horizontal axis is the year

I will introduce it from a broader perspective than the MDG

It starts 50 years ago, when many countries in Africa started to become independent.

Look at the Congo, so high, Ghana low, Kenya even lower

Let's see what happens when the times change, let's get started

Independence, literacy has improved Vaccinations have begun, smallpox has been eradicated Hygiene has improved, things are going in the right direction

But in the 80's, look here

A civil war broke out in Congo, and the level dropped like this.

Ghana improved rapidly

There is a backlash in Kenya, not Ghana Both Kenya and Ghana are declining Only the Congo is left behind

this is the world today

As you can see, it doesn't make sense to average countries that are not making progress and countries that are making rapid progress.

Times have changed. Let's stop thinking of sub-Saharan Africa as a region.

It varies a lot from country to country, and just as we don't treat Europe as one place, we shouldn't treat Africa as one place.

We all know that the Greek economy is very different from the Swedish economy.

All countries will be judged by the policies they adopt.

Let's take a broader view

My country is Sweden 1800 was here

What did we do wrong?

it's so funny

Sweden didn't do anything about child deaths, but they did keep statistics.

And this period was the year of famine

This year was the worst, people gave up on Sweden

my ancestors immigrated to america

After all, Sweden soon became a lot better.

We have better education here, we have better health services, we have lower infant mortality rates.

Sweden has never been at war and has always been peaceful.

But look, the cuts in Sweden weren't fast.

Because Sweden got off to an early start, it also reduced infant mortality.

I started my primary education in 1842.

And as a result, it's had an amazing impact: a generation later, women's literacy rates have improved.

You should understand that the investments you are making now are for the long term.

It's not just five years, it's a long-term investment.

Sweden has not reached the Millennium Development Goals, calculated at 3.1 percent

I've digressed, this is Sweden

wouldn't be so interested

We want other countries to be better than us. In fact, it is happening.

Let's look at Thailand, which is doing well, starting with a high mortality rate in the 1960s and then dropping to an infant mortality rate similar to that of Sweden.

And then there's Egypt, a hidden public health triumph.

Egypt here in 1960 was worse than the Congo

The Nile Delta was a terrible place for children. Diarrhea, malaria, myriad problems.

Then Aswandam was built, electricity reached homes, education advanced, primary health care was declared.

Thus, mortality decreased

Eradication of malaria by providing safe drinking water

It's a success

Reducing child mortality among the Millennium Development Goals is a realistic possibility

Amazingly, in Ghana today, we've done it, and in Egypt, we've done it the fastest.

Kenya is now accelerating

here is the problem

We have a problem here in this country and we are not making progress on reductions.

So let's take a look at the broader picture -- the big whole movement in child mortality.

If you look at the correlations in this graph, the vertical axis is child mortality.

Look at the correlation between infant mortality and family size.

1, 2, 3, 4 children per woman, 6, 7, 8 children per woman

Back in 1960, 50 years ago.

Each circle is a country Color is assigned to each continent

Dark blue is Sub-Saharan Africa

The size of the circle is the population

The countries here are called developing countries

High infant mortality, very high mortality, six to eight families.

On the other hand, the countries on this side are called Western countries.

Low infant mortality and small family size

what can happen

I want you to take a closer look at the correlation between lower child mortality and fewer families.

No preparation needed, just watch

This is what actually happened, let's get started

Reduced mortality, eradication of smallpox Improved education Health services

Gather here, China joins Western countries

You see, Brazil has also entered the Western world.

India is also approaching, Africa's first country has entered the West, many neighbors have moved

Welcome to the land of longevity

Come on, I want all mankind to gather here

this is the new vision

Look, the first nations of Africa have entered

this is now

Western countries and developing countries are irrelevant now.

This is the United Nations report that just came out on Friday (9/17/2010)

Child Mortality Trends, very good content, except for this page.

This page is the worst Country is sorted by category

The following countries are written as developing countries: Developing countries: Republic of Korea

Huh?

It's Samsung's country, why is it a developing country?

There is also Singapore

The country with the lowest infant mortality rate in the world

We overtook Sweden five years ago, but we're still classified as a developing country.

There is also Qatar

richest country with al jazeera

Why can such a country be called a developing country?

this is garbage

(Applause) The rest is fine, good content.

you have to have a new way of thinking that fits the data

We must understand well that all nations are gathered here.

this relationship is important

Look, it's Africa These are the African countries

We can see the relationship between the decline in child mortality and the decline in family size, even in Africa.

you know what's going on

It's possible to reduce child mortality by about 50 percent by educating women, according to a study released Friday by the Institute for Health Metrics and Evaluation in Seattle.

A girl goes to school, and 15 to 20 years later, the results come out.

So we need a long-term perspective, but we do take statistics every 10 years.

We can bring child mortality down in all of these countries, and we're all coming together so we can all live together.

Of course, reducing child mortality is of paramount humanitarian concern.

Now we're talking about a decent life for a child.

But it's also a strategic investment for all of humanity in the future, because it's also an environmental issue.

You can't control the environment, you can't escape the terrible weather disasters, you have to stabilize the world's population.

let's make it clear

To that end, let's reduce child mortality and connect women's education to family planning.

It's possible, let's do it

Thank you for your attention

(applause)

If you don't mind, imagine a gift

try to draw it in your mind

Not too big, about the size of a golf ball

Please imagine the contents of the box

But before I show you what's inside, let me just say that it's life-changing.

the whole family gathers for you

You will receive an outpouring of love and respect, and you will be contacted by friends and acquaintances you haven't heard from in many years.

Respected, admired, and even bewildered

Reminds me of the most important things in life

It will redefine what spirituality and trust are.

A new understanding and trust in the body emerges

I feel supremely energized

Expand your vocabulary, meet new people and live a healthier life.

What's more, with this, you don't have to do anything at all - you can take eight weeks off.

Enjoy a lot of gourmet food

A large bouquet of flowers will be sent

People will say, "You look good, what did you do?"

In addition, a lifetime supply of medicines will be provided.

You will be inspired, inspired and humbled in the face of obstacles.

find new meaning in life

You will reach peace, health, tranquility, happiness, nirvana

How much does it cost?

It's about $55,000. That's pretty sweet.

You can't help but want to know what's inside and where you can get it?

Do you carry it on Amazon?

Does it have the Apple logo?

Do you have a waiting list?

none of them apply

About 5 months ago I received this

It was wrapped like this It doesn't look very good

Then this and this

This is a rare gem, a gift that has given me so much, a brain tumor, a hemangioblastoma to be precise.

I'm fine now, but I don't want you to receive it.

I don't know if you want it

But I don't want to misrepresent my experience

This gift has changed my life 360 ​​degrees, as I said here.

In the future, the next time you encounter something unexpected, nasty, or unpredictable, think about it. Maybe it's a gift.

(applause)

Sometimes I flip through very old magazines

So I found a test of observation based on the story of Noah's Ark.

The artist who drew this test picture included a few mistakes, about a dozen of them.

Some are very easy

There are chimneys and antennas and lamps and there are clockwork screws.

There are also mistakes about animals and their numbers

But there's a more fundamental error in the overall story of Noah's Ark that isn't depicted here.

The question is, "Where are the plants?"

There's a God who's going to keep the earth under water forever, or at least for a very long time, and nobody's thinking about plants.

Noah had to bring pairs of all kinds of birds, all kinds of animals and moving creatures, but there is no mention of plants.

why?

Another part of the same story claims that all life on earth came from the ark: birds, domestic animals, wild animals.

Plants aren't living things, and that's the problem.

This is the problem that the Bible doesn't address, but plants have always been with humans.

Let's take a look at the theories summarized in Renaissance-era books.

There is an explanation of the laws of nature

It's a pretty good explanation, and from the left, there's a stone, and right after the stone is a living plant.

There are living, sentient animals, and humans are at the top of the pyramid.

this is no ordinary human

"Homo studious," the learned man

It's great to see someone like me, a professor, at the top of biology.

but this is totally wrong

It is also said that the professor is the pinnacle.

You're wrong about plants, too, because they're not only alive, they're also sentient.

They have more developed senses than animals.

To give just one example, every root tip is capable of simultaneously and persistently sensing and monitoring at least 15 different chemical and physical factors.

Plants are also capable of exhibiting complex and wonderful behaviors that we might call "intelligence."

But underestimating plants like this is what we've been doing all along.

watch this short movie

I'm David Attenborough

Attenborough was a plant lover, and he made some really great films about the properties of plants.

But there's nothing wrong with his description of plants.

When it comes to commentary on animals, we often ignore the fact that plants exist.

The blue whale is the largest animal on earth, and that's not it, it's not at all.

The blue whale is a dwarf compared to the true largest animal on earth, the largest of which is this magnificent, majestic sequoiadendron.

(Applause) This is an organism with a mass of at least 2,000 tons.

Now, the story that plants are low-level organisms was put together by Aristotle a long time ago in De Anima, a book that had a huge impact on Western civilization.

It is assumed that there is only a low-level soul

They call it the plant soul, but they don't need any senses because they don't move.

What so?

Some plant movements are well known

This is a fast-forwarded video

This is a Venus Flytrap, aka Venus flytrap, catching a slug, sorry for the slug.

This has been denied for centuries, despite the evidence.

No one could say that plants can eat animals, because it was against the laws of nature.

But plants can also show a lot of movement.

Well known is flowering etc.

It just requires the use of techniques like time-lapse photography.

There are also more sophisticated movements.

Look at this bean sprout constantly moving to catch the light.

Very graceful, like dancing angels

Plants can also play. This is how they really play.

These are sunflower sprouts, but this movement can only be described as playful.

They're training themselves to grow up, like baby animals often do, because a grown sunflower will be chasing the sun all day long.

Plants can of course respond to gravity, so when they sprout, they grow against the direction of gravity, and their roots grow toward gravity.

plants can sleep

this is foxglove

During the night, the leaves are rolled up to reduce movement. During the day, the leaves are open and more active.

And that's interesting, because the individuals that are sleeping this way are really conserving their energy.

This is the same for plants, insects and animals.

So if you want to study sleep problems, it's easier to do, let's say, plants, than animals, and it's even easier ethically.

It's called the vegetarian experiment.

Plants can also communicate, they are very good at communicating.

plants communicate with other plants

You can distinguish whether they are similar or not

Plants interact with other plants, species and animals, and they do so by producing volatile chemicals, for example, during pollination.

Pollination is an important problem for plants, because they cannot move themselves as they carry pollen from flower to flower.

So you need a vector, and this vector is usually an animal.

Many insects are used by plants as vectors to carry pollen.In addition to insects, birds, reptiles, and even mammals such as bats and mice are commonly used to carry pollen.

this is an important job

Some plants provide animals with a form of sugar, a source of energy, instead of carrying pollen.

But some plants are manipulative to animals, and some, like this orchid, expect sex and nectar, but pay nothing in return for carrying pollen.

Now, given all these behaviors we've seen, there's a big problem.

How can you do this without a brain?

The answer to this question would have to wait until 1880, when the great Charles Darwin published a revolutionary, wonderfully surprising book.

It's titled "Motility of Plants"

Before Charles Darwin, no one could describe plant movement.

In this book, Darwin, with the help of his son Francis, who became the world's first professor of plant physiology at Cambridge, explored all the different movements of plants and summarized them in 500 pages.

And in the last paragraph of the book, putting the most important point in the last paragraph, that's Darwin's way, and that's the hallmark of his book.

Here, Darwin said, "It's no exaggeration to say that the tip of the radicle functions like the brain of lower animals."

this is not a metaphor

Darwin wrote a very interesting letter to one of his friends, J.D. Hooker, who at the time was president of the Royal Society and the greatest scientific authority in Britain, talking about plant brains.

Now, this is the root tip growing up the slope.

You may recognize these movements, but they're the same movements exhibited by worms, snakes, and all other animals that move without legs on the ground.

This is not an easy move. To do this kind of movement, you have to move different parts of the root, and you have to move these separate parts at the same time without the brain.

So we studied the root tip and found that there's a specific place right here, the part shown in blue, let's call it the transition zone.

This part is very small, less than 1 mm.

And it's in this small area that you see the highest oxygen consumption of this plant, and more importantly, these kinds of signals.

These signals that you're seeing are action potentials, the same signals that neurons in our brain use to communicate.

We now know that root tips have hundreds of cells with these functions, but we also know that even plants as small as rye have large root tips.

It has 1.4 million roots

It has 1,150,000 root tips, totaling over 600 kilometers long, giving it a very large surface area.

Now imagine that each root tip forms a network with the other root tips.

Here on the left is the Internet, and on the right is the root tissue.

both are working the same

These are like little computers running in a network.

But why are they so similar?

That's because both evolved for the same reason: to resist predation.

both work similarly

Even if 90% of the root tissue is removed, the plant can survive.

The Internet can survive 90% of connections lost

So what I'd like to encourage network researchers to do is that plants can give us some good ideas about how to evolve networks.

And another possibility is engineering possibilities.

Imagine if you could build a robot inspired by plants.

Until now, humans have only taken inspiration from humans and animals to build robots.

There are ordinary robots based on animals, there are artificial animals, and there are artificial insects and so on.

There are also human-inspired androids.

So why not artificial plants?

If you want to fly, you should look to birds and take inspiration from birds.

But if you want to study soils or open new lands, the best thing to do is get ideas from plants that are good at doing that.

Another possibility, in my lab, is to create hybrids.

Easier to make than a robot

A hybrid is half biological and half mechanical.

In this case, it's much easier to work with plants than with animals.

Plants have computing power, and they have electrical signals.

It's much easier to connect with machines, and it's much more ethical.

Something made of algae, something that moves at the tips of the leaves, and something that moves at the most powerful part of the plant, the root, and these are the three possibilities that we're working with to create hybrids.

Thank you for your attention

Finally, I assure you that no slugs were harmed in the making of this presentation.

thank you

(applause)

What I love most about my job at the Gates Foundation is that it allows me to visit developing countries, and I actually do it quite often.

And when you interact with local mothers in many of these remote places, it's amazing what we have in common.

We want our children to be the same: we want them to grow up to be successful, to live healthy, happy lives.

But poverty is also ubiquitous, and the picture is striking in its scale and scope.

When I went to India for the first time, I visited a house with a dirt floor, no running water, no electricity.

So what amazes me is how they don't own anything.

But there was one thing that surprised them: Coca-Cola.

coca cola is everywhere

When you actually go to a developing country, you see Coca-Cola everywhere.

So when you come back from a visit like this and you're thinking about development, and you're flying home and you're thinking, "How can we get people to get condoms and vaccines?"

Coca-Cola is doing it, why can't governments and NGOs do the same?

I'm not the first to ask this question.

But as an activist group like ours, we still have a lot to learn.

Overwhelmed by Coca-Cola

Selling 1.5 billion bottles of coke every day

It's calculated that every adult and every child on the planet drinks Coke every week.

So why is this important?

Because we need to learn from innovators as we accelerate the pace of development toward the Millennium Development Goals that the world has set, and there are such innovators in every field.

If we can understand what makes something like Coca-Cola popular, then we can apply it to benefit society.

Coca-Cola's track record is important because if we can analyze it and learn from it, we can save lives.

So I spent some time researching Coca-Cola.

I think there are basically three things we can learn from Coca-Cola.

Collecting real-time data and immediately reflecting it in products

They're hiring local, entrepreneurial talent, and they're doing great marketing.

Let's look at the data first

Coca-Cola's earnings are very clear, they report to shareholders, so they have to make a profit.

So we collect data and use it to measure progress.

Coca-Cola keeps giving feedback

When we learn something, we apply it to our products and marketing.

It's like having a department for market analysis.

It's like any other consumer goods company.

For example, if I run a Coca-Cola company in Namibia, which is divided into 107 districts, I know where Sprite, Fanta and Coke are sold, in cans or in bottles, whether they're sold in town retailers, supermarkets or street vendors.

So when sales start to drop, we can see where the problem is and fix it.

Let's just compare this to development aid.

In development assistance, an evaluation report is made at the end of the project.

I've been to many such conferences, but the data is just too late to use.

As one NGO person put it, it's like bowling in the dark.

When you throw a ball, you hear the sound of some pins falling down

But it's dark, so I can't tell which pin fell down.You can only see the effect when the light comes on.

But real-time data lights up the lights.

So what's the second great thing about Coca-Cola?

This company makes good use of local entrepreneurial talent.

Although it's been in Africa since 1928, Coca-Cola didn't reach the remotest places for a long time, because the way Coca-Cola was done in the developed world was by using big trucks to deliver it.

And in remote parts of Africa, it's hard to find paved roads.

But Coca-Cola realized that there were local people buying the product in bulk and selling it in areas where Coca-Cola couldn't reach.

So Coca-Cola did a little research on this.

And in 1990, I decided to educate these local entrepreneurs and give them small loans.

And we gave them the role of small distribution centers, hired salesmen, and sent them out on bicycles and stalls and carts to sell Coca-Cola.

There are currently about 3,000 centers in Africa, employing about 15,000 people.

In Tanzania and Uganda, it's 90% of Coca-Cola's sales.

Let's see what about development aid?

What can governments and NGOs learn from Coca-Cola?

Governments and NGOs also need to recruit local entrepreneurs, because it's the people who live locally who know what drives change and access to the less accessible areas around them.

I think a great example is Ethiopia's new medical extension program.

The challenge for the Ethiopian government was that many people were very far from medical clinics, taking more than a day to get to them.

So it's impossible for an emergency room, even a mother about to give birth, to go to a medical clinic.

The government thought this wasn't a good idea, and went to India to study a model system in Kerala and adapt it to Ethiopia.

And the Ethiopian government launched this new system in its own country in 2003.

We have trained 35,000 medical extension workers to provide direct medical care to people.

In just five years, the health worker ratio went from 1 in 30,000 to 1 in 2,500.

Just think about how this could change people's lives.

Health extension workers can help in a variety of ways, such as helping with family planning and managing pregnant women, or advising pregnant women on how to get their children vaccinated or to get to a clinic in time for delivery.

This kind of thing has a big impact in a country like Ethiopia, and it helped reduce Ethiopia's child mortality rate by 25 percent from 2000 to 2008.

Hundreds of thousands of children are surviving in Ethiopia, thanks to this health extension worker program.

So what is the next step for Ethiopia?

The government has already started discussing

We're starting a conversation about, "How do we get community health workers to come forward with their ideas?"

“How would rewards be based on contribution in a remote village?”

This is how we harness local entrepreneurial talent and unlock people's potential.

Marketing is Coca-Cola's third success factor.

One important fact that ultimately determines Coca-Cola's success is the demand for Coca-Cola among people.

The reason these small entrepreneurs are able to sell Coca-Cola and make money is because they're selling every single bottle in the stalls and carts.

So we're relying on Coca-Cola's marketing. So what's the secret to Coca-Cola's marketing?

to make you dream

The product reminds people of their ideal life.

Despite being a global company, Coca-Cola has a very local approach.

Coca-Cola's global campaign slogan is "Open Happiness"

I try to fit in with the community

And instead of imagining what makes people happy, they go to, say, Latin America, and do it with the understanding that happiness has to do with family life.

In South Africa, happiness is associated with being respected in the community.

This was actually done in the World Cup campaign

Listen to this song produced by Coca-Cola for the campaign: "Wavin' Flag" by Somali hip-hop artist

(video) Kanan: ♫ oh ♫ ♫ oh ♫ ♫ oh ♫ ♫ oh ♫ ♫ give me freedom, give me passion ♫ ♫ give me a reason, let's go ♫ ♫ The players that start the game now ♫ ♫ make us one and make us believe ♫ ♫ in the city we're up ♫ ♫ free from restraints ♫ ♫ filled with joy ♫ ♫ everywhere in every country ♫ feels great brighter, right?

But Coca-Cola didn't stop there, creating versions in 18 different languages.

The song reached number one on the pop charts in 17 countries.

It reminds me of a song I heard when I was a kid, called "Love Harmony," which also went to No. 1 on the pop charts.

What these two songs have in common is that they carry the same message of joy and togetherness.

What about in the fields of health care and development assistance?

This is based on avoidance rather than admiration

I'm sure you've all heard messages like this before.

"Use condoms to prevent AIDS infection"

"Wash your hands to avoid diarrhea."

It doesn't sound like "Wavin' Flag" at all

And I think we're fundamentally wrong, we think that if you want something, you automatically want it.

i think that is wrong

There are signs that change is slowly starting to happen around the world.

An example is public health

1.5 million children die each year from diarrhea, mostly from open defecation.

But there is a solution: install a toilet.

But all over the world, time and time again, it's the same result: you put a toilet in there, and if it stays that way, no one will use it.

Reuse as planks for your own home

We are using it as a grain warehouse.

I've even seen it turned into a chicken coop

(Laughter) But what kind of marketing does it take to address hygiene issues and actually eliminate diarrhea?

it is to reach out to the community

First, explain why it's not good to defecate in the open in the village, and get them to understand.

And then you show them the restroom, and they position it as a modern, state-of-the-art facility.

In one state in northern India, they've even linked toilets to marriage proposals.

But it works. Look at these headlines.

(laughter) [Guys, set up a toilet before you flirt.] "No toilet? No wife." It's true.

Women refuse to marry men without toilets

No toilet, no marriage

(Laughter) But this headline isn't just funny, it's novel -- it's a novel marketing campaign.

And more importantly, it saves lives.

Look at this, in the room are a bunch of young men and my husband, Bill.

Can you imagine what these young men are waiting for?

waiting to be circumcised

Can you believe it?

Circumcision is known to reduce HIV infection in men by 60%.

When I first heard about this result at the Foundation, to be honest, Bill and I were a little confused, saying, "Who would want to be circumcised?"

But these young men knew it was because they heard their girlfriends saying it was better, and because they thought it would improve their sex life.

So when we start to understand what people really want in health care and development assistance, we can make a difference in our communities, and we can make a difference across our nations.

Why are these things so important?

Let's talk about what happens when all this is done together, what happens when you put these three things together.

I think one compelling example is polio.

Polio reduced by 99% in 20 years

If you look back to 1988, there were about 350,000 polio cases worldwide.

This number dropped to 1,600 in 2009.

How did it go down?

If you look at a country like India

It's home to over a billion people, but there are 35,000 community doctors who report paralysis, and we have an extensive reporting system from clinicians and pharmacies.

and there are 2.5 million vaccines

But let me explain this story a little more concretely.

I'm going to tell you the story of an 18-month-old boy named Sriran, who lives in the northern state of Bihar, India.

On August 8th of this year, Sriran complained of paralysis and on the 13th he was taken to the doctor by his parents.

Doctors took stool samples on August 14th and 15th, and on August 25th, he was confirmed to have type 1 polio.

On August 30th, genetic testing was completed, and we knew the type of virus that caused Syrians.

The virus was thought to originate from two sources.

Either Nepal, just across the border, or Jharkhand, just south.

Luckily, genetic testing confirmed that the virus came from the north, because if it had come from the south, the impact would have been much greater.

because more people would have been infected

So what happened in the end

On September 4th, there was a large-scale clean-up, which is standard work for polio.

Two million people have been vaccinated in Shrilan's area.

So, in less than a month, one case of paralysis turned into a targeted vaccination program.

Thanks to that, there was only one more case of polio in the area.

This is how we can prevent large-scale epidemics, and this shows what can be done when people on the ground have access to data: they can save lives.

One of the challenges with polio remains marketing, but it may not be what you think.

It's not field marketing

It's not about telling parents, "If you think you have paralysis, take your child to the doctor or get them vaccinated."

Our challenge is marketing among funders

Over the last 20 years, the eight major industrialized nations have generously donated to polio, but we've reached a point of "polio fatigue" where donors are less willing to pay for polio.

Polio funding is expected to run out next summer

So we're 99 percent of the way to achieving this goal, and we're running out of money.

I wish marketing was more hopeful, and if people started to pay attention to how far we've come and how great it would be to end this disease, I think we could call it polio fatigue and put an end to polio.

And if we can do that, we can stop immunizing everyone against polio in every country in the world.

Polio will be the second simple disease to be eradicated from the planet.

Achieving the goal is just around the corner

And this success is just possible

If Coca-Cola's marketing department came to me and asked me to define happiness, they would say that my definition of happiness is a mother holding a healthy baby in her arms.

for me it's happiness

So if we learn from innovators in every field, the future we build together should have happiness everywhere, like Coca-Cola.

thank you

(applause)

I learned about the earthquake in Haiti on Skype

My wife texted me, "Wow, it's an earthquake," and I didn't hear back for about 25 minutes.

It was an incredibly terrifying 25 minutes faced by thousands of people across America.

I was worried about the tsunami, and I didn't realize there was a greater threat lurking in Haiti: the collapse of buildings.

I'm sure you've all seen pictures of collapsed buildings in Haiti.

Here are some photos that my wife took a few days after the earthquake while I was fumbling my way to the scene.

This is the Haitian parliament building, the equivalent of the White House in the United States.

This is the largest supermarket in the Caribbean, and it was supposed to be busy with shoppers.

This is a nursing school, 300 nurses were studying.

The general hospital right next door was largely undamaged.

This is the Ministry of Economy and Finance building.

We've seen and heard enough about the enormous death toll from the Haiti earthquake, but we haven't been told enough about why they died.

There hasn't been enough coverage about why the building collapsed.

220,000 people died, 330,000 were injured, 1.3 million people were displaced, and food, water and supplies were cut off across the country.

It's the deadliest urban disaster in decades.

AIDG has been providing engineering and business support to small businesses in Haiti since 2007.

After the quake, we called in seismic experts to figure out why the buildings collapsed and what was and wasn't.

Working with the United Nations Stabilization Mission in Haiti, the Ministry of Public Works and other nonprofit organizations, we surveyed more than 1,500 buildings.

Starting school Housing Clinic

Investigated food warehouses, etc.

I also surveyed government buildings.

This is the building of the Ministry of Justice

Behind the door is the National Judicial Archives.

Standing by the door is André Filitraut. He's the director of the University of Buffalo's interdisciplinary alliance, the Seismic Engineering Research Institute, and he's been investigating whether it's safe to reinstate the archives.

André says all the buildings have collapsed for the same reason, and there's nothing new to investigate.

told me

All of these were common causes: Inadequate anchoring of walls and planks to columns Roof detached from building Cantilever beams, structures with biased loads, shook and collapsed Poor building materials, insufficient concrete block compression, Smooth rebar rusting off from exposure to the elements.

There is a way to solve all problems

we know the right architecture

About a month later, we found living evidence when an 8.8-magnitude earthquake hit Chile.

The Chilean quake was 500 times stronger than the magnitude 7.0 earthquake that hit Port-au-Prince, but injured less than 1,000 people.

Even with population density, they accounted for less than 1% of the victims of the Haiti earthquake.

What was the difference between Chile and Haiti?

It's the magnitude numbers and the framing that keeps the building from collapsing as a whole, with the walls, the columns, the roof, the slabs holding each other up.

If you look at this Chilean building, it's split in two, but it's not a pile of rubble.

Buildings in Chile for decades have been built with this form of masonry.

AIDG is working with KPFF Design and Architecture for Humanity to bring more framework masonry exercises to Haiti.

This is Exantus Daniel. He's not a master carpenter, he's just a regular bricklayer. He attended one of our trainings.

And in my last job with the master carpenter, I started improperly building the columns.

He stopped the master builder and showed him the framing materials and said,

"You don't have to keep going the wrong way

The right design will not be a burden on us."

redo construction work

Correct rebar and proper column installation ensured the safety of this building.

From now on, every building they do will be safe.

You don't need a special policy to make buildings safer, you just need to work with local bricklayers and help them learn proper building techniques.

Many organizations are now helping

He's Craig Toten in the vest, and he's the one who gets the paperwork for the organization that does this kind of training.

Through Haiti Rewired and Build Change Architecture for Humanity AIDG, we were able to reach out to 30,000 to 40,000 bricklayers across Haiti and create a movement for proper architecture.

If you call everyone in this collaborative way, the cost will drop dramatically.

If you spend the billions and dollars that go into rebuilding, and you train craftsmen, they can build healthy buildings for the rest of their lives.

Ultimately, there are two ways to rebuild Haiti, like Haiti has been doing for decades, on top.

How to install faulty construction that could collapse and interlock walls

The load-balanced structure is a framed masonry structure that can withstand earthquakes.

It's a perfect time to build a better home so that future generations will be prepared for every calamity, so that when the next big earthquake strikes, it will be a disaster, not a tragedy.

(applause)

I named this lecture "The Unimaginably Strange Wonders of Science"

The line, "Unimaginably strange," is attributed to the famous biologist J.B.S. Holden. "The universe is not only stranger than we imagine it to be, but . . . stranger than we can imagine."

“Perhaps there is something stranger in heaven and on earth than any philosophy has dreamed and can dream,” says Holden.

Physicist Richard Feynman likens quantum theory's prediction of actual measurements to being "accurate enough to determine the width of the continent of North America to within a hair's breadth of error."

From this, it can be said that quantum theory is true in a sense.

But the assumptions needed to make this accurate prediction are so puzzling, as Feynman himself said, "If you think you understand quantum mechanics... ...that's proof you don't understand quantum mechanics."

There are so many paradoxical interpretations that David Deutsche, who is supposed to speak here,

In his book, Is There an Ultimate Theory of the World?, he accepts the many-worlds interpretation of quantum mechanics, because the only thing that can be said about the many-worlds interpretation is, at worst, it's ridiculously wasteful.

This interpretation argues that there are an infinite number of rapidly increasing universes existing in parallel, but they can only detect each other's presence through a small peephole through quantum mechanics experiments.

That's all for Feynman, biologist Louis Wolpert.

I believe that the quirks of modern physics are just some of the extremes.

Unlike technology, science betrays common sense

He points out that for every glass of water you drink, you're likely absorbing at least one molecule that passed through Oliver Cromwell's bladder.

This is just a rudimentary probability problem.

There are far more water molecules in a cup than there are cups or bladders in the world.

Of course, Cromwell and the bladder are not special. What you just breathed were nitrogen atoms that passed through the right lung of an iguanadon, third to the left of a tall cycad tree.

'Unimaginably strange'

How can we imagine? How far can we imagine?

Is there anything in this universe that is comprehensible to a higher intelligence than us, but is beyond our comprehension?

Is there anything that even the highest intelligence can't comprehend?

The history of science is a series of crazy ideas, with each successive generation having to come to terms with an increasingly strange universe.

Now, we're used to the idea that the earth rotates instead of the sun revolving around it.It's hard to imagine what kind of spiritual revolution that was.

It seems very obvious that the earth is vast and stationary, and the sun small and moving, but Wittgenstein's view of the subject.

You might want to recall, "Why do people say it's more natural for the sun to revolve around the earth than for the earth to rotate?" he asked.

My friend replied, "Of course it looks like the sun is spinning."

"Well, what would it look like if the Earth were spinning?" Wittgenstein retorted.

Science has taught us that things that are apparently solid, like rocks and crystals, defy our intuition and are made of mostly empty space.

One explanation is that the nucleus is the fly in the middle of the baseball field, and the atom next to it is the baseball field next to it.

So, no matter how hard and strong a rock is, it's mostly empty space and very sparsely populated with particles.

So why do rocks feel solid?

As an evolutionary biologist, my explanation is this: our brains have evolved to adapt to the size and speed at which our bodies operate in order to survive, like living in the atomic world.

We didn't evolve. If we did, our brains would perceive rocks as almost empty space.

Exactly because objects like rocks and hands can't penetrate each other.

So it's useful for our brains to create concepts like "hard" and "impenetrable" to navigate the medium-sized world we live in.

On the other hand, given the large scale, our ancestors didn't need to travel at near the speed of light through space, and if they did, it would have been easy to understand Einstein.

This medium-sized world in which we operate and evolve

I would like to call it the "middle country". "Middle-earth" in The Lord of the Rings... has nothing to do with it. It is a "middle country"

We evolved in this "middle country," and that limits our imagination.

Intuitively, it's easy to imagine that if a rabbit is moving at a "medium" speed that a "medium country" object is moving, and it hits another "medium country" object, a rock, it will faint.

Let me introduce you to Albert Stubblebein III, who was a Major General of Army Intelligence in 1983.

He stared at the wall of his office in Arlington, Virginia, and decided

Oh my God, he's going to the office next door.

he stands up and turns his back on the desk

He thought, "Atoms are mostly made of empty space." He started walking, "What am I made of? An atom."

"What are the walls made of? Atoms." "All I have to do is fit the empty space."

And the major banged his nose hard against the wall

Major General Stubblebein, commanding 16,000 men, was at a loss as he couldn't get through the wall.

He believed that this ability would one day become a common military tool.

This is an article I read on Playboy

I have reason to believe this is true

Actually, my article was on there, so I was reading Playboy.

It's hard to believe Galileo's teaching that, according to the human intuition learned in the "middle country," that in the absence of air resistance, heavy and light objects would fall at the same time, because in the "middle country," air resistance is always present.

If we evolved in a vacuum, you'd think we would be at the same time, and if we were bacteria.

It's a different prediction, because we're constantly being shaken by the thermal motion of molecules all the time.

But the inhabitants of the "medium country" are too big to feel the Brownian motion

And also, our lives are governed by gravity, and we don't really care about surface tension.

For small insects, this order of precedence is reversed.

On the left of the picture, Steve Grand... on the right is Douglas Adams... Steve Grand is the author

In "Creation: Life and Its Creation," he positively captures our preoccupation with matter.

We tend to think that only hard, tangible things are true "things".

I can't believe it's real

People in the 18th century thought that waves needed a substance to carry them, ether.

It's just because we evolved in a "middle country" where it's convenient for us to think of matter.

To Grand, the whirlpool is as real as the rock.

Sand dunes of volcanic ash at the foot of the Olu Donyo Lengai volcano in the Tanzanian desert

Surprisingly, the entire dune moves

Across the desert, the entire dune migrates westward at a speed of about 17 meters per year, called a "barchan."

The dune keeps its crescent shape and moves in the direction of the horn.

The wind blows the sand up a gentle slope, and then the sand slides over the top of the dune to the other side, the concave side of the crescent, and the overall crescent shape of the dune moves.

Steve Grand says we are like waves, not perpetual.

"Think about your childhood." "Something distinct in your memory."

"In fact, you were there at that time."

"So you remember?"

"It's a shock, but it's actually different."

"Not one atom of your body... ...is the same as it was in that era of memory."

"Matter constitutes you for a short while as it moves"

"So your substance and the matter of which you are... irrelevant."

"If this important fact does not make your hair stand on end... ...read it again."

In other words, the word "actually" should not be used lightly.

If neutrinos had brains, they evolved from a neutrino-sized ancestor, so rocks are almost empty.

Our brains evolved from a medium-sized ancestor that couldn't fit through rocks.

Whatever the brain needs to survive is "reality."

Different species live in different worlds, with different realities that are unacceptable.

The world we see is not the world as it is. It's a model of the world with sensory data tuned and structured to make it easier to deal with the real world.

The nature of the model changes depending on what kind of animal it is

Flying animals require a different kind of model than walking, climbing or swimming animals.

A monkey's brain probably has software that simulates a three-dimensional world of branches and trunks.

The software that moles model the world in would be well suited to life underground.

Like Edwin Abbott's "The Flat World," water striders live on the surface of ponds, so they probably don't need three-dimensional software.

I believe that bats can see colors with their ears.

Bats, like birds that fly during the day, like swallows, fly around three-dimensional space to catch insects, so the bat's model of the world must be very similar to the model of birds in the sky.

It's just a contextual difference that bats use sound reflections in the dark to feed the current state into their models, while swallows use light.

Furthermore, I think that just as swallows and humans use colors such as red and blue to distinguish between long and short wavelengths, bats use perceived colors to acoustically distinguish surface textures such as "fluffy" and "smooth."

There's nothing special about red being a long wavelength

The point is that the nature of the model is not determined by the type of perception, but by how it is used.

Holden also had an opinion on the animal world where odors play an important role.

Dogs can distinguish between similar fatty acids, caprylic acid and caproic acid, in very low concentrations.

The only difference, as you can see, is that one has one extra carbon atom.

Holden speculates that just as humans can sense the length of a piano string by its pitch, dogs can sense the molecular weight of fatty acids by smelling them.

In fact, there's another similar fatty acid called capric acid, just with two more carbon atoms.

Just as we can imagine the sound of a trumpet that is one step higher than any trumpet we have ever heard, even a dog who has never encountered capric acid can easily imagine its odor.

Maybe just like the bat debate

Olfactory animals such as dogs and rhinoceroses may perceive colors through odors.

The range of sizes and velocities in the "middle country" that we've evolved to work with instinctively is narrow, a bit like the spectrum of light that we see as different colors.

Wavelengths outside of that are invisible to us without special instruments.

In contrast to the seemingly bizarre, tiny, gigantic, or super-fast world, the "middle-of-the-road" we judge as normal is only a narrow reality.

Something similar can be said about probability: nothing is impossible.

Miraculous events are extremely rare

Even a marble statue might wave its hand because the atoms that make up it vibrate back and forth.

But there are so many atoms, each moving in so many different directions, that the marble we see in the "middle country" is immovable, like rock.

But what if the atoms that make up the statue's hand happen to move in the same way repeatedly at the same time?

They might wave at us, and of course the odds of that are very low.

If we were to write that number, even if we continued to write zero from the beginning of the universe to the present day, it would still not be enough.

As we evolved in the "middle country," we have short lifespans, so we can't handle very low-probability events very well.

In the vastness of astronomical space and geological time, even what seems impossible in the "middle country" may become inevitable.

As an example, let's count the number of planets.

We don't know how many planets there are in the universe, but it's estimated that there are about 10 to the 20th power, or 100 billion, 1 billion.

From that, we can infer how likely it is that life exists.

And just like the spectrum of electromagnetic wave lengths that I mentioned earlier, we can think about where in the spectrum of probabilities stands out.

If life originated once per planet, life would be very common, maybe once per star, or once per galaxy, maybe once in the whole universe, which is us here.

That includes the possibility of magic happening, such as a frog transforming into a prince.

If there's only one planet in the universe where life originated, that planet is the Earth we're talking about here.

So it's reasonable to speculate that the birth of life would be a scientific phenomenon about a billion times rarer than 10 billion.

But I think life is so mundane that I don't think that's the right way to think about it.

Although commonplace, unfortunately, it may be rare enough that different life forms do not meet each other.

How do we interpret "unimaginably strange"?

Is it inconceivable in principle, or is it simply beyond the limits of our brains, which evolved in the "middle country"?

Can we train ourselves to break out of the "middle-of-the-middle" mindset and understand the microscopic or gigantic world not just mathematically, but intuitively? I have no idea.

Perhaps from a very young age, playing computer games, for example, in the world of quantum mechanics, can help us understand the world of quantum mechanics, where strange things happen, like a ball going through two slits at the same time.

Relativistic computer games, in which objects on the screen undergo Lorentzian contraction, could teach us relativistic thinking to... children.

And finally, let's apply the idea of ​​the middle country to how we perceive each other.

Most scientists today take a mechanistic view of the mind, saying that the wiring and hormones in our brain determine who we are.

And different neural structures and different physiochemistries have different personalities.

But we scientists are contradicting

For example, we don't react to a person acting abnormally like a child killer by saying, "This part is broken and needs to be fixed."

Our response, even to extreme anthromechanists like myself, is, "You monster, go to hell."

Or worse, revenge could trigger the escalating chain of revenge we see all over the world today.

So, as a researcher, I think of people as complex machines, like computers or cars.

Just like Basil Fawlty in the comedy Fawlty Towers, if the car doesn't move on the day of the dinner party, he'll slap you and punish you.

We anthropomorphize things like cars and computers because we live in a social world, just as monkeys live in the treetop world, moles in the underground world, and water striders in the surface tension world. We are swimming in a sea of ​​people.

It's a social version of "middle country"

Evolution has made us great psychologists, able to infer the behavior of others.

It may be scientifically and physiologically correct to treat people like machines, but it's a huge waste of time trying to guess what a person will do next.

It's a more rational way to model people as goal-chasing agents who have pleasure and pain, desires and intentions, and who are subject to crime and punishment.

Anthropomorphizing and treating people as intentional has been such a successful way of modeling people that it's no wonder we often apply the same modeling techniques to things that are inappropriate, like Basil Fawlty's car, or the divine will that millions of people believe.

If the universe is strange beyond what we can imagine, is it because we were naturally selected to imagine only what it would take to survive in Africa during the Pleistocene epoch?

Or are our brains flexible and scalable enough to be trained to escape evolutionary cages?

Or, finally, is our universe so strange that we can't even imagine how omnipotent beings are like God?

thank you for listening

I was once instilled with the mundane, unoriginal idea that the emergence of new technology is an opportunity for social change.

I'd like to share with you what I've been up to -- I haven't changed my mind in any way -- and I'd like to introduce you to my lab and my current place of work, the Environmental Health Clinic at New York University.

It's kind of a twist on the concept of health.

Here I'm trying to redefine what the word health means.

It's a health clinic at any university, but the only difference is the reason patients come. They come in because they have environmental health concerns, and they bring home a prescription with an action plan for improvement.

It's a very useful phrase taken from the Hippocratic Oath that physicians swear, "The majority of the soul resides outside the body, and to heal the inside, the outside needs healing."

These words represent my aim as a point of contention: an opportunity to redefine what health is.

Because the idea that health is internal, fragmented, personal, and controlled by drugs is largely wrong.

I'd like to shed light on the concept of health from a different angle using a recent study by Philip Landrigan. Landrigan visited most of the pediatricians in Manhattan and the New York area and kept notes of what diseases they were seeing during their visits.

Five diseases accounted for 80-90% of visits.

The most common is asthma, the second is stunting, and the third is a rare childhood cancer that has increased 400-fold in the last 10-15 years.

Number four and number five were childhood obesity and diabetes.

Now, what do all five of these things have in common?

The environment. Environmental involvement was on the rise.

Doctors are trained to deal with germs, but that's not the same thing. They define health differently. Health here has the big advantage of being external, common, and actionable.

Clients at the clinic are called impatients, not patients, which implies patience, because they can't wait for laws to improve community and environmental health.

We see these people at the university, and there are several off-campus offices in various locations, so I put myself in the field and got a firsthand sense of the environmental problems that we are exposed to.

I love this off-campus clinic in Belgium, because I used to see patients at roundabouts, because that's exactly what these roundabouts represent, leaderless social movements that represent social change, as opposed to top-down, red-light intersections.

Of course, in this case, the roundabout is just a bunch of small decisions people make on the fly without any orders.

But, of course, more traffic, but fewer accidents, it would be interesting as a model for social movements.

I'm going to show you what we've developed in the clinic.

Well, let me explain, we name the tadpoles after the bureaucrats who have the authority to decide the quality of the water that people in the area drink.

So a "non-patient" who cares about water quality grows a bureaucratic tadpole in a water sample of interest.

The clinic will give you some tools, containers to keep close at hand, like when you're blogging or writing emails.

And a tadpole walker, a device for walking your pet tadpoles in the evening.

And then something interesting happens -- it's a tadpole, so it's no surprise that tadpoles have the most biosensitivity of any living organism. Because some of their senses are orders of magnitude superior to ours, tadpoles have significant biological responses to a range of industrial toxins called endocrine disruptors, or endocrine disruptors.

By taking our pet tadpoles for an evening walk -- here's a picture of what we're doing -- the first thing your neighbors will say is, "What are you doing?"

And that leads me to introduce tadpoles, and how they got their name.

What they're doing, and of course, the ease of observing tadpoles as they grow, and having the same thyroid hormones as humans, all of which have to be explained.

So the next time you see your neighbors, they'll say, "What's going on with that tadpole?"

So, connecting tadpoles and them with social networks. Environmental health clinics have social networking sites, not just for human "non-patients," but also for non-human animals, both humans and non-humans.

Of course, these endocrine disruptors are suspected to be causally linked to the epidemics of breast cancer, obesity, the 2.5-year decline in the age of menarche in girls, and a host of other related phenomena.

The culmination of this program is, if we succeed in raising a tadpole, keeping track of its behavior and growth, we go to meet the bureaucrats that gave it its name, introduce us to the tadpole, and discuss the facts and evidence that we've observed.

I'd like to introduce you to one more program, which I hope you can get a concrete picture of what we're doing -- instead of taking urine samples, we're asking you to give us mouse samples.

Anyone lucky enough to share a kitchen shelf with a mouse? Do you have mice in your family?

you are very lucky

Rats, as you probably guessed it, are the quintessential laboratory model organism.

It's even more fitting as a model for environmental health, because not only do we live as mammals, but we also eat pretty much the same as humans.

They live under the same environmental stressors that humans do, and they're exposed to asbestos, lead, whatever.

They are also more restricted in their range of motion than in humans, because the pollutants they have been exposed to are in their homes and are difficult to remove, whether they are of biological origin, occupational, or childhood.

Because if you look at a mouse, you know what's going on.

It all starts with building purpose-built rat traps.

It is like this

Dealing with environmental stress can be tricky

Anyone taking antidepressants?

(Laughter) A lot of people drink in Manhattan.

We did an experiment to see if rats could drink SSRIs on their own.

Prozac, Zoloft, black jelly beans, muscle relaxants.

So who thinks the rats took their own antidepressants too?

how is it? (Audience: Yes! Of course!) How did you know? yes i drank

This is a vodka water solution and a gin water solution

This rat also liked plain water and muscle relaxants.

Anyone know more?

Vodka, gin... (Audience: [inaudible]) Yes! yes you know rats

I drank alcohol too.

Interestingly, I drank as much vodka as I did plain water.

The rat then enters a trap and is caught.

I have an old cell phone, and it's a good way to recycle it.

It's a process of taking a blood sample and looking for blood or body hair.

Now I would like to explain to you one of the great benefits of looking at health externally.

There are some products that we prescribed as part of our work.

very different from the medical model

The actions we take to improve water and air quality, and the actions we take to understand and change it, can benefit everyone who drinks the same water and breathes the same air.

This collective effect, the effect of collective behavior, can actually be used to the benefit of everyone.

So I'm going to show you one of the prescriptions that we have in our clinic, it's called No Park.

Formulated to improve water quality

Many “non-patients” have a strong interest in water and air quality

So we turned to fire hydrants. Parking is not allowed in front of fire hydrants, so the prescription was to remove the asphalt and create an artificial green space to let rainwater infiltrate.

As many of you know, the biggest source of pollution in the Port of New York-New Jersey right now isn't from one particular source, it's not a big factory, it's not GE, but it's a huge network of roads. Because the surface of this road is impermeable, neurotoxins like cadmium from brake discs and oil-soaked hydrocarbon wastes are dumped into the estuary every storm because of the old infrastructure.

Not much good will come from here

Here's a small measure to try and block this pollutant from reaching the harbor, which is being ingeniously built by "non-patients" in city blocks all over the city.

As a rule of thumb, there are usually two or three fire hydrants per block, except for the asphalt here.

Even if we create artificial green spaces that allow rainwater to permeate, it's not to prevent emergency vehicles from being parked.

Some plants will die, but that's okay, they'll grow again.

But if we could do this for every single fire hydrant, wouldn't we have a new definition of an emergency?

99% of the time the fire engine isn't parked, it soaks up the contaminants.

At the same time, it helps combat carbon dioxide and sequesters airborne pollutants.

All these little shields together can keep pollutants from the roads from being washed into the estuaries, even in the event of seven inches of rain or a once-in-a-century storm.

Collectively, these small actions can have a big impact on improving the health of our communities.

Let's look at a bigger example

The problem that the climate change crisis has revealed is secondary in itself. There is a more pervasive crisis that is even more pervasive than that, and it's about the functioning of our actions, about what we do.

Buy locally grown lettuce, switch to energy-saving light bulbs, obey the speed limit, and change your tires regularly.

The bomb shelter in this photo, you remember, it's interesting as a symbol of an era.

What is a nuclear shelter for the modern climate crisis?

At that time, citizens were mobilized at once

Churches, schools, hospitals, general housing -- everyone built a bomb shelter in a matter of months.

These shelters remain symbols of the collective response to the vague but universal threat of the nuclear crisis.

A nuclear shelter against the climate crisis, if you ask me, is something like this, something like this, it's an urban farming complex that's about to be completed in my lab building at New York University.

What this facility does is a very simple idea: 80 to 90 percent of the carbon dioxide emissions in Manhattan come from buildings, so just like commercial greenhouses used in agriculture, it's designed to ensure that the carbon dioxide that comes out of the building -- the carbon-enriched air -- goes through the urban farming facility, and from there it feeds oxygen-rich air.

I can't really use it on the roof because it wasn't originally built that way.

We're going to use the legs, and we're going to concentrate all this functionality on the stone walls and columns.

Using open-source hardware to build together

Here's a quarter-size prototype, and it actually worked in Spain.

Here's the finished product Wishing you all the best NYU god wills

Now, what I'd like to show you -- actually one of those components, which we've been testing lately -- is called solar chimneys, and there are currently 17 of them scattered around New York, and they passively suck air.

You know how this works

warm air rises

When you put black plastic on the side of a building, it warms up in the sun and creates passive airflow.

And here we actually put a standard HVAC filter on top.

This removes about 95 percent of the carbon particulates in the air. Black carbon, together with ozone, accounts for about half of the global greenhouse effect, because it sticks to the surface of snow, changing its reflectance, and it also changes the permeability of the atmosphere.

Carbon particulates are also the soot that sticks to your clean pink lungs.

It's bad, and it's not from combustion itself, it's from incomplete combustion.

In fact, about 95 percent of these carbon particles can be removed through our solar chimneys.

When it accumulates, I take it out with my students and actually take out this black carbon again.

Soot that is removed from the air is used to make pencils.

this is one of the chimneys

It was built by students, people who use pencils very often.

Now, let me show you just two more devices, because one of the great human challenges is to reimagine the relationship between nature and humans, not just through the twisted ideas I've talked about about personal health, but through the animals that live with us all around us.

Not only humans but also animals are migrating

Because, in fact, urban migration now also means moving animals once known in the wild to urban centers.

Coyotes in Central Park Whales in the Gowanus Canal Moose in Westchester County

It's a phenomenon that's happening all over the developed world, partly because of habitat loss, partly because cities are just a little bit more livable than they used to be.

It's also because each green space we create invites living things other than humans to coexist.

Until now, we lacked the imagination of how we could make it work, how we could make it interesting.

I'd like to show you some of the technical interfaces that we've come to call OOZ, or zoo spelled backwards, that don't have cages and that try to reinvent the relationship between animals and humans.

This is a technology for communicating with birds, and it looks like this.

When the bird perches, it plays a recorded voice.

There are actually six in the Whitney Museum, each playing a different voice with a different message.

Sound like this

(Whistling) Recorded voice: Do as I say now.

Buy a healthy food bar over there. It's called bird food.

ok you are a good person

Natalie Jeremijenko: What do you think? (Laughter) There are several devices like this.

birds can fly between

It's just a normal pigeon that lives in the city.

In my early experiments, I was looking at which voices were able to elicit cooperative behavior from people -- and I came to the conclusion that it worked best 100 to 1:

Recorded voice: tick tick tick

This is the sound of a bird flu gene mutating into a deadly human flu.

How do mutations slow down?

Increase healthy bird flock populations and increase overall ecosystem diversity

If we birds are healthy and happy and well fed, it's also for you humans.

So don't monopolize the nutrition you have, share it.

In other words, share the rice with us birds.

(Laughter) Natalie: It worked. It's true.

So the last project I'd like to show you is a fish interface, which has just started recently -- thanks to some wonderful collaborators at the Union of Architects -- it's officially due to go live next week.

It may not sound like you're talking about communicating with fish, but I built a device for that.

Here's what it looks like: Floating buoys 3 feet above and 3 feet below water

Glows when fish swim under it

It actually looks like this

More Features

The top light -- I'm sorry if I made you seasick -- The top light actually also displays the water quality.

You can also send text messages to fish

I have a business card, so please email me.

I will reply

When the buoy receives an email, it will flash twice, meaning it has been received.

But the most popular one is a buoy placed in the Bronx River, where you can see the beavers who have done the madness of nesting in New York City for the first time in 250 years.

Latest news from Bieber

You can subscribe to news from Bieber and talk to him.

So what I'm trying to think about is an interface that's redefining how we interact with natural ecosystems, specifically who's the source of the information, where they put it, who can understand it, and what they can do with it.

In this case, you can do better than tossing chewing gum, Doritos, whatever you have in your pocket, and feeding the fish -- right in the middle of the city of Iceland, there's a waterhole I've been involved with, and the biggest source of water pollution isn't actually pollution from the roads, it's actually the bread that humans throw in to feed the fish and birds.

Instead of doing that, we developed a fish stick that can be used as food for fish.

It's delicious

It's a deliciousness shared by different species. It's delicious for both humans and non-humans.

But it also contains chelating agents.

Nutritionally, it's a good food, unlike Doritos.

Anytime you feel like interacting with animals -- this desire is as common as that common "Don't feed the animals" sign, isn't it?

In New York City, there are three signs per park.

In Yellowstone National Park, there are more "Don't feed the animals" signs than there are animals willing to feed.

But by rewriting what we do, or how we interact, by turning it into an opportunity to provide food with the right nutrients, it serves the purpose of increasing the food sources that we humans have depleted and increasing the number of fish. It has the effect of excreting it out of the body.Because it becomes a complex salt and loses bioreactivity, it effectively prevents toxic substances from being absorbed into the body.

But this interaction, redefining how we interact, turning it into a global movement, or a global improvement movement, is a very different approach than the PCB dredging operation on the other side of the Hudson River, which is the result of 30 years of legislative and judicial strife, and is the largest dredging operation in the world, funded by GE under the Superfund Act. It will be transported to Nia or the nearest third world country, where it will be disposed of as new toxic waste.

Although simple pollution transfer is not the answer to environmental problems,

Until now, humans have typically operated within this framework.

But by taking advantage of the opportunity to redefine the way we communicate, using new technologies, existing new interactive technologies, and designing them not just as isolated and individualized interactions, but as collective, holistic activities that together mean something, we can begin to truly address some of our most important environmental problems.

thank you

(applause)

Please use this slide for your presentation.

(laughs) Isn't it beautiful?

do you understand?

All the dots and lines are incredibly

It represents the network. For me, the media network is important because it's my job to connect people.

Isn't that amazing?

Connect with people through the internet

There are many ways There are many ways

For example, getting the vacuum cleaner dressed up

(Laughter) In a project called "Earth Sandwich," we asked participants to place two slices of bread on the ground at the same time in opposite locations on the planet.

People who agreed started putting bread down, and finally there was a sandwich between New Zealand and Spain.

great thing there's a video on the web

I also connected with people through a project called "Me then and now."

They find pictures from when they were kids and ask them to recreate the same thing now as an adult.

(Laughter) This is the same person, James above and Julia below.

I am touched

this is a gift for mother's day

(Laughter) It's creepy.

(Applause) (Laughter) My favorite was the first photo, where a woman, about 30, was holding a baby in her lap, and then the second was a little old woman looking over the shoulder of a 100-pound man.

Some projects have changed the way I think about how to connect with people.

It's a project called "Ray"

A song was sent to me, I don't even know who made it

He said, "Listen to this."

It was like this

RECORDED: My name is Ray My daughter called me yesterday she was exhausted after a very unfair job.

Agitated and looking for solace, I had so many troubles and didn't know what to say to my daughter.

So I wrote a song to encourage my daughter to overcome the stress and pressure of work.

And I decided to put the song on the internet in the hope that it would help working people who are feeling stressed cope better.

It's a song like this

"I'll whip your ass" "I'll whip your ass" "Leave me alone" "Let me go home now" "Or I'll whip your ass" You may not be able to sing it out loud, but if you memorize it and hum it

you'll feel a little better

You should be strong.

Zei: Uh

No, keep quiet, we have to hurry

I was touched by this song it's great it brings people together

The people who made this knew that there were people who felt something from this song, even if they were far away.

great this is what i wanted to do

So I thought I should thank Ray first.

So I said to the viewers of my show

"I want you to listen to this song and remix it.

he has a nice voice and the key is B flat

Combine it with something

Hundreds of remixes have been submitted

Especially well done

Artwork by Goose

Remix: "I'll whip your ass" "I'll whip your ass" "Leave me alone" "Let me go home now" "Or I'll whip your ass" "Whip your ass -" Zey: Great

(Applause) - Thank you.

I heard this song was playing at a baseball stadium in Kansas City.

It ended up being the most downloaded song on various music streaming sites.

When I said, “Let’s put together an album of remixes,”

Viewers designed the cover

So I said, "If you find Ray, I'll send you the finished album." All I knew was Ray's name, this song, and that his daughter was mad at him.

Found Ray in 2 weeks

I got an email saying, "Hey, it's Ray.

are you looking for me ”

(Laughter) I replied, 'Hey Ray

A lot has happened in the last two weeks."

I went to St. Louis and met Ray, a pastor. (Laughter) From the Ray thing.

It reminded me of this sign that's all over the streets of Amsterdam.

looks like a metaphor for the virtual world

In the picture, what he's really interested in is the button, and it's almost as if he doesn't care about crossing the street.

(Laughter) And that's what got me thinking.

All over the street, people are looking into their phones. It's easy to dismiss this as a bad trend.

But actually there is life

When the person looking into their phone stops and smiles, that strange, dense network becomes a living space.

we are all

Seeking mutual feelings with people

We can create an environment that makes it somewhat easier, but what we're trying to do is connect deeply with other people.

It doesn't just happen in the physical world

Now it's happening in the virtual world, and we have to understand this better.

Many of the people who have built networking technology aren't very good at connecting with people.

I used to do this when I was in 3rd grade

(Laughter) Over the last few years, in trying to actually create intimate ties, in trying to actually create intimate ties, there's one project that has inspired me.

Some were very simple

In "My Childhood Roads," I asked people to remember the roads they took many times in their childhood, such as bus stops, roads to neighbors' houses, and other seemingly insignificant things, and drop them into Google Street View.

I promise you, if you do this, there will come a moment when you remember something that will give you a bang.

We've collected those moments - especially Street View photos and memories.

"I said, 'I'm bored,' and she said, 'I'll have a pretzel then.' It happened so many times, I remember it so clearly."

"After I divorced my mother, I walked to a convenience store and bought a cherry coke as soon as my father told me to."

"They used a brooding footage, a close-up of Chad's shoes in the middle of the highway.

I think I took it off when I was hit by a car

Chad came to stay at my house and left his pillow.

A pillow with a name written in magic

He died a long time later and never got a chance to return the pillow."

I had more abstract memories.

This is a "pain packet"

After September 11th of last year, I was thinking about pain and how to relieve it and get it out of my body.

So we set up a hotline so people could leave voicemails about their pain, not just 9/11.

The following message was left

Recording: Just listen

i'm not alone i'm loved

i'm so lucky

But sometimes I get so lonely

And at times like that, even the slightest act of kindness makes me cry

Even if a convenience store clerk happened to meet my eyes and say, "Have a nice day."

Zei: With permission, I took the voicemails and put them into MP3 files and gave them to sound editors, and from there came short recordings of just the voicemails.

It's been in the hands of DJs, and it's been used as raw material in hundreds of songs.

(music) I don't have much time

listen on the web

"From 52% to 48% With Love" was a project during the last presidential election. McCain and Obama both talked about reconciliation in their post-election speeches.

ok let's try

I'm going to have to raise a sign of reconciliation,' I thought.

Got some really nice comments

"Whether you vote Democrat or Republican,

Let's move forward together towards the future

this is so cute

From the winning Democrats

"I promise to listen and respect the Republican Party."

From a Republican supporter who unfortunately lost

"I hope the leaders of the Democratic Party are as noble as you, though I doubt it."

As this effort gained popularity, some right-wing blogs and message boards began to deem it intrusive, which is understandable.

So I started getting an astounding amount of hate mail and even death threats.

A man kept sending me terrible messages, and he was dressed as Batman.

"I'm in this form to hide my identity.

Don't let the real Batman come after you." That gave me some relief, "Whoa, it wasn't real."

And so I was -- I was going crazy with all this terrible experience and all this pain inside me.

I was trying to protect this project from blackmail, and I didn't want these special photos to be defaced.

So I put all of my emails together in "anger paper," which is an origami template printed with vulgar, threatening emails and other words.

I asked people to send me something that would cleanse them using "angry paper."

(Laughter) Something exciting happened.

A viewer who lost his uncle used "wrath paper" to remember him.

that's great

The last thing I want to talk about is a series of projects called "Songs You Already Know", in which I wanted to address certain emotions through group studies.

one is very simple

Someone asked me if I could write a song for her daughter who is afraid at night.

I decided to write a spell for her to sing to herself and put her to sleep.

It's a song called "When I'm Scared"

(Video) "This is a song I sing when I'm scared" "I don't know why, but it gives me courage" "The lyrics encourage me" "For some reason I'm not scared anymore" "At least my life isn't full of failures" "I've done many things" "At least my life isn't full of failures" "I've done many things" "This is a song I sing when I'm scared" The song was like this.

To my delight, my client passed by my daughter's room and she actually sang this song.

"Great" I thought

Then I got this email with a story behind it.

i don't have much time

What I tried to do was a project called "I am You on Facebook." I wanted to experience living as a different person.

I asked people to give me their usernames and passwords.

I gathered about 30 in 30 minutes

Recruitment was canceled

I picked two of them and asked them to teach me how to be them on Facebook.

One was very detailed, but the other was not.

I later found out that this person had just started a new job in a new city.

When people ask me, "How about a new job?"

I said, "I don't understand. What do you mean by work?"

It was that kind of feeling

But anyway, that person, Laura, sent me an email after the project was over.

I felt sorry that I couldn't be her well

Laura says, "I just moved and started a new job, and I was really worried."

I listened to the song "When I'm Scared" and was hoping that maybe I could do something.

"What does it feel like to be anxious?"

Laura wrote an article explaining it

So I said, "I'll think about it."

Secretly to people behind the scenes

started sending this

(music) "Hey" "It's okay" "I'm sure it'll work." I asked the people I sent them if they could send and receive sounds, and I put on my headphones and had them sing along to the song, and I recorded their voices.

For example, a voice like this came back

Recording: "Hey" "It'll be fine" "I'm sure it'll work" Zei: This one sings well

And the good news is, when the response started to grow, suddenly we were getting 30, 40 songs from all over the world.

And when we put it all together, something amazing happened. It's just unbelievable. Voices from all over the world came together in one chorus.

And the amazing thing is that it happened completely unnoticed. It's been a month, and Laura sent me an email.

"I think you forgot about my request.

I just want to say thank you for thinking of me."

I sent this to Laura a few days later.

(Music) "Now it's like I forgot to turn on the light" "What I thought was so pretty yesterday" "Now it looks gray and dull" "I'm standing still" "The world seems to be spinning" "Or is it me that's spinning?" "Take a breather" "Everyone will sing along" "Hey" "It's okay" "I'm sure it'll go well" "Take a breather" "Hey" "It'll be all right" "I'm sure it will go well"

(applause)

Stories that tell each other are important

Talking about your life is important

And most of all, I think it's very important how we get involved in each other's stories.

When I was six years old, I heard a poor man's story for the first time.

I didn't hear it directly from the poor, but through my Sunday school teacher, who told me about Christ.

I remember being told that they need a lot of things. They need food, clothing and shelter.

And along with that, we were taught that our duty as 5- and 6-year-olds in Sunday school was to help.

This is a request from Christ

"What you do to the least is what you do to me"

i think i'm really looking forward to

I wanted to be of service to the world.It's a feeling that everyone has felt.

that God is asking for help

It was new to me, but I felt it was important to contribute to this.

But I soon learned that Christ was saying that the poor are always with us.

I was dissatisfied and confused about this.

I'm confused, dissatisfied, and angry.

I was timid

This was the first time I felt fear and discomfort towards the poor.

What came to my mind was the image of people standing in a line that always haunts me.

I'm always asking for help and supplies, and I don't know how my desire to help will help.

What happens when you run out of things to offer?

Growing up, I heard a lot of stories about poverty, but they were all dark stories.

For example, looking at pictures or videos of people suffering from grief,

Stories of poor people in trouble,

I've heard stories of disease and war that seem to be connected to each other.

Those stories made me realize that this is the situation, that the poor people of the world live a life of suffering and sorrow and destruction and despair.

And then, like many people, I started reacting like this: Every time I heard about poverty, I felt sorry for him.

You feel guilty about your relative abundance because you haven't contributed enough.

I felt embarrassed because of that

So naturally I started to keep my distance

I don't listen to the poor people as closely as I used to.

I didn't think things would get any better.

But if you invest your time and money

It would have seemed like we were spending money on solutions that we could afford.

for the money of a cup of coffee

It is true that one child can be saved

When I felt overwhelmed, I donated. When pity ran high, I donated too.

That's really why I donated, not purely out of hope, not out of help or kindness.

For me, it's become a mere trade and buy and sell.

I was buying something like the right to live my life, the right not to be haunted by sad news.

In trying to get through their troubles, they forget their humanity and their individuality first and foremost.

Treating it like some kind of commodity is really horrible behavior.

I'm sure many of you have dealt with it like I did. It's kind of like buying distance. You're buying the right to carry on with your normal life.

This deal should be the most desired

It interferes with the desire to make a difference in someone's life in a meaningful way, or, simply put, it interferes with love.

Thankfully, there was a turning point a few years ago when I heard a talk by Dr. Muhammad Yunus.

Many of you are probably familiar with him, but for those of you who don't, I'll give you a very brief introduction: Dr. Yunus was awarded the Nobel Peace Prize for his work in establishing microfinance.

I heard him talk three years before he won the award.

Microfinance in a nutshell: financial services for the poor.

It's a system that adapts the services that banks provide to people who live on a few dollars a day.

Dr. Yunus told his story and what he accomplished at Grameen Bank.

I talked specifically about microloans, which are small loans to help start a business and grow a business.

I was excited to hear him talk for several reasons.

First and foremost, I learned new ways to change the world. I found that lending money while being involved was a natural way to do it.

And more importantly, the story about the poor was unlike anything I'd ever heard before.

Though I happen to be poor

It was about an entrepreneur with the strength, the wisdom and the drive to make a difference in life for himself and his family.

All they needed was a little money to do it faster and better.

I was surprised by this view.

I was so moved, I can't put into words how much it touched me, and I was so moved that after a few weeks I decided to quit my job and head to East Africa to see for myself.

For the first time in my life, I wanted to meet each and every individual, I wanted to meet entrepreneurs and see how they lived for myself.

I interviewed entrepreneurs who spent three months in Kenya, Uganda and Tanzania, starting and expanding their businesses with $100.

And through these exchanges, I made my first friends with people I had always thought were invisible and distant.

I became friends and learned about each person's story

And over the course of many interviews, I listened to the details of how their lives changed during their time with them.

I heard about a goat herder who bought a few goats on a loan.

Get your business on track

With a little more income, you can raise your standard of living and live a better life.

I'm interested in small improvements in life, like sending kids to school.

Will you be able to buy mosquito nets?

Buying a key to the door will give you peace of mind

It is said that they are proud to add sugar to the tea they serve to guests.

Even if you take turns talking to 20 goat herders, there are all kinds of lovely details about how meaningful it is to make a wonderful life change that happened at one point in time.

I was affected

For the first time, I realized my mistake in thinking that a magic wand would solve all my problems.

Because the way you think is best is the best way to change your life.

This is how I became aware of my thoughts

More interesting things happened over there

I've never been asked to donate, because I used to associate poverty with aid.

I knew I would be asked for donations.No one asked for donations.

I didn't want anyone to feel sorry for me.

If I had to say, I want to do what I'm already doing and improve my capabilities.

Sometimes I hear that people want to borrow money, and I think that's a very rational and wonderful thing.

My majors were philosophy and poetry, so when I visited the field, I couldn't tell the difference between profit and income.

I was just under the impression that money was useful.

My exposure to the business came from a mere $100 capital contribution.

I learned about profit and income and leverage from farmers and tailors and goat herders.

Now, you should be able to share this new story about business and hope with your friends and family so that they can raise the money they need to lend out and keep their business running. And out of this little idea, Kiva was born.

A few months later, digital camera in hand, I returned to Uganda, built a simple website with my partner, Matthew, and sent out pleading emails with pictures of seven of my new friends and their entrepreneurial stories.

"We have not received any legal or OK SEC inquiries. Can you please provide these people with the money they need?"

The funds were raised almost overnight

send money to uganda

Six months later, it's been an amazing journey. The entrepreneurs have received the money, and the money they've received has allowed them to grow their businesses, become more self-sufficient, and change the trajectory of their lives.

By October 2005, the first seven loans had been paid off and the website was out of beta.

"A modest experiment succeeded

This is the real thing.” It was the official start.

In its first year from October 2005 to 2006, Kiva made $500,000 in loans.

$15 million in the second year

In the third year it was $40 million

Just under $100 million in the fourth year

And today, in less than five years, Kiva has made more than $150 million in lending starting at $25, with more than one million lenders and borrowers spread across 200 countries.

I hope you understand the current state of Kiva

I'm always interested in talking about these numbers and statistics, but for me, Kiva is the episode.

It's about retelling the story of the poor, giving us the opportunity to engage with them in a way that preserves their dignity, demonstrating our partnership as opposed to the strained relationship that comes with traditional handouts.

We move forward with optimism, not in traditional relationships, but in relationships that foster respect and hope.

I'm hoping that not only does money flow in and out, but I also want Kiva to erase the lines that we've been talking about between the rich and the poor -- us and them -- between the haves and the have-nots.

I hope Kiva can do it

Because what's really happening is that we're free to have more open, fair, creative exchanges, and actively help each other.

If there's a beggar on the street, how do you feel when you try to help him?

Think about it, on the other hand, how does it feel when you hear about a business from a hardworking entrepreneur?

I want to talk about my achievements with a smile

Think about talking to people who are growing something to make it bloom, who are using their talents to create something, who have started their own business from scratch, who are surrounded by abundance around them and who don't complain about lack, who are creating their own abundance.

Those who wake up every morning and work hard for a better life will tell you stories you never expected.

It's a story that shatters each other's beliefs

I believe that Kiva can help build a community that supports these people, and if we can be a part of their lives with a small loan, we can change the way they see each other's potential.

Kiva is just the beginning for me

Thinking back on what I've learned to think about future developments

First of all, entrepreneurship was new to me.

Over the years, I've talked to people who borrow from Kiva, and they've taught me what entrepreneurship is all about.

At its core is the determination to make life better.

Recognize an opportunity and decide to do this to seize it

In other words, you believe that tomorrow will be better than today, and you go for it.

Second, lending plays an interesting role in connecting people.

it's not a donation

It seems to be more or less the same

In fact, if you give it to someone, they'll thank you, and then all you have to do is listen to the results.

In the case of loans, you pay it back in small increments over time, creating an ongoing dialogue.

It's really important to focus on the long term, because the relationships that arise between each other are different.

Third, I've heard from entrepreneurs I've met that, all else being equal, they would choose funding with a community to get only the funding they need, or to receive support and encouragement from the global community in addition to the funding.

It's a meaningful and powerful combination.

When I kept all of these things in mind, something triggered me to decide what to do next.

Entrepreneurs are found everywhere

In addition, there are many support groups around the world.

With the help of social networks, it's amazing how quickly the number of supporters around you grows.

So I was wondering if there was a way to use this network of mutual help as a catalyst for more entrepreneurship to bring about change and create a better tomorrow for all of us.

A survey of the state of affairs in the United States yielded some interesting insights.

One, predictably, all over the world, small businesses need money to grow and do more, and money to weather tough times.

I need a source of funds around me at all times.

The other thing I've learned is that the money isn't coming from banks, or venture capital, or institutions or institutions, it's coming from friends and family.

One statistic says that 85% of small business funding comes from friends and family.

$130 billion a year, that's a lot of money.

Third, there's the question of what to ask for when you're raising money from friends and family. No matter how motivated you are, or how much you want to thank your supporters, the end result is that you don't know what to promise.

To unlock the power of our community of support in new ways and to help entrepreneurs make their own decisions, after thinking about what financial transactions should look like and what works best for entrepreneurs, this very week we launched a platform called ProFounders, where friends and family can invest the money they need to start small businesses.

It's not a donation, it's not a loan, it's an investment with a dynamic return.

If you think about it in terms of involvement, it's exactly like going through peaks and valleys together.

Essentially, it's a mechanism for small businesses to self-serve fundraising.

Our website makes it easy to create profiles and investment terms.

It's made really easy for me and the users.

Entrepreneurs chose a percentage of their income

You can raise up to a million dollars from millions of amateur investors, ordinary people, and when the time comes, divide the proceeds according to the terms you set.

Subject to these terms, participating investors can receive their investment results in cash or donate them to pre-determined NPOs.

You can invest for profit or for social contribution.

I want to use this mechanism to show anyone with an idea how to do something they want to do, and to bring together the people who are already around them -- the people who know them best, who love them and are willing to support them -- to make it happen.

this is what i'm working on now

and finally please

The pro-founder is a newborn mechanism, and as you can see, it's just a vessel and a tool.

We need the help of people who actually use it, just like Kiva had a lot of people involved and a lot of connections.

I don't need to convince you.

We often hear ethical and moral reasons, and religious reasons, that helping brings happiness.

You know what I'm talking about. If you try too hard to help, you'll be so afraid of failure that you won't be able to do anything because you really want to help each other and live a meaningful life together.

I thought the best thing I could do today was tell my story.

Feelings of helping others that you already have

could you wake me up

If you have unbreakable love, you should be able to take the plunge

sorry

(Applause) Thank you.

(Applause) Thank you.

(Applause) For me, the best way to find the courage to try is to stop and listen to someone else's story.

I'm grateful that this TED allows us to do that.

Whenever I hear someone talk to me, thankfully, it motivates me.

Every time I hear stories, I am convinced that people can do great things and that I can help them do it.

Forget about tools and money exchanges, it's that easy.

Let's believe in each other and be confident Let's believe that each of us can do great things when the time comes So let's make our story a story of love And if we keep collecting it to create lasting hope And it'll be great for everyone.

I believe that by trusting each other and continuing every day without doubt, we can change the world of tomorrow to a better one than today.

thank you

(applause)

This technology has had a very important impact on us.

It changed the way our history developed.

But this technology is so pervasive and obscure that we have long forgotten to take it into account when we think about human evolution.

I know the results of this technique.

let's do a little test

Everyone, please face the person next to you.

face to face

Please, everyone on the second floor

smile and open your mouth

with a friendly smile please

(Laughter) So everyone, did you have canine teeth?

(Laughter) Didn't Count Dracula's fangs grow in your neighbor's mouth?

of course not

Because our teeth, in terms of dental anatomy, aren't meant for scraping raw meat from bone or chewing on fibrous leaves for hours.

Our teeth are soft, low in fiber, and easy to chew and digest for a diet that's easy to digest.

It sounds like you're talking about fast food.

(Laughter) We have teeth that are better suited for cooked food.

On our faces, the changes that have been made to the cooking, the ingredients, are reflected in who we are today.

So I have a suggestion for our classification.

we are omnivores

I think we should call it a coctivor. (Laughter) It's from the Latin word for cooking.

We are animals that eat cooked food.

no no

Cooking is a very important skill.

yes it is technology

I don't know what you think, but I cook for fun.

To cook well, you need design.

Cooking is a key skill, and it's how we got what we have today: a big brain, a great cerebral cortex.

brain is expensive

I need education

(Laughter) And it's also expensive on your metabolism.

Our brain is about 2% to 3% of our body weight, but uses 25% of the energy we expend.

brain is expensive

Where does that energy come from? from food of course

Eating raw food doesn't give you much energy.

From the ideas of our ancestors, this amazing technology was invented.

Inconspicuous is what we do every day

Mutation, natural selection, the environment that allowed us to evolve is also made possible by cooking.

Considering that cooking and food have unlocked human faculties, why should food get a bad name?

Why is it always said in two words, good or bad for the body?

On the positive side, let's look back at the unlocking of capabilities, about continuing to advance human potential.

Cooking also gave us migratory properties.

mankind left africa twice

I learned to live in all kinds of environments.

Because if you can cook it, you'll be able to eat whatever you find in your new home.

This also leads to a constant use of the brain.

This very simple technique was developed after practicing this method.

Find something edible and cook it for an easy source of energy.

This technology has affected the brain and the gut.

The brain grew and the gut shrunk.

You can't tell from my body type

(Laughter) Compared to the gut of a primate of my weight, it shrunk 60 percent of the gut of a primate of my weight.

Because cooking food makes it easier to digest.

As you know, a big brain is a big advantage, because it allows you to influence your environment.

They can improve the technology they created

Can continuously innovate and invent

The same is true for cooking techniques.

So how did it go?

How did the brain affect us?

On what basis did it change?

It's the reward and energy of taste.

We have five tastes, three of which sustain us.

sweetness is energy

Umami is the taste of meat

You need protein for your muscles and for recovery from illness.

saltiness salt is needed for the body to move with electric signals

The latter two are protective: bitter and sour, which indicate toxicity and corrosiveness.

They're hardware-bound, but we're using them in a sophisticated way.

Think bittersweet chocolate, or think the tartness of yogurt and the wonderful combination of strawberries.

We can create countless combinations like this, because cooking allows us to tweak our food.

Rewards, this is a complex, intertwined brain function that involves environmental conditions, physical conditions, moods, and more.

Even foods you don't like can be very satisfying when you're hungry.

Satisfaction is the key

As I mentioned earlier, energy is essential.

So how did the gut play a role in development?

The gut emits a silent voice, more like a feeling than a voice.

I would describe it as digestive comfort, and the gut is really more concerned with digestive discomfort.

Stomach pain, bloating, etc. will let you know if you ate properly, cooked properly, or made any other mistakes.

My story is about two brains. You might be surprised, but we have a fully functioning brain in our gut.

A manager in this room would say, "I know that.

It's what I always do."

(Laughter) In fact, the feeling in the belly is something we all use and it's useful.

That's because your gut is connected to the brain's limbic system, which is responsible for your emotions.

And having a brain in your gut means that it's not just the brain that needs to communicate to the food, it's the food that needs to communicate to the brain, because we need to learn how to talk to the brain.

If you have a brain in your gut, you need to learn how to use it.

Now, 150 years ago, an anatomist precisely described the structure of the walls of the digestive tract.

I'm going to talk about three structures here: the stomach, the small intestine, and the colon.

You can see two pinkish layers in the structure here, which is actually muscle.

Between the layers of muscle, we found a lot of nerve tissue, which runs through the muscle and submucosa, and this is where all the components of the immune system are housed.

Your gut is your body's largest immune system.

What you eat can pass through mucous membranes.

This layer is actually the lumen that touches your swallowed and digested food.

As for the intestine, if it were stretched out, it would be 40 meters long, the length of a tennis court.

If you unfold it, if you unfold all the folded parts, it's 400 square meters.

And this brain's job is to muscle the gut, protect the surface, and of course, digest the food.

This brain is designed to be autonomous. It has 500 million nerve cells and 100 million neurons. It's about the size of a cat's brain.

There are 20 types of neurons in your gut.

Diversity of this magnitude is found in the pig brain, which has 100 billion neurons.

It's an autonomous, organized microcircuit that can run programs.

It senses food and knows exactly what to do.

It's also important that it senses food chemically and mechanically, because it needs to move food around and mix the different substances it needs for digestion.

Control of this muscle is very important, including neural reflexes.

If you don't like food, especially children will get it.

It's the brain that triggers that reflex.

Finally, it also controls the secretion of the enzymes that actually digest the cooked food.

How do the two brains work together?

So we've got a model of robotics, it's called Inclusive Architecture.

This shows that we have a hierarchical control system.

The lower brain, the gut, has its own purpose, such as digestion and defense, while the upper brain, the purpose of integrating and shaping behavior.

Blue arrows show that both are in the lumen of a segment of the intestine and serve the same food.

The brain integrates signals, signals emitted from the behavior of the brain in the gut. What subsumption means is that the brain can interfere with the brain in the gut.

The brain can replace or suppress signals.

Let's consider two kinds of signals, for example, the hunger signal.

When you're hungry, your stomach produces a hormone called ghrelin.

It's a very loud signal, telling your brain, "Go eat."

There's a stop signal, and there's eight different signals.

In my case, this signal is ignored.

(Laughter) So what happens if the brain ignores the signal during the integration stage?

If you ignore hunger signals, you'll get a disease called anorexia.

Even though there are healthy hunger signals out there, the brain ignores them and forces the gut to do other things.

Overeating is more common

Even if it receives a signal, it will change it and it will continue to eat, even if the eight different signals stop it by saying, "Stop, I've sent enough energy."

What's interesting is that if something that can be digested in the lower gut remains undigested, the signal gets stronger and stronger.

This was revealed by bariatric surgery.

the signal is getting stronger and stronger

Now back to cooking and design.

We've learned how to talk to the brain, you know, taste and reward.

What is the language for the gut brain to send out signals so powerful that the brain can't ignore them?

It creates a state that we all want: a balance between hunger and satiety.

From our research results, we have a short recommendation.

this is fat digestion

On the left is a drop of olive oil, which is attacked by enzymes.

This is an in vitro experiment

It's very difficult to do research in the gut.

Everyone would expect that once the oil breaks down and the components are released, they are absorbed away.

But in reality, very complex chemical structures emerge.

If you can see it, you can see the rings in the center image, which is water.

This whole system creates a larger surface area, allowing more enzymes to break down the remaining oil.

And then, in the picture on the right, you'll see foamy cell-like structures, and your body will now absorb the fat.

Using the language of its molecular structure, it can send out a stronger signal if it occurs all the way through the digestive tract, increasing its duration.

I think our research is similar to university research, but we're working on this point, and it might sound trivial, but it's about how we can change the way we cook.

How would you cook it to produce this language?

Our problem is not the omnivore's dilemma.

We have an opportunity as cook eaters because in the last two million years we've acquired tastes and rewards that are sophisticated functions of cooking that give us pleasure and satisfaction.

If we add the language of molecular structure, which is yet to be explored, to this combination, we can regulate and balance our energy intake, and it comes from our primal behavior, cooking.

So even philosophers would have to change their minds about how cooking made us who we are to make cooking really important.

That's why I say, "I cook, so I am (coquo ergo sum)."

thank you very much

(applause)

I'm a visual artist and co-founder of the Plastic Pollution Coalition.

For 20 years, I've cut plastic bags, sewed them back together, and used them as materials for my creations.

We're making two-dimensional, three-dimensional sculpture out of plastic.

After about eight years of using plastic, some of my pieces cracked and crumbled into pieces.

look at it and say, "wonderful

Like us, they're short-lived."

After learning a little bit more about plastics, I realized that this is actually a bad thing.

Because plastic breaks down into tiny pieces and still remains plastic.

What I've noticed is that many of these are in the marine environment.

And then over the last few years, I've learned about the Pacific garbage patch and ocean currents.

I'm sure you all would react the same way if you knew this, but my first reaction was, "I can't believe this!

We have to remove it."

So I actually came up with a proposal to lead a cargo ship, two old fishing trawlers, a crane, a crusher, a compressor, and conduct a cleanup operation in the ocean.

I wanted to go to the waters in question, raise awareness of the problem, start collecting plastics, grind them, and convert them into building materials that can be used in developing regions.

I started talking to people who were out there doing research on the problem of plastic in the oceans, and I realized that even if we did, it was only a fraction of what was being thrown away in the world, and I needed to change my mind and look at the bigger picture.

Looking broader means looking for ways to cut through the root causes.

We need to globally end the use of single-use plastics that are entering our oceans today.

When I learned about the situation, anger welled up inside me.

My concern about plastic pollution isn't just in the middle of the Pacific Ocean, as you might imagine, now in five oceans and 11 currents.

I'm also worried about plastic pollution in supermarkets.

All food and beverages at the supermarket

It's wrapped in plastic, and so are health food stores.

My concern extended to the plastic in our refrigerators, and the toxins that leach out of it and eat into our bodies.

So we recruited people who were working on this problem and together we founded the Plastic Pollution Coalition.

We're working on a lot of improvements, some of which are very basic.

First, if 80 to 90 percent of marine sediment is plastic, let's just call it plastic pollution.

It is said

When thinking about resource conservation and environmental conservation, people think of recycling as a solution.

Put it in the recycling box and you're done.

Is it right? in America

Less than 7% recycled plastic

If you look at the reality, especially plastic bottles, they're either perishable, incinerated, or destined for China.

Bottles can be recycled and turned into bottles again, or they can be reused, which is not possible with plastic bottles.

that's our big problem

Another thing we're trying to reach out to people with is the fourth R, Refuse, which precedes the 3Rs of Reduce, Reuse, and Recycle.

as much as possible because there are alternatives

Avoid single-use plastics, even old-fashioned containers

I personally collect and use these wonderful Pyrex containers, not Glads or Tupperware, for food storage.

This is how I contribute to myself and my family.

Even if you forget to bring a stainless steel bottle to refill your drinking water when traveling, it is easy to choose stainless steel or bottled drinking water instead of plastic bottled drinking water.

There's a lot of public awareness about this problem, but what I want to tell you is that it's a big problem in the oceans caused by us, the consumers, but it's solvable.

We can solve it by raising awareness and encouraging the use of alternatives.

Avoid using single-use plastic whenever possible

If we don't get to the root of the problem, we can save the oceans, the planet, and ourselves.

thank you

I'm a caricaturist who draws cartoons for newspapers.

I don't know if everyone has heard of newspapers

reading on paper

(Laughter) It's a little lighter than an iPod, and it's a little cheaper.

But do you know what they say?

They say print media has no future Who said that? no the media

But it's not news, is it?

you already read that

[Print media has no future / I read it yesterday on the internet] (Laughter) Ladies and gentlemen, the world is getting smaller.

It's cliche, but look how small it's become like a poppy seed

Of course you know why

It's because of technology Hi

(Laughter) Anybody designing computers?

You guys make my life miserable The trackpad used to be round Round and nice

Great for drawing funny cartoons

But what are you gonna do with a flat, square trackpad?

I can't do anything as a cartoonist

anyway i know the world is flat now

Really

And the Internet has reached every corner of the world, no matter how impoverished and remote

Every African village now has an internet cafe

[no internet cafe/no coffee] (laughter) don't order a frappuccino here

This is how we eliminate the information gap.

The third world is also connected to the Internet, and we are all connected.

What happens next?

I got an email [Third World Connected! / Email: I'm hungry! ]

Yes

Anyway, the internet gave us power.

Empowered you Empowered me Empowered other people

(Laughter) I actually drew these last two cartoons live at a conference in Hanoi.

It seems that it was rare in Vietnam, a new socialist country.

(Laughter) So I was doing a live cartoon on widescreen, and it was pretty sensational, and then this guy came along.

They're taking pictures of me and my sketches, so I thought, 'This is a great Vietnamese fan'

And it came on the second day too, so I thought, "Wow, you really are a manga lover."

On the third day, I finally found out that the person was on a mission.

So now I should have over 100 pictures of me My smile and my sketches together in the files of the Vietnamese police

(Laughter) But really, the internet changed the world.

Rocked the music industry Changed the way we listen to music

Older folks may remember that back in the day, you had to go to the store and shoplift.

[The Internet has changed music / You used to have to go to the store to steal] (Laughter) And the Internet has changed how future employers see your resume.

So be careful What you write on Facebook 81 00:03:31,000 --&gt; 00:03:34,000 Be careful like your mom said Be careful like your mom said

Technology set us free, this is free WiFi

But it freed us anyway from our desks at work

this is your life please enjoy

(Laughter) So basically, technology and the Internet have changed our lifestyles.

Tech guru like this guy, what a German magazine called a philosopher of the 21st century, decides how we do things [Apple's Steve Jobs].

direct how we consume

Just directing our aspirations

[This makes it easier to do things that you never had to] (Laughter) (Applause) I don't think you'll like it.

Technology has changed our relationship with God

[Pastor, I have sinned / (Google) I know] (Laughter) Now, I shouldn't comment on this.

Religion and caricatures, as you may have heard, have been at odds since that day in 2005. Danish cartoonists came together to create cartoons that resonated around the world, led to demonstrations, death sentences, violence, and death.

It was a very sickening event, people died because of cartoons.

Of course, at the time, I thought that cartoons were actually drawn from both perspectives.

The first time I used cartoons was in a Danish newspaper, trying to make an opinion about Islam.

A Danish cartoonist told me that he was one of 24 people who were asked to draw the allegations, and did you know that 12 of them turned them down?

Said "I don't need to be told what to do"

"It's not like that"

But soon, of course, cartoons were also used by Islamic extremists and politicians.

purpose is to provoke controversy

I think you know the story around that

I know you can use manga as a weapon

Historically, the Nazis also used cartoons to attack Jews.

and up to now

At the United Nations, half the world's nations are calling for punishment of those who insult religion, calling it religious slander, while the other half are resisting and defending free speech.

So there's a clash of civilizations and cartoons in between?

I also thought about this

This is me sitting at the kitchen table thinking Please come and see my wife while you're in my kitchen

[I'm looking for the meaning of life / I google it] (Laughter) A few months later, in 2006, I went to Ivory Coast in West Africa.

This is exactly what a divided country is, it was split in two

The rebels in the north, the government in Abidjan in the south, and the French in between.

Shaped like a giant hamburger

I don't want to be the meat in the middle

I went to do a cartoon report on this story

I've been doing reports like this for 15 years.

That's why I think you can see that the manga style is different

Much more serious content than editorial cartoons

I've been to places like Gaza during the conflict in 2009.

In other words, it's practically journalism with comics.

I hope everyone will see more

I think this is the future of journalism

So of course I went to see the rebels in the north

they were the poor fighting for their rights

This conflict also includes ethnic issues that are common in Africa.

I also went to see the Dozon tribe

The Dozon are traditional hunters of West Africa.

Often joins the rebel army feared by the people

There is magic power and disappears

believed to be able to dodge bullets

I went to see the chief of the Dozon tribe, who told me about his magical powers.

Said "I can cut your head off right now and bring it back to life"

I said "No, I don't think I have time for that right now"

(laughter)

So I went back to Abidjan, and I had the chance to do a workshop with the local cartoonists there. I thought, in a situation like this, you can really use manga like a weapon against your opponent.

Because the media in Ivory Coast was completely dichotomy, like the media in Rwanda before the genocide, so you can imagine.

And what can a mere manga artist do?

Sometimes editors tell cartoonists to draw what they want, and of course cartoonists have to live, right?

my idea is so simple

Combining cartoonists from both sides of Ivory Coast in one place

Ask them to stay away from each newspaper for three days.

It was to do a project together and have them tackle the issues that were affecting the country in cartoons, yeah in cartoons.

Show me the positive power of manga

For better or worse, comics are an effective way of communicating.

And as we've seen, cartoons can cross boundaries

I think humor is also a good way to tackle serious issues.

The results of the gathered cartoonists were amazing

We didn't agree, but it doesn't matter

And I didn't ask you to draw a classy cartoon

Although we yelled at each other on the first day

Produced a book looking back at 13 years of Ivory Coast's political crisis.

So I had the idea to do something together

I did a project like this in Lebanon in 2009 and in Kenya in January this year.

It wasn't a book in Lebanon

The idea is the same, in a divided nation, call cartoonists from all parties and get them to do something together.

In Lebanon, the editors of newspapers were also invited to print out on one page the works of eight cartoonists, from all factions, on issues affecting Lebanon, such as politics and religion in everyday life.

was effective

Most of Beirut's newspapers released all these cartoons at once for three days, anti-government newspapers, pro-government, Christian, Muslim, of course, English versions, all kinds of newspapers.

so this was a great project

And then what we did in Kenya was address the ethnic problem, which is a devastating problem all over Africa.

So we made a video clip that you can see on Youtube/kenyatunes

It's easy here to talk about freedom of speech, but it's the same as what you saw in oppression and division. What can you do as a cartoonist?

Cartoonists also do their jobs

But I think that in any place, in any situation, cartoonists at least have the choice not to draw cartoons that incite hatred.

So that's the message I'm trying to convey

I think we all have the choice eventually not to do bad things.

And we need to support those critiques and responsible voices, whether in Africa or Lebanon, in our local newspapers, or in Apple stores.

Technology companies currently have the greatest influence over what content is available

We decide what's offensive to people and what's exciting.

So it's not a matter of whether cartoonists have freedom, it's a matter of your freedom.

The silence of cartoonists, journalists and activists means that the world is at the mercy of dictators.

thank you

(applause)

(Music) We stand here like Adam and Eve Waterfalls in the Garden of Eden Fools in love are so strong and beautiful The birds in the trees are chirping looking down at them Long ago when the dinosaurs Cars ran on gasoline Where have they all gone? It used to be a place Now it's full of flowers Yeah yeah yeah If this was paradise I think I'd want a lawnmower yeah yeah yeah yeah this used to be a mall Now it's a cornfield yeah yeah yeah don't leave me here I'm not used to this place

(applause)

okay

I'm taking a walk in Central Park Everybody's out today All the daisies and dogwoods are in full bloom Oh, what a wonderful day For knicks and frisbees and rollerskates And friends and lovers and sunbathers all alone Everybody's out in Manhattan for fun in January (Applause) I brought you iced tea Did you bring your bug spray? A fly is as big as your head Did you see a full and happy crocodile next to a palm tree? Everyone's out in Manhattan for fun in January (whistling) Everyone!

(whistling) A pastor I know said, "Don't worry, all the scientists are wrong." It wouldn't matter if it's winter here So I'm wearing a halter I'm wearing a halter We're all out in fun Manhattan in January (Applause) Chris Anderson: Jill Sovure!

Today I'm going to talk to you about value for money.

We always offer value for money

I'm trying to get it, but I don't care if it's worth it to many people.

Do we care about the four billion poor people who earn less than $2 a day?

How can we balance value for money with value for crowds?

Let's look at it in terms of performance and price.

Money can get you something of value

You can buy a Mercedes-Benz, which is very expensive and performs very well.

What if there is no money?

You have to ride a bicycle, carry heavy things, and get your daily bread.

The poor don't stay poor, they move to the lower middle class.

Then things get better and you start riding scooter bikes.

But you can't buy more than a scooter, so you can't say you got enough value.

The question is, can you give more value for that price?

It seems impossible for poor people to have a car or have the pride and safety that a car gives them.

This is what happens all the time on the streets of India.

But there are many people who look at the same scene and think about something else, including this person, Ratan Tata.

Leaders are great not only because they're passionate, but because they're passionate, they're great and innovative.

An innovator is someone who doesn't know the impossible

I believe things can be done

And great leaders like Ratan have compassion.

As the host, Lakshmi, said, it's not just Ratan Tata, but the Tata Group has been doing that for a long time.

let's talk about that

I grew up barefoot until I was 12.

It was a big problem to live a day-to-day life.

I got 11th place out of 125,000 people on the standardized exam for high school.

But my poor mother couldn't afford the tuition, and I was about to drop out.

At that time, the Drabji Tata Foundation gave me six rupees, or about one dollar, every month for six years.

That's why I'm here

That's what Tata Group is about.

(Applause) Innovation and compassion and passion.

have both

Compassion sparks interest. About eight or nine years ago, I heard this story from Ratan Tata, when he was driving a car - Ratan drives himself - in the rain, a family with an infant, drenched.

When I saw that, I thought, 'We have to make a $2,000 car that they can afford.'

Of course, if you say that, people will tell you it's impossible, and so did Suzuki.

Ratan said he would build a tricycle with a spare tire.

here is the manga

But what we actually built was a proper car, the Nano.

I'm 184 cm tall Rattan is taller than me The Nano has plenty of space whether we ride in front or in the back

great car

If one thing works, everything will work out Even those who were negative changed their attitude, one after another, saying, "Let's build a car like the Nano, too."

begin to say

How was Nano developed?

let's talk a little

First, how it all started. Rattan started a project with five young engineers in their mid-twenties.

He said, "It's not the specs of the car that I decide, it's the price.

Selling price is 100,000 rupees (about 200,000 yen) Please make it cheaper than that.”

And I told the engineers, "I doubt common sense.

Push the limits.”

Over time, Ratan became so immersed in the challenge that he became part of the team himself.

Can you believe it?

He still talks about the single wiper design he helped develop.

late at night he was thinking

And the next morning, he came back with a solution.

By the way, who was the leader of the team?

It was a 34-year-old man named Girish Waff.

The average age of a nano development team is only 27.

Innovate in design and beyond

It broke a lot of conventional norms.

For example, the Nano is the first car with a single balance shaft to use a two-cylinder engine.

We also use glue as a substitute for rivets.

We then conducted various joint development projects with parts suppliers and trading companies.

any ideas welcome

100 parts suppliers were set up next to the factory, creating an innovative business model for selling cars.

Can you imagine nano being sold in a clothing store?

great innovation

Found a solution in industries other than automobiles

It was also an open innovation where all ideas were welcome.

The Nano is equipped with mechanisms used in helicopter seats and windows, and a dashboard inspired by motorcycles.

Fuel lines and lights are the same as for motorcycles.

Most importantly, get more from less.

the situation was always extreme

The price of 100,000 rupees, or $2,000, cannot be changed.

So every component had to have a dual function.

The device that lifts the seat is also the base of the seat, and it's also used as a structural component to give it rigidity.

Nano has half the number of parts in a typical passenger car.

By the way, the total length of nano is

It's currently the cheapest model, eight percent shorter than the average car, but 21 percent more space inside.

Here's how you can get more out of how little.

In 2007 dollars, the Ford Model T cost $19,700.

Beetle is $11,333

Mini around $11,000

And the nano is a whopping $2,000

This is where a new paradigm shift begins, where people who used to never think of owning a car and put an entire family on a scooter, now dream of owning a car.

And the dream is becoming a reality

Here's a picture of a house near my house and the driver and car of that house.

The driver's name is Narang

I recently bought a Nano

In addition to the housekeeper's car, there is a parking space for Narang to park Nano.

I call this "innovation that changes society."

Because it's not just a technological thing, it's also a social innovation.

And that's where the theme of getting more from less becomes important.

About a year and a half ago, I told this story for the first time in Australia, where the academic society made me an honorary fellow.

Incredibly, I was the first Indian in 40 years.

I titled my talk "Innovation in India: From Gandhi to Gandhian Monozukuri."

He called the idea of ​​getting more out of less the Gandhian way of manufacturing.

In my view, manufacturing, Gandhian, is about moving the world forward and making a difference for everyone.

I've been talking about traveling by car, but now I'm going to talk about traveling for people who unfortunately have lost their legs.

This American has a prosthetic leg

the price is 20,000 dollars

This prosthetic leg is designed to walk only on well-maintained paths.

But in India it's not all that way.

This person is walking barefoot on rough and muddy roads.

More importantly, in India, not only do we walk long distances and ride bicycles to get to work, but we also ride bicycles,

Climbing to heights is sometimes a job

I need a prosthetic leg that can be used in such cases

it's not easy

4 billion people in the world earn less than $2 a day

A $20,000 prosthetic leg is their income for 10,000 days.

I can't buy such things

I need another way

So in India Jaiperfoot was founded

With a revolutionary prosthesis and delivery system, you can create bespoke prostheses on the spot with rapid molding and modularized components.

Other companies' prostheses take about a day, but Jayperfoot can do it in an hour.

The outer socket is made of high-density polyethylene tubing, not hot sheets.

A unique design with a high ankle and an appearance that resembles a human foot Combines flexibility and functionality

Let me show you how this prosthesis looks and works.

(music) Look, I'm jumping, how much force is being applied.

(Anyone with legs below the knee can do this.)

(It will be difficult if it is only above the knee)

("Does it hurt?")

("No, I'm fine.")

(He can run one kilometer in four and a half minutes) One kilometer in four and a half minutes

(Applause) This is Gandhian manufacturing.

Time magazine spotted this $28 prosthetic leg.

(Applause) That's great.

Let's move on to the next story

We've talked about getting more from less

what about health

So far, we've talked about moving

I'm talking about health here.

New diseases are emerging that require new drugs

If you compare drug development 10 years ago and now, what do you see?

10 years ago it cost $250 million to develop a new drug.

now costs $1.5 billion

The time from molecular level to market, through animal and human testing, has increased from 10 to 15 years.

Can we get more drugs if it takes more time and money?

unfortunately not

We used to have 40 but now we have 30

Spending more does less, and even fewer people can use it.

These drugs are so expensive that very few people can afford them.

For example

Psoriasis is a deadly skin disease

Treatment costs $20,000

20 subcutaneous injections of $1,000 antivenom

It took about 10 years and cost $700 million to develop.

Set your goals with the mindset of getting more from less and reaching more people.

I can't give you $20,000. I don't have that kind of money.

How about $100?

10 years is not enough for development

It's been 5 years since I'm in a hurry

Development cost - $300 million?

No, I can't give more than $10 million

too bold

seems silly

but this is india

that's what actually happened

How did it come true?

Francis Bacon said, "If you want to do something that no one else has done, don't think that conventional methods will work."

So the traditional method of making a molecule and testing it on mice or humans would cost billions of dollars.

What the Indians were smart about was that they scientifically substantiated traditional knowledge and tested it not from the molecule to the mouse to the human, but from the human to the mouse to the human again.

that made a difference

Blending traditional medicine with modern medicine and science

Nine years ago, I started a huge program called the Council for Scientific and Industrial Research (CSIR).

It changed the paradigm, not just in psoriasis, but in cancer and other fields.

Psoriasis innovation in India has taken an unconventional approach, using pharmacological knowledge.

Comparing before and after treatment

This treatment is affordable even for the poor, getting more from less for more people.

Introduce the words of Gandhi

"Earth can meet everyone's needs, but not everyone's desires"

What Gandhi meant was to get more out of as little as possible, and share it with as many people as possible, not just with the current generation, but with future generations.

"I admire all scientific inventions that benefit everyone," Gandhi said.

Inventions should be made for as many people as possible, not for the few.

Ladies and gentlemen, this is about getting more out of less for more people.

It's not about getting a little more from a little less.

what i'm talking about

It's about ultra-low prices, not low prices

We're not talking about $9,000 for $10,000 of treatment for the poor.

must be offered for $100 or $200

Is that possible? there's a reason it's possible

Let's talk ultra-low prices, not just low prices

Let's talk about absolute affordability, not just affordability.

There are 4 billion people living on less than $2 a day

not an exclusive innovation

We need embracing innovation

And to do that, we need disruptive innovation, not incremental innovation.

It's going to make you think in a completely different way

It's not just more people getting more from less and sharing it with more people, the whole world is working on it.

I was impressed when I saw such an innovation the other day.

It's an infant incubator

still in African and Indian villages

such things are not available

babies are dying

because an incubator costs $2,000

But now we have a $25 incubator that does the same thing.

who made it

I'm a student at Stanford University.

Their hearts are pointing in the same direction as Ratan Tata

This isn't just innovation, it's innovation with compassion and passion.

I want to create such a world

That is the Gandhian style of manufacturing.

I want to finish before the time limit

These 18 minutes were unsettling

there's a minute and a half left

Finally, India has given the world a great gift.

What is it?

The 20th century produced Gandhi

And the gifts of the 21st century are very important to the world at large. The global economic meltdown, climate change, and all the other big problems lead to getting more from less for the more people, not just for the present generation, but for the generations to come.

This can only be achieved through Gandhian manufacturing.

Ladies and Gentlemen, India's 21st century gift to the world is Gandhian craftsmanship.

(Applause) Lakshmi Pratari: Thank you Dr. Masherkar LP: Let me ask you a question.

What did you think you would become when you were a school boy?

What drove you?

What kind of vision did you have?

RAM: Let's talk about what changed my life

I went to a poor school and my mother was unable to prepare 21 rupees or half a dollar in time.

At a school called Union High School

We had no money, but we had good teachers.

There was a teacher who taught me physics

He took us out one day and showed us how to measure the focal length of a convex lens.

I placed a piece of paper and moved the lens up and down

bright spots appear

The teacher said, "This is the focal length."

And if you leave the lens as it is for a while

paper burned

Then he turned to me and said, "Masherkar, if you focus your energy like this, instead of diffusing it, you can achieve anything."

If you concentrate, you can do it. Those words struck a chord with me.

I thought, "How wonderful science is, I should be a scientist."

The important thing is that if you focus, you can do it.

Those words are important to us today.

What is focal length?

The sun's rays come in parallel

Parallel lines never intersect

But a convex lens

cross it

Convex lens leadership

Today's leader is a concave lens type

the crack will grow

That's how I came up with the leadership of convex lenses.

I am the National Institute of Science and

When I was at the Scientific and Industrial Research Council, two of the 40 labs were on bad terms, but I managed to pull it together.

Now I'm the director of the Global Research Alliance, which has 60,000 scientists from nine countries, from India to the United States.

I want to build a global team to tackle the big problems facing the world.

These are based on my experiences as a young man.

LP: Thank you (RAM: Thank you) (Applause)

What I want to talk to you about today is about the power of the global community in this 21st century.

So the story is that this power is undergoing a change, and there are two types of that change.

One is the "transfer of power," the change in the balance of power between nations in the international community.

In other words, a transfer of power from the West to the East.

The other is the dispersion of power, the shift of power from all state actors in the East and West to non-state actors.

These are the two major shifts in the balance of power that have taken place in our century.

After each explanation, I'll explain how the two influence each other and why, and I'll end with some good news.

When we talk about "power transfer," we often talk about "the rise of Asia."

Actually, maybe we should think of it as "Asia revival" or "Asia return."

In 1800, more than half the world's population lived in Asia, which produced more than half of the world's total output.

By 1900, more than half the world's population was still living in Asia, but Asian production had fallen to one-fifth of the world's.

What happened? The "industrial revolution." It was a sudden change, with Europe and America becoming the dominant center of the world.

But in the 21st century, Asia is making a comeback as a region with more than half of the world's population and producing more than half of the world's output.

We should think that there is a very important power shift taking place.

Now I'd like to talk a little bit about another power shift, power distribution.

To understand "distribution of power," first consider this: the costs associated with computer technology and communication have fallen by nearly a factor of 1,000 between 1970 and the beginning of this century.

It was a very large, abstract number.

Now it's a realistic number. If the price of a car, for example, were to fall as fast as the price of computer technology, you could buy a car for five dollars.

Now the price of all technologies has fallen dramatically and the barriers to entry are lower.

Now everyone can join the game

1970 From Oxford to Johannesburg to New Delhi to Brasilia, if you want to communicate everywhere at the same time, you can.

there was technology

But in order to do that, you had to be very, very rich, whether it's a government, a multinational corporation, or the Catholic Church, but you had to be a wealthy person.

What about today? Now everyone can have the ability that was only available to a select few because of its price.

Internet cafes cost about £1 an hour, I think, but Skype is free.

In other words, abilities that were once reserved for a few are now available to everyone.

This doesn't mean that the era of state ownership is over.

the state still matters

but not only the country

The stage is crowded with many performers

And it's the wonderful non-governmental organizations, like Oxfam, that does the good work.

The villain is another non-governmental organization, like Al-Qaeda.

But how does this affect thinking based on traditional words and concepts?

For example, think in terms of wars, wars between nations.

Look back to 1941, the year the Japanese government attacked America at Pearl Harbor.

In contrast, it should be noted that in 2001 non-governmental organizations attacked the United States, resulting in more American casualties than the attack on Pearl Harbor in 1941.

You might think that this is the denationalization of war.

Yes, we are witnessing a major shift in terms of the distribution of power.

The problem now is that we're not taking a very innovative approach to thinking about that change.

So let me take a step back and ask: What is power?

Power is the ability to influence others to achieve desired results in three ways.

First, by intimidating and intimidating, which is the stick. And then by rewarding. This is the carrot.

Among them, what I call "soft power" is the ability to get what you want without using threats or rewards to get others to have the same goals.

Soft power has been neglected and much misunderstood, but it's very important.

In fact, the more soft power we have, the less carrots and sticks we'll use.

Traditionally, power meant primarily military power.

For example, the great Oxford historian A.J.P. Taylor defined a nation with the power to win a war as a "great power."

But understanding the power of the 21st century requires new stories.

War still exists, but it's not about winning wars

It's not about which army wins, it's about whose story wins.

We need to think more in terms of stories and who's stories will work.

So let's get back to the question of power transfers between nations and what's going on there.

The stories we tell today tend to get caught up in the themes of the rise and fall of great powers.

Most of it will be the rise of China and the decline of the United States.

In fact, during the 2008 financial crisis, it was often said that American power was beginning to end.

He was saying that the geological structure of international politics was changing.

For example, Russian President Medvedev said in 2008 that the unipolar dominance of the United States was beginning to end.

But in practice, that term for decline is often misleading.

If you look at recent history, you'll notice that the decline of America is being talked about in cycles of 10 or 15 years.

In 1958, the successful launch of Sputnik by the Soviet Union was called "the end of America."

The 1973 oil embargo and the cessation of the gold-dollar exchange meant "the end of America."

In the 1980s, during the Reagan administration, America's transition from a manufacturing-based economy in the Midwest to a Silicon Valley economy in California was called "the end of America."

But the example just given is not true.

Indeed, in the early 2000s, people were overzealous, thinking that America could do anything.

The moral of this story is that all stories about the rise and fall of nations are more psychological than factual.

If we're going to focus on the facts, we have to focus on what's actually happening in China and America.

Goldman Sachs predicts China's economy will overtake US by 2027

I predict

So in 17 years, China will be bigger than America.

Someday China's 1.3 billion people will be rich, and China will be bigger than America.

But be wary of predictions like these, including Goldman Sachs' predictions that seem to pinpoint the power transfer of this century.

Let me give you three reasons why predictions are too simplistic.

First, because it's linear prediction.

Most people say that this is China's growth rate, this is America's growth rate, and it varies linearly.

history is not a straight line

The road will be bumpy and there will be accidents along the way.

Second, although it is said that China's economy will overtake the United States by 2030, that is the economy as a whole, not per capita income.

Since there are still many regions in China where the economy has not yet developed, the average national income is a more appropriate yardstick for measuring economic sophistication.

It won't be until the second half of this century, after 2050, that China catches up to or overtakes the United States.

Another point to note is how one-sided this prediction is.

Although we're looking at economic strength in terms of gross domestic product,

You don't talk much about military power, you don't talk much about soft power.

It's a completely one-sided view.

I touched on it a little earlier, but when you talk about the rise of Asia and the resurgence of Asia, remember that Asia is not one.

If you're in Japan, or New Delhi, or Hanoi, your view of China's rise will be a little different than it's from Beijing.

Certainly, in terms of power in Asia, one of the strengths of the United States is that Asian countries are concerned about China's rise and want security from the United States.

For example, Mexico and Canada are hostile neighbors of the United States, which of course is not the case.

Simple predictions, like those of Goldman Sachs, don't tell us what we want to know about power transfer.

Maybe everyone will ask, so? and

why is it important I don't care and

After all, isn't this a game for diplomats and academics? and

But this is a very important matter.

If we believe in decline and misjudge these facts, which are not fiction, we may end up adopting very dangerous policies.

Let me give you a historical example.

The Peloponnesian War was a violent conflict between city-states that split the ancient Greek city-states 2,500 years ago.

what was the cause?

According to the great historian Thucydides, who wrote the history of the Peloponnesian War, the cause of the war was the rise of the Athenian power and the fear of the Athenian power within Sparta.

take a look at both positions

Many argue that the 21st century will be a repeat of the 20th century. The First World War broke out in the 20th century, dividing the European state system and destroying the heart of the world.

And now there are those who say that this is about to repeat itself, and that it will happen again this century.

i think it's a mistake

it had a dark history

For example, by 1900, Germany had surpassed Great Britain in industrial production.

As I said earlier, China has not overtaken the United States.

But if you think about it, and you're terrified, you're going to provoke a radical reaction.

Fear is the greatest danger in navigating the transfer of power to the East.

To quote Franklin Roosevelt, "The greatest thing to fear is fear itself."

We need not fear the rise of China or the resurgence of Asia.

By taking a holistic view of history and adopting policies that address the present, we can successfully navigate this transition.

Now I'm going to talk about power distribution, and then I'm going to talk about how it contributes to power distribution, and then I'm going to talk about combining the two.

The distribution of power in the world today can be compared to a three-sided chess game.

The top board is military power between nations.

The United States is the only superpower and will remain so for the next 20-30 years.

China will never replace the United States militarily.

The board in the middle is the economic power between nations.

power is multipolar

The power is distributed, the US, Europe, China, and Japan are balancing each other.

At the bottom of the board are the cross-border relationships that are outside the control of governments. Things like climate change, drug trafficking, money flows, disease outbreaks are all outside the control of governments, and no country is responsible.

It makes no sense to call this state unipolar or multipolar.

power is distributed chaotically

In this century of the greatest challenges, working together is the only way we can solve them. In other words, soft power, the ability to work together to meet these challenges, is becoming more important.

The other thing I want to tell you is that when you think about power in the 21st century, you should let go of the idea that power is always zero-sum, or that you win and they lose, or vice versa.

The sum of power can sometimes be positive.

If China were to improve its energy security and increase its energy capacity to deal with its carbon footprint problem, it would be beneficial not only for China, but for us and for everyone else.

Helping China to tackle its own carbon footprint is good for everyone, and it's not a zero-sum game where you win and they lose.

everyone wins

When you think about power in this century, let's put aside the "I win, they lose" mentality.

It doesn't mean to be an optimist

War is constant and power continues

military power is important

It's also important to keep the balance

they all survive

Hard power exists and will remain.

But without adopting a strategy that combines hard power and soft power, which we might call smart power, it's very difficult to meet the new challenges that stand in our way.

So what we have to think about is how we can collectively create global public goods that benefit everyone.

So how do we define the national interests of each country so that it's not a zero sum, but a positive sum?

In this regard, for example, for the United States, the reference is to maintaining a free trading system, maintaining financial stability, maintaining freedom of navigation on the high seas, all of which were British national interests in the 19th century.

And in the 21st century, we need to do something similar.

How do we create global public goods that are great for everyone, not just for ourselves?

I think these ideas are a good part of the considerations we need to make when we think about power in the 21st century.

There are ways to define the public good, some ways that you can protect yourself with hard power, but you can also network with other countries so that you can not only create public goods, but even increase soft power.

In addressing this point, I was impressed by the basic diplomatic position of the Obama administration, which was expressed by Secretary of State Hillary Clinton, who said, "We will use all available diplomatic tools," in the sense of applying smart power to foreign policy.

To successfully address the two big power shifts that I talked about today, inter-state power transfer and cross-state power distribution, we need to create new stories that combine hard power with soft power to create smart power strategies.

The good news is that we can do it

thank you

(applause)

Sustainability is underpinned by what is obtained where and how

It doesn't matter who got what or why

I want to know about the person who was involved in my meal

how i affect them

i want to know how they affect me

I want to know why they take fish

I want to know how they make a living from fishing.

Understanding these things can help us rethink our perception of seafood from mere consumption to an opportunity for ecosystem restoration.

It inspires us to appreciate the seafood we are lucky enough to eat.

What shall we call this?

What about "recovering seafood"?

Sustainability refers to the ability to maintain and sustain, whereas recovery refers to the ability to replenish and progress.

Resilience Seafood is a proposal that takes into account the dynamics of developing systems, recognizes our relationship with the sea as a resource, and that we can revitalize the sea to make it more resilient, the sea that produced it.

It's a more promising, more humane, more informative way of understanding the marine environment.

This Wallet Guidet is a great tool that really helps break down common issues related to ocean conservation.

The three colors of green, yellow and red indicate marine products.

The associations are very simple: "green buy no red no yellow be careful"

But in my opinion, eating only green, safe foods isn't enough.

Seafood sustainability cannot be maintained without taking action to change the fate of the species shown in red and yellow.

But what if we only eat green things?

You'll get a yellowfin tuna hooked on your rod This won't hurt sustainability

Because I caught it with a rod instead of overfishing with a net

Advantageous for anglers Large sums of money support the local economy

But the tuna is the sea lion, the sea's number one predator.

What's behind this meal?

Waiting for 450g of tuna at the steakhouse?

A meal like this three times a week?

I'm still in the green zone But neither I nor you did this

The point we have to understand is that we need a background measure for our actions.

For example, red wine is said to be very good for the body, antioxidants and minerals are good for the heart.

wonderful! I fell in love with red wine!

Let's guzzle it and we'll be healthy

So how many bottles will you open before you realize it's bad for your health?

Ladies and gentlemen, we also have a protein problem.

This awareness of the issue is lost when we hear the word diet, and we make sacrifices as a result.

The problem is that we hide our costs.

We hide this problem behind the social acceptance of a bloated belly.

and escape behind huge profits

When we think about recovering seafood, we should first consider our needs.

Seafood that recovers should be "Jolly Green Giant" instead of "Jaws", "Flipper" or "Gordon's Fisherman"

So it's a vegetable, and it has the potential to save the ocean.

Sylvia describes blue as the new green.

We want to respectfully offer broccoli as the new blue.

We have to keep eating seafood, preferably the best.

But you also need to eat a lot of vegetables at the same time.

The best thing about seafood recovery is that you'll get Tabasco on a clam shell and a slice of lemon.

Dijon's mustard and breaded 140g tilapia is crunchy and soft and sweet enough inside, served with charcoal-grilled broccoli and a touch of chilli tossed with pecan quinoa pilaf.

Hmmm!

I will definitely sell

And best of all, these ingredients are available at your local Walmart.

Jamie Oliver campaigns to improve American diets

Sylvia is campaigning to save the ocean from our wrong diet.

there is a tendency

Forget the Holocaust, all you have to worry about is the fork.

We've misused our food resources and negatively impacted ourselves in many ways.

I think the diet so far is completely wrong

It's time to change our food expectations.

Sustainability is a complex issue, but dinner is part of our well-understood life.

so let's start here

In recent years, there has been a growing movement to incorporate greenery into the diet.

Dan Barber and Alice Water are vigorously pushing the 'Green Tasty Revolution'

But green food is often synonymous with undermining the responsibility of the eater.

Because just because it's an eco-friendly resource doesn't mean we eat everything.

Some shrimp are eco-friendly

There are also techniques for farming these

But we've never had eco-friendly all-you-can-eat shrimp.

this makes no sense

A heart-healthy diet is an important part of recovery seafood.

While we try to stop the decline of marine life, the media is making moves to increase seafood consumption.

Studies show that millions of seniors in the United States can live another year longer by eating more seafood.

This is an advantage that cannot be overlooked

But it's not just about seafood

It's a question of how we think about food.

As a chef, I've found that the easiest thing to do is to eat less.

then something changed

First my reward increased

Customers began to order appetizers and salads after realizing that the main course alone would not fill them up.

I spent more time eating than I used to, and I had more opportunities to communicate during that time.

The bottom line is that I feel more satisfied than I used to, although I eat less protein.

I was able to get my calories from a wide variety of foods.

I got healthier and my rewards increased.

that's great

All of our dishes are eco-friendly, but at the same time, we serve them with due consideration for the concerns of our customers.

Another thing we've been working on is making sure we have a wide variety of ingredients in our meals.

Crustaceans, mussels, oysters, clams, tilapia, and char are also common.

We made resilience our goal, and we were reselecting our ingredients.

you have to take care of this

This is the true meaning of the green list

But in fact, it's also a clue to rehabilitate the environment.

But what about that popular, large predator? I'm talking about the green list tuna I mentioned earlier.

Well, I have the recipe if you need it.

Big fish take time. Let's get started.

Start with this 450g fish

Grab the knife and cut it into four pieces

put it on four plates

Cover the four plates with vegetables Now open the number one Burgundy wine you have at home Light the candles and let's celebrate

Let's appreciate the opportunity to eat this dish

Invite your neighbors and friends Please go once a year Maybe I'll have a meal

i'm expecting a lot

It starts with health and fun, and so does family and community ties.

I also want to make my own ingredients. Preparing food and eating food is a common concern of mankind.

I was very lucky that my father was a great cook.

My father taught me early on the benefits of being able to eat.

I remember the food when I was a child.

The right amount of protein was served with heaps of vegetables and a little bit of starch, mainly rice.

Even today, most people eat like this.

I feel sick when I go to a steakhouse

I get oily sweat

It's like a protein hangover

I feel bad

Of all the horrifying news you'll hear and the news you'll ever hear about the ocean, I'm afraid I'm going to tell you the worst possible story, which is that your mother was right.

"Eat your vegetables too!"

It's straight to the point

What should I ask for in my meal?

You look healthy. I'm looking for ingredients that make my body healthy.

On the fun side, sexy things like butter and salt make the penance a little less painful.

When I think about my family, I want to respect recipes that have been handed down in the family for generations.

Let's start talking about the local community

We cannot escape the fact that our food has a global impact.

Learn as much as possible about its impact and act to minimize it

You've seen images of the blue Earth from space, all of the Earth's resources.

It's not just storing resources, it's also a world map of what we call dinner.

We use as much food as we need and we can share the rest. We can start with blessing and healing.

fully enjoy vegetables

By reducing the amount of seafood you taste

let's protect our dinner

thank you

(applause)

I'm a scientist and a huge Star Trek fan, especially Mr. Spock.

He's also a scientist and second-in-command of the starship Enterprise, and while the crew of the Enterprise goes on adventures, Spock and his friends are swayed by his emotion, or lack of emotion.

Spock is half human, half Vulcan, Vulcans are an alien race that controls and suppresses emotions and acts entirely on logic.

Spock is half Vulcan, so he knows he's always going through a conflict between logic and emotion. Because he's part of the team, the entire crew wrestles with his conflicts, analyzes them, and makes fun of them.

Even Star Trek fans find his seemingly contradictory behavior amusing.

For fans, this is a big attraction of this work.

This question has been a key theme throughout the entire Star Trek TV series and movies from the '60s to today.

I'm going to talk to you today about exactly this, the role of emotion in science.

We tend to think that science is only about facts and logic, and human emotions are often ignored or seen as obstacles to be removed.

What I would suggest is that just as emotions are important in many aspects of our lives, they are equally important in science.

Science is man-made, and we humans can't get rid of our emotions, no matter how hard we try.

So instead of fighting emotions, I think we should use them in science too, because emotions are as important to great discoveries and innovations as fact and logic.

I'll leave Spock's story for later, but I'd like to start by sharing my experience with the role of emotion in science, and one experience in particular that I've been thinking about for the last few years.

I am researching organic light-emitting diodes, so-called OLEDs.

As you may know, OLEDs are being used for next-generation displays.

Recently, it is increasingly being used for smartphone displays and TV screens.

It's bright and colorful and the display can be bent.

Here's an image of an OLED in my fellow physicists' labs.

As a chemist, whenever I think of OLEDs, this image comes to mind.

Ever since I started researching OLEDs, I've been obsessed with it.

So when the company I was working for at the time announced that it was going to stop researching OLEDs, I wasn't happy.

Management at the time had good reasons for making this decision, and in fact the company executed it very well.

No one lost their job, and everyone got paid for what they did.

What I want to tell you today is what happened to me and my scientific colleagues in the period from the announcement to the final day of the research project.

Think of it as a small case study of emotion in science.

In 2015, our research team had grown to over 80 people, and after the announcement of the cancellation of the project, the cancellation was postponed day after day.

It took us several months to successfully complete all our research efforts and find new jobs within the company for everyone.

this happened

We knew that the project we were working on was going to be cancelled, but in those few months, we've made a lot of progress.

We were working on two different OLED projects. One was blue OLED material development, which we started in 2001. The second was green OLED material development, which we started in 2014.

Here's what we've done with green OLEDs.

You can see from the graph that the service life, which is an important measure of the equipment's durability, has increased over the years.

In 2015, we were told to scale back just six months into the project, stop it as soon as possible, and start something else.

But since then, we've continued to make rapid progress.

How on earth?

After the announcement, my colleagues began leaving the team in a hurry, and it wasn't long before only a few were left behind.

What I want to emphasize here is that while the number of people involved in the project has decreased, the dedication of those who have remained has increased exponentially.

A stronger sense of solidarity was also born

We all had the same passion for research, we were sad that it was coming to an end, and we wanted to see our ideas come to life.

We felt a sense of belonging to something greater.

On top of that, our projects were getting less and less attention from management, because they were already considering new projects, restructuring, etc.

As a result, we have more freedom to take some things into our own hands.

Of course, with more control comes more responsibility, but that's what we wanted, because we were confident in our work.

felt empowered

These three pillars -- dedication, belonging, and empowerment -- worked well together in a sort of self-reinforcing cycle that worked better the closer I got to the shutdown.

So we each worked with enthusiasm on projects that had already been sentenced to death, because we felt connected to something meaningful.

Of course, it was a difficult and sometimes frustrating period, but we shared the joys of our research and the sadness of the end of our projects in the lab and sometimes in the café.

It was a very fulfilling and fascinating time until the end.

And finally, our material had a lifetime comparable to the green OLEDs that were already on the market at the time, and we did this in just under a year.

Thanks to these achievements, the company was able to sell the patents for what they were worth.

Now, the characters are different, the missions are a little different, but it's the same story.

A scene from "Star Trek"

Sorry for those who haven't seen the movie, but I have a spoiler.

At the end of Star Trek II, after Spock defied himself and saved the starship Enterprise, Captain Kirk and his main crew decided to search the universe to find Spock, though with little hope of his survival.

Starfleet Command would not allow that to happen to Captain Kirk or any of the other ships.

After many ordeals, we finally found Spock, and he returned to the team, happy and grateful.

Spock felt the team's dedication and cohesiveness to the mission, which saved him and brought the crew together.

And as the years passed, and after adventure stories, Spock realized that facing challenges and exploring new worlds required a combination of both logic and emotion.

OLED and "Star Trek" -- those two plots are actually the basic setting for many groundbreaking success stories, not just in science, but in other fields as well.

The main characters are all on great teams.

They all work very hard to achieve their goals.

Strive for all the freedom you can afford and take on the responsibilities you need.

Around the time the OLED research project was nearing its end, I was advised several times,

"dont 'worry

I have to do another study."

If I had followed his advice, I would have avoided many dark nights and many tears, but I would also have missed out on many opportunities in terms of personal growth and happiness.

The same goes for my colleagues and the project as a whole, so our results would have been minimal.

Science should, of course, be based on facts and logic.

When I say that science should use emotions, it doesn't mean that we use emotions instead of facts.

I just want to say that we shouldn't be afraid to use our emotions to implement and catalyze fact-based science and innovation.

Emotion and logic are not mutually exclusive

Complement and strengthen each other

A sense of commitment to something meaningful, a sense of belonging to something greater and a sense of being empowered is essential to creativity and innovation.

No matter what kind of work you do, be sure that it's an important job, and put it into your heart's content.

thank you

(Cheers)

I'm a big bug lover, not since I was a kid, but later.

I fell in love with bugs when I was a zoology major at Tel Aviv University.

In zoology, I took an entomology course, insect science.

And I thought about how I could be more practical in the field of insect science.

And in the world of plant protection, I became interested in protecting plants from insects and pests.

In plant protection, I encountered the science of biological pest control, using organisms to reduce plant pests.

The aim is to reduce the use of pesticides in the field of plant protection.

By the way, biological pest control is that these good bugs have been living on Earth for a long, long time, thousands of years.

But it's only in the last 120 years that people have come to study and develop ways to use biological control, natural control phenomena.

Because biological pest control can be found in every backyard.

All you need is a magnifying glass like this

You can magnify it ten times. It's ten times.

Open it up, turn the leaf inside out, and you'll see a hidden world of microscopic insects, or tiny spiders less than a millimeter, one-and-a-half millimeters, two millimeters, and you'll learn to distinguish good from bad.

This natural pest control phenomenon exists everywhere.

Also in front of this building, take a good look at the plants.

it's everywhere

need to know how to use

First of all, let's think while looking at examples together.

What are pests?

What kind of damage does it do to plants?

What is the natural enemy? Are they agents of biological control, or are they good bugs?

I would like to talk to you about ticks.

Six-legged creatures are insects, eight-legged creatures are spiders and mites.

let's go see them

It's a pesky pest called a spider mite, and it makes webs like spiders.

On either side of the mother beetle are baby worms, and to the right you can see one egg.

You can see what kind of damage it causes

On the right is a cucumber leaf, in the middle is a cotton leaf, and on the left is a tomato leaf with little spots.

Spider mites pierce leaves with their mouths and suck the juice, causing the leaves to turn from green to white.

But there are also mites in nature that are beneficial to us.

They're feeding mites, and like the spider mites, they're about a millimeter or two in size, and they move very quickly, chasing and catching spider mites.

Here's how it hunts: it pierces the pest tick on the left with its needle and sucks out its bodily fluids.

After five minutes, it's just a dead body. Next to the desiccated carcass of a spider mite are two satisfied feeding mites, the mother on the left and the larvae on the right.

It can eat about 5 spider mites or pests or 15-20 pest eggs in 24 hours.

i am always hungry

(Laughter) Another example is aphids.

By the way, it's spring in Israel, and the temperature is going up.

You can see this pest clinging to the plants on the young, fresh spring leaves of hibiscus and lantana.

Like Amazons, aphids only have females.

Females give birth to females and more females

there is no male

It's called monosexual reproduction

they are so happy

this is the damage

Aphids produce a sticky, sweet juice called honeydew that sticks to the tops of plants.

The ubiquitous cucumber leaves are covered in sooty black fungus, turning from green to black.

Parasitic wasps offer a helping hand

not a predator

It's a parasite, not a two-legged parasite, but an eight-legged parasite.

The parasitic wasp is about 2mm in size and is agile.

It flies sharply. You can see this parasite in action. It's like aerobatics.

She faces the target on her right and bends her abdomen to lay one egg inside the aphid's body.

Aphids try to escape

They kick, chew, and release sap, but to no avail. The parasite eggs are laid inside the aphid.

After a few days, depending on the temperature, the eggs hatch and the larvae eat the aphids from the inside out.

it's all real it's natural

never made up

it's happening in your backyard

this is the final result this is a mummy

It's Mi-I-La. This is a video of an aphid corpse, all the way to the inside.

birth is almost complete

You can see it in the movie, it only takes a few minutes.

Females will soon mate with males.

They only live for 3-4 days and need to lay 400 eggs during that time.

So that means laying eggs inside 400 aphids.

Of course this is not the end

Natural enemies are also abundant, but this is the last example.

I'll start with the pest, the thrips.

By the way, I didn't use their Latin name, but rather a strange name, but one that everyone knows.

This is a slim, very vicious pest.

It's green pepper

More than Just an Exotic Ornamental Pepper

But it cannot be eaten due to a deadly plague transmitted by adult thrips.

The natural enemy is the red stink bug, which is very small.

I have a black adult and two young ones

in action

In just a few minutes, the adult stings the thrips, sucks them, moves on to the next prey, and so on.

If you sow beneficial insects such as red stink bugs in a green pepper field, for example, they will take up residence in flowers.

Thus, the flowers are cleared of pests of thrips and flooded with beneficial predatory insects.

very good situation

Developing fruit and seedlings are unaffected.

No problem in this situation

But the problem is, here we've seen a one-on-one view of pests and predators.

I actually do something like this

There is a factory on the Sdeuliyahu kibbutz in northeastern Israel that mass-produces these predators.

So you're extending the phenomenon of natural control, or biological control.

In a 30,000 m2 state-of-the-art greenhouse, predatory mites, stink bugs, parasitic wasps, etc.

mass production

The vistas are spectacular, too, with the mountains of Jordan on one side and the Jordan Valley on the other. Winters are not too cold and summers are pleasantly warm, which is very good for mass production of them.

This mass production has never been genetically engineered.

Genetically modified i.e. no GMOs at all

We take them from nature, put them in greenhouses and climate chambers, and give them the best conditions to thrive.

actually got this

seen under a microscope

You can see one predatory tick in the upper right corner

It is a mass of predatory mites

You can see this ampoule

Contains 1 gram of predatory mites

There are 80,000 in one gram

80,000 can protect a 4,000-square-meter strawberry field from spider mites for almost a year.

Believe it or not, we can grow dozens of kilograms a year from now on.

This is what I call an amplification of this phenomenon.

not disrupting the balance of nature

On the other hand, to provide an environment whose equilibrium has already been disrupted by pesticides.

By using these natural enemies in our farms, we aim to use less pesticides, turn the wheels back a little bit, and improve the balance of the natural world a little bit, and that's the goal.

What is the impact?

You can really see the impact of successful biological control with beneficial insects in this table.

For example, in Israel, more than 1,000 hectares, and in Israeli units, 10,000 dong ($10,000) of green pepper fields using biological control measures have actually reduced pesticide use by 75 percent.

Strawberries in Israel have reduced that by 80% of pesticides specifically targeted at pest mites found on strawberries.

The impact is huge.

So the question is, you ask farmers, "Why biological control?"

"Why are you a beneficial insect?" I ask.

you will get different answers

For example, in the Arava region in the southeastern part of Israel, above the Great Rift Valley, which is the heart of Israeli agriculture, there are especially many greenhouses, and if you drive to Eilat, you can see these in the middle of the desert.

If you look at it up close, you can see this: grandparents and their grandchildren spraying beneficial insects, natural enemies, instead of wearing special clothes and gas masks to spray pesticides.

Safety in use is the number one reason farmers use biological controls.

The second reason is that pests are horrified by the idea that one day they will become resistant to pesticides, just as bacteria become resistant to antibiotics.

may occur as rapidly

Fortunately, biological control and natural control rarely lead to resistance.

almost never

That's evolution, that's the rate of nature, and resistance, on the other hand, is what happens with chemicals.

The third is the demand from society.

The societal imperative: The stronger the social pressure to use less pesticides, the more farmers believe they need to switch to biological control of pesticides wherever possible.

Here again, there are people who are very interested in insects, pests and beneficiaries, walking cautiously through a field with a magnifying glass on their head.

Finally, I would like to talk about my vision of the future: my dream.

because this is the reality

look at the gap

If you look at total revenue, the global biocontrol industry is $250 million.

See the big picture of pesticides in the global grain industry

I think it was about 100 times

$25 billion

A very large gap needs to be filled

So what should we do?

how to fill this gap

Or can it be made narrower? The first is to find a stronger, more useful, more reliable biological solution, beneficial insects, either by mass-producing them or by actually protecting them in farmland.

Second, to create demand from a more radical and determined society for less pesticide use on fresh produce.

Third, to increase farmers' interest in this industry.

Now you can narrow the gap

narrows little by little

This is the last slide, and I want to say here, "Give it a chance," or you can sing it.

I'm here to say on behalf of all biocontrollers in Israel and abroad, all who wish and do, give nature a chance.

Thank you for your attention

(applause)

(Music by Anna Oxygen) (Music: "Shells" by Mila) You know how to dive Put on your mask, believe me Get me some shellfish for dinner Bring a tank and you can breathe Underwater with slow movements You're an island Till then I'll find out all the secrets Till it's secret Till it's secret Till it's secret (Music) (Music by Caroline Lufkin) (Music by Anna Oxygen) The dream Time has you, lurking in the shadows, you're brand new, I'm not good at mornings, I see too much, I prefer night time, it's dark and hazy, the night is falling, the light is wandering, the night is calling, the light is wandering, and when the moon comes out, I'll leave the real world behind and find myself in a deep dream.

It was Miwa Matreyek!

(applause)

i love video games

even a little frightened

I'm in awe of the imagination, the technology, the concept.

But more than that, I'm in awe of the power of games to motivate, to encourage, to attract.

And I think that knowing how games work in that way is a really cool thing to learn.

I think I can learn, especially about learning.

Now, the video game industry is growing faster than any medium in existence today.

$10 billion in 1990, $50 billion worldwide today, showing no signs of slowing down.

estimated to exceed $80 billion in the next four years

This is three times the size of the CD music industry

This is amazing, but there are still other stats that tell us how great the game is.

What really struck me was that people today spend eight billion dollars a year of real money buying virtual items that only exist in games.

Here's a screenshot of a virtual game world called Entropia Universe

Earlier this year, the game's virtual asteroid sold for $330,000 in real money.

And this is the Titan-class battleship from the space game EVE Online.

This virtual object took 200 real people, 56 days to build, plus thousands of hours to build.

nevertheless several of these have been built

And then there's another kind of awesomeness, the game Farmville, which you may have heard of, with 70 million players worldwide, most of whom play it almost every day.

All of this may seem to some people indicators of social inadequacy and insecurity.

And here's the good news, too, which is that we can figure out why this real effort and value creation is happening.

And I think that by understanding it, we'll have something very useful for us.

I think the most interesting way to think about this is reward.

Especially when it comes to how playing games can be such a powerful emotional reward for an individual or a group.

If you look at what's going on in the brain of someone playing a game, you can see that there are two separate processes going on.

One is the process of desire

It's the desire and motivation to say, "I'll do that, I'll do my best."

And the other is the process of taste -- enjoyment, goodwill, and pleasure -- and this is a giant beast with an orc on its back.

great picture very cool

This image is from a game called World of Warcraft, which has over ten million players around the world, one of which is me, and the other is my wife.

A world where you can fly around in giant beasts shows why games excel in terms of desire and taste.

because it's so effective it's great

give you great power

Your desires are fulfilled and yet so beautiful

flying around is a great pleasure

These things combine to make our approach to the game very strong emotionally.

There are more things that are really interesting

What's really interesting about virtual reality is that you can measure things with it.

Because in virtual reality, everything is measurable.

All players who played the game can measure all the actions of each and every one of them

The world's largest game today measures more than a billion pieces of data about what its players are doing and more, far more detailed than any website.

This measurement allows us to do something special in the game.

It's called a reward schedule

This means observing the behavior of millions of people and carefully modulating the frequency, nature, type and intensity of in-game rewards to keep players engaged for an overwhelming amount of time and effort.

Now, to illustrate this with real life, I'd like to talk about a task that you're probably familiar with in many games.

It is to get a certain amount of a specific game item.

For the sake of clarity, let's say my mission is to get 15 pies, and to get 15 pies, I need to hunt this cute little monster.

simple game quest

You can think of this in terms of a box.

i have to keep opening boxes

I don't know what's in the box until I open it.

Then keep opening boxes until you get 15 pies

Now, games like Warcraft, for example, can be thought of as epic box-opening games.

This game lets you open a million boxes and gives you better and better things.

This sounds terribly boring, but games have the power to make the process incredibly engaging.

The way to do that is by using a combination of probability and data.

Let us first consider the probability

If you want someone to open the box and get the pie, the difficulty of getting it has to be neither too easy nor too hard.

What should we do? A million people, no, 100 million people. If you observe and analyze 100 million box-opening players and set the probability of getting a pie to be about 25%, which is neither too troublesome nor too easy.

keep players engaged

Of course, that's not all. There are 15 pies.

Now, you could make a game called Piecraft where the game is just getting a million or a thousand pies.

this is going to be terribly boring

15 is a pretty good number.

5 to 20 is a good number to keep people doing something

And it's not just the pie that's in the box.

there is still room for 100%

We make sure that every time a player opens a box, there's some kind of small reward to keep them engaged and making progress.

In most adventure games, it's a little bit of in-game currency or experience.

that's not all

There are other items of varying quality and excitement.

10% chance of getting a pretty good item

0.1% chance of getting amazing items

These rewards are carefully calibrated per item

There are also questions like, "How many monsters? Should we fill the world with a billion monsters?"

No I prefer one or two monsters on screen at a time

Then I get into the right difficulty

All of the above are very powerful

Furthermore, this is a virtual world and the box is not a real box.

so we can do more amazing things

If you watch a player open a box, you'll find that by the time you get to about 13 out of 15 boxes, your interest will fade away and you'll start to get bored and grumpy.

Players are not rational about probabilities

Players think this game is unfair

I don't get the remaining two pies, I'm about to give up

You can't do anything in real life, but you can do this in-game.

"Okay then, let's increase the probability of finding 13 pieces to 75%."

Retain players, watch what they do, and adjust the world to meet their expectations.

not always like this

The thing to make sure is that if you get a great item with a 0.1% chance, the game manager will prevent it from appearing for a certain period of time to keep its value and specialness.

The point here is that, through evolution, we've come to feel fulfilled in only a limited number of ways.

Over the millennia, we've evolved to find certain things stimulating, intellectual, civilized, so much more stimulating to problem-solving and learning.

And now we can parse this out and build a world that specifically stimulates our evolutionary box.

What does that mean?

I came up with seven ways to apply the lessons learned from the game to the real world.

The first one is very simple, an experience bar that shows progress, and this was discussed earlier this year by Jesse Shell and some other smart people.

already being implemented at Indiana University and elsewhere

Instead of grading with chunks of credit, we give students an avatar that they feel they are, and we do it in incremental steps.

All grades are reflected in the avatar, and the student sees it creep up and gradually accepts it.

Second, multiple long-term and short-term goals. 5,000 pies would be boring, but 15 pies would be fun.

So let's give people a lot of different tasks.

Let's say, for example, solving 10 problems, and another task, 20 times, showing up for class on time, collaborating with others, showing yourself working five times, hitting a specific target, and so on.

You can coordinate the work into chunks so that people can keep working on it, you can pick and choose which work you want to do, you can parallelize some of the work, and you can direct it in a way that works for each individual.

The third is a reward for hard work.

This is an essential element. Games excel at this.

Every time you do something or try, you get praise

I won't punish you for failure Even if it's just a little effort, you'll be rewarded.

Get instant rewards for all your hard work

Fourth is feedback.

This is more important than anything else: Virtual worlds are great at giving feedback.

If you look at the intractable problems in the world today that have informed us so far, it's very difficult to learn if you can't connect behavior with cause and effect.

In problems such as pollution and global warming, the causal relationships have different scales in both time and space.

It's very hard to feel the lessons and learn

If you can build that model, and if you can give people something to manipulate and tweak and have feedback come up, they'll be able to learn lessons and grasp and move forward and understand.

The fifth is the element of uncertainty.

It's a neurological goldmine, so to speak. Known rewards excite people, but what really drives people are uncertain rewards -- rewards with moderate uncertainty that you may or may not win.

25%. This will set your brain on fire.

If you think about implementing this in practice, any test or training can incorporate randomness and stimulate a powerful human evolutionary mechanism that can change the way people work.

We get very excited when we can't make perfect predictions.

I want to check it again and again to figure it out

As you may know, the neurotransmitter associated with learning is called dopamine.

This is associated with reward-seeking behavior

Some very interesting things are starting to happen at places like the University of Bristol in England, where they're starting to mathematically model dopamine levels in the brain.

So we're better able to predict the amount of time that learning will take up in terms of how much effort we've made to improve our learning.

Two things develop from here.

One has to do with memory, the moment you're trying to remember.

can identify, and then throw in information that helps

And the other thing is about self-confidence. Playing games and having a reward system makes people braver, more willing to take risks and challenges, and less likely to get discouraged.

this can be seen as a bad thing

It's like, "Our brain is being manipulated, it's an addiction."

The word addiction is pervasive

this is really a problem

The most neurologically igniting factor is the other.

others excite us so much

It's not money, and that's fine, but from a reward standpoint, it's about doing things with other people, being seen, and collaborating.

I'd like to tell you a little story from 1999, in a game called Everquest.

In this game, there are two large dragons that can only be defeated by a large number of people, and a maximum of 42 people are required to participate.

The problem is that dragons only drop a few decent drops.

We've devised a system that allows players to pose this question, while at the same time motivating each other and giving them a fair and honest assessment.

It was a system in which players paid each other virtual currency called Dragon Kill Points.

Each time you go on that mission, you will be paid dragon kill points.

I recorded it on another website

In other words, the players managed their own money, and when the items they wanted came out, they would bid with points. Players would manage everything themselves.

This amazing system isn't just used by Everquest, but today, ten years later, it's used by games all over the world that require the same kind of work, and it's used by tens of millions of people.

Almost 100% success rate

This is a self-sustaining player monetary system. This is a very sophisticated player behavior.

So I'd like to end by suggesting some ways to put these principles to work in the real world.

Start with business

We're starting to face big problems in business, like recycling and energy efficiency.

We've got some really cool technologies coming up, like real-time energy meters.

I looked at it and thought, "This could be applied more, let's set goals, adjust those goals, take advantage of the uncertainty factor, set multiple targets, use rewards and inherent incentive systems, get people to work together and compete in groups and districts, and take advantage of the very sophisticated cohorts and motivational mechanisms I showed you earlier.

When it comes to education, I think it's most obvious, you can change the way people work.

It can provide people with an epic series of experiences and a personal investment.

You can break things down into small, carefully calculated tasks.

You can take advantage of computed randomness

Every time everything is processed, you can give rewards for your hard work in quick succession.

Group behavior takes advantage of the progress people make when they play together, and it's a uniquely complex mechanism of collective behavior.

One thing that really blows my mind about politics is that the U.S. government, in particular, is actually funding people to lose weight.

Rewards in the form of cash are being used to combat the huge problem of obesity.

But again, if we can take advantage of the vast gaming industry's vast acumen to make rewards more attractive, and if we can take data and behavioral records from millions of people and give them feedback on how to improve their efforts, then we can tailor these rewards even more precisely.

And finally, I would like to end by mentioning the word "tackling."

The psychological and neurological knowledge gained from observing game players can be used to change the way individuals approach their work.

But it's also a story of collective engagement, and an unprecedented testing ground for looking at what drives people to work, to play, to engage on a grand scale.

I think if you observe these things, learn from them, and find ways to use them, you'll get something that has revolutionary power.

thank you very much

(applause)

There are several things about elections that appeal to us humans.

We go to elections, we vote, we watch elections.

Democracy is built on elections

We all understand the significance of elections, and we all leave home to vote on the same day.

We respect our voice in the decisions that shape our nation's future.

The basic concept is to give our representatives, the politicians, the power to make decisions that affect all of us.

Without this authority politicians will be corrupt

Unfortunately, power is corrupted, and people will do anything to gain or maintain power, including electoral fraud.

Even if the concept of an election is perfect, running an election within a single country is a big project and often a mess.

Something seems to go wrong with every election.

Elections have procedures to reduce mistakes as much as possible.

For example, when you get to the polling station right now, you're asked to show your ID before you're handed your ballot, and then you go to the voting booth and fill it out.

When you come back from the booth and put your paper in the ballot box, it will be mixed with other ballots and no one will know your vote.

So what I want you to think about is what happens after you put the paper in the ballot box.

Most people go home and believe that the election system is working, so they have no doubts that their forms will be counted.

They believe that election administrators and observers are doing their jobs properly.

The ballot box goes to the tally

They believe that the sheets that are opened and removed are carefully counted.

Most of us have to trust that we're doing these things right for our own votes, for everyone else's votes.

In other words, many people involved in the election

We need trust in the electoral process.

And sometimes you have to trust the computer too.

Think about it: Millions of ballots cast by millions of voters should be counted accurately, but when something goes wrong, it makes headlines like this.

Faced with this kind of infamous headline, researchers took a step back to consider how elections could be run differently.

I looked at the problem from a broader perspective.

That big picture is a reconcilable election.

It's important that voters can verify that their ballots have been counted correctly without compromising the confidentiality of the election.

here is the difficult part

How can elections be fully collatable while keeping votes secret?

We've found a way to use computers without relying on them.

the secret is the ballot

If you look closely at this ballot, you'll see that each candidate list is out of order.

So if you mark a candidate and cut off this list, the other side doesn't know who you voted for.

And then on the right side of each ballot is a bar code with an encrypted value.

It's a complex encryption scheme, but the format of voting on one side of the paper isn't complex.

We'll let the computer do the complicated encryption work for us, and we'll use this paper to collate the ballots.

this is how to vote

Receive a randomly distributed piece of paper, head to the voting booth, mark your vote, and cut along the perforations.

Shred the candidate list

All that's left is the side where the ballot was written, which is your ballot.

And election officials scan the votes.

Thanks to encryption, voting, storage and counting can be done centrally at headquarters and published on the web for everyone to see.

Take this encrypted ballot with you as a receipt

After the election is over, you can check to see if your votes were tallied by comparing your receipts to information on the web.

Remember, your votes are encrypted from the moment you walk out of the booth, so it's actually impossible for election officials to spy on your votes.

If the government wants to know who you voted for, it can't.

No hacker can access your voting information

You can't even fraudulently change your vote, because the receipt and the information on the web won't match.

Votes won't be lost because they won't be found when looking for them on the web.

But the magic doesn't stop there

We want the entire election process to be transparent so that news media and international spectators can download all the election data and do their own counting.

Are all votes counted correctly?

You can also check whether the announced election results are true or not.

This is an election by the people, for the people.

So the next generation of democracy is about providing transparent and reconcilable elections.

Thank you for your attention

(applause)

The story begins in 1960, when I was seven or eight years old, in my living room, watching a Cousteau documentary, wearing a water mask and flippers.

After the show, I went into the bathtub, swam in the bathtub, and stared at the drain, because the only thing I could see was the drain.

At the age of 16, I chose to pursue a career in marine science, exploring, diving, and living in underwater habitats, such as off the coast of the Florida Keys, for 30 days.

Brian Skerry took this photo Thank you Brian

And I've dived all over the world in deep-sea submersibles.

And this is the deepest Japanese submarine in the world.

And Sylvia Earle and I took part in this submersible expedition 20 years ago in Japan.

I dived to a depth of 5,400 meters, and what I thought was a pristine, unknown ocean floor.

But when I got there, I found a lot of plastic trash and other trash.

I realized that I couldn't just do science and explore for fun, and that was a turning point in my life.

had to see the whole

We had to move towards the goal of environmental protection.

So I joined an expedition to Antarctica with the National Geographic Society and others.

Participated in three Antarctic diving expeditions

Ten years ago, it was the first trip, when we explored a large iceberg called B-15, the largest iceberg ever to collapse from the Ross Ice Shelf.

We've developed a new technique to go inside and below the iceberg, which is kind of like using a pad to heat your kidneys and drag a battery around it, so that as the blood flows through the kidneys, it gets a little warmer before it makes its way back into our bodies.

But after three expeditions to Antarctica, I decided that I'd be better off working in warmer water.

That same year, ten years ago, I left for the Phoenix Islands.

I would like to talk about that

Before that, take a look at this graph

You may be looking at it another way, the top line is the total amount of terrestrial protected areas on the planet, about 12 percent.

It's shaped like a hockey stick, and it's been on the rise since the 1960s and '70s.

I think everyone started to pay attention to the environment, and I think everything that happened in the '60s, with Earth Day and the hippies and all of that, raised awareness about the global environment.

But the protected areas of the ocean are essentially unchanged, and may now increase slightly.

I think the protected areas of the ocean will increase in the future.

If we could have seen what happened at sea from what happened on land, it would have happened sooner.

But unfortunately the ocean is opaque, so you can't see what's going on.

So the protection of the ocean is lagging behind the protection of the land.

But scuba diving, submersibles, everything we're trying to do will help correct that.

Where are the Phoenix Islands?

It used to be the largest marine reserve in the world, until last week, and from this week the Chagos Islands are the largest.

It's in the central Pacific Ocean, which is about five days away from anywhere.

If you go to the Phoenix Islands, 5 days from Fiji, 5 days from Hawaii, and 5 days from Samoa.

It's in the middle of the Pacific, right on the equator.

Ten years ago, I hadn't even heard of the islands, not even the country that owns them, Kiribati, until two friends of mine who run overnight dive boats in Fiji asked if they were willing to do a scientific expedition to these islands.

they had never dived here

I answered yes

"But tell me where the island is and what country it belongs to."

When I first learned about the island, I had no idea what it would be like.

But I was interested in exploring

So let me tell you a little bit about the Phoenix Islands Reserve.

the deepest part of the earth

Average depth is about 3600 meters

The Phoenix Islands have many seamounts and this is a particularly protected part.

Seamounts are important for biodiversity

There are actually more mountains in the ocean than there are on land.

it's interesting

There are many seamounts in the Phoenix Islands.

Now imagine a deep three-dimensional space, a very deep three-dimensional space, a school of tuna whales and all kinds of deep-sea marine life that you've seen in previous talks.

This is the ship that we used early on for our research, and this is the island in the background.

Just below the water's edge, all but one are uninhabited islands, inhabited by about 35 administrators.

Long uninhabited, even to the ancient Polynesians who traveled extensively across the Pacific, these islands were far from Fiji, Hawaii, and Tahiti.

We went there. We went to places that had never been dived before. It was a unique, wonderful, scientific and personal opportunity.

"Let's be there" and dive

Both my personal life and my professional life have changed.

Suddenly, in the ocean, I saw a world I'd never seen before: dense schools of fish blocking the passage of light from the surface, dense, continuous, colorful coral reefs, giant fish everywhere, manta rays.

Parrotfish Spawning It was an ecosystem, this is the spawning of about 5,000 longnose parrotfish at the entrance to Phoenix Island.

You can see these fish mating, exchanging eggs and sperm to reproduce, making the water turbid, an event that takes place in the ocean, but due to human activity, it's difficult to do in many places.

The Phoenix Islands and the equatorial part are very important for tuna fishing, this yellowfin tuna.

The Phoenix Islands are a major tuna fishing ground

And the sharks, too, in the early days of our dives, we saw up to 150 sharks at one time, which shows a very healthy and strong ecosystem.

So I thought that this endless wild scene would last forever, but it didn't.

And then we explored more land on the island, an important bird nesting site, the most important bird nesting site in the world, in the Pacific Ocean.

and finished the trip

this is the area

There are eight islands sticking out of the water

Seamounts that do not emerge from the water

When a seamount rises from the sea surface, it becomes an island

What is the situation around the Phoenix Islands?

where is it?

Located in the Republic of Kiribati, Kiribati is located in the central Pacific as a group of three islands.

Gilbert Islands to the west

We have the Phoenix Islands in the middle, and that's what I'm talking about right now.

And to the east are the Line Islands

This is the largest atoll country in the world

The country has a population of about 110,000 people spread over 33 islands.

Equivalent to 13.6 million cubic kilometers of oceans, 1% to 2% of all water on Earth.

When I first went there 10 years ago, I barely knew the name of this country, so much so that people asked me, "Why are you going to Kiribati?"

It reminded me of an old joke where a bank robber walks out of court handcuffed and a reporter yells, "Willie, why are you robbing a bank?"

And he replies, "Because all the money is there."

"Why am I going to Kiribati?"

"Because it has all the seas"

It's basically one country that controls most of the equatorial waters of the central Pacific.

It's a country we own, and it's also a country in imminent danger.

Sea levels are rising due to climate change, sea level rise due to thermal expansion, and the melting of freshwater into the sea, along with 42 other countries, are projected to be underwater within 50 to 100 years.

The islands are only 1-2 meters above sea level Some of the islands are

already under water

These countries are facing real problems

As a world we also face problems

What should fellow Earthlings who have already lost their homes do?

The President of the Maldives recently held a mock cabinet meeting to highlight the plight of these countries.

that's what we need to focus on

And back to the Phoenix Islands, this is the subject of this talk.

When I got home I said what we saw was great.

I want to share it with the government of the Republic of Kiribati in Tarawa, on the far west side.

So I started contacting them, and they actually gave me permission to explore, and I said, "I want to tell you what we found."

But for some reason they didn't want me to come. Maybe it was the wrong time and place. It took a while.

But if you're coming, please prepare lunch for everyone in the seminar."

For those who participate, I

I will gladly prepare lunch for you."

Coral reef biologist David Obra and I traveled to Tarawa and spent two hours explaining some of our amazing discoveries in the Phoenix Islands.

This country didn't have information from this area.

I didn't get any information from the Phoenix Islands.

After the talk, the Minister of Fisheries walked up to me and said, "Greg, you're the first scientist ever to come back and tell us what you've done.

We will issue you unlimited licenses to conduct research in our territorial waters," he said, "usually after a few years you will receive a short letter or a copy of your paper.

you were the first to tell us what you did

I really appreciate it. Please let me buy you lunch today.

Do you have time for dinner? ”

I had time for dinner. I went out to dinner with Kiribati's fisheries minister.

Over dinner, very poor Kiribati gets most of its revenue from selling foreign access to fish from its waters, because Kiribati doesn't have the capacity to fish.

The agreement is that the captors will give Kiribati 5% of the value of the catch.

So if the United States takes a million dollars worth of lobsters from the reef, Kiribati gets $50,000.

It didn't seem like a very good deal to me, so

At the dinner table, I asked the Minister, and he said, "Look at how we can calculate the resource value and not take the fish or the shark, but leave the shrimp in the sea and still get paid."

He stopped eating, and he said, "I want to do it to address the overfishing problem. It's kind of like calling it a 'reverse fishing permit.'"

He coined the term "reverse fishing license"

I said, "Yes, it's a reverse fishing license." After dinner, not knowing which direction to go.

When I got back to the United States, I started looking around to see where I could see reverse fishing licenses being used, and there weren't any.

There were no maritime agreements that paid for not fishing.

It's on the ground, in the rainforests of South America and Africa, where landlords are paid for not cutting trees.

Conservation International is handling this agreement.

I went to Conservation International and asked for help and got them to join as partners to do a fish stock assessment exercise, how much should Kiribati receive, what kind of fish, and I got other partners involved, the Australian government, New Zealand, and the World Bank.

The Oak Foundation and National Geographic were also big funders.

We've set up a zone based on the Fund's idea to pay this poor country an amount equal to the lost fishing permit fee and protect the zone.

During this process, I met the President of Kiribati, Anoto Tong.

He's a really important leader. He's a visionary, a forward thinker. When I approached him, he told me two things.

"There are two things I want you to do, Greg.

One, I'm a politician, and I want you to work with my ministers to convince the people of Kiribati that this is a good idea.

Second, I want you to create a foundation that will last beyond my presidency.

I don't want it to end with my presidency."

Foresight and strong leadership, lots of scientific information, lots of lawyers

It took me a while to realize

First, because they understood that the Republic of Kiribati was in their own interest.

I understand that this is an assertion that can be shared with environmental groups. I understand that it is an assertion.

In 2002, when all was well, a coral bleaching event occurred in the Phoenix Islands.

So this is the resource we were trying to protect, it was record-breaking heat.

Occasionally, we see extreme ocean temperatures like this, where a hot air mass formed and stayed on the Phoenix Islands for six months.

It was over 32 degrees Celsius for six months, and it killed 60 percent of the coral.

It seemed as if the waters we were protecting, or at least the reefs, were dead.

Of course, deep waters and open oceans are great, but the corals that everyone wants to see are in trouble.

The good news is that it recovered, recovered rapidly, faster than any reef we've seen.

This picture was taken by Brian Skerry a few months ago, and when we returned to the Phoenix Islands, it was protected waters that had healthy schools of fish and healthy reefs that ate seagrass and kept the reefs healthy, so the corals came back strong.

It's kind of like when a person has multiple diseases, it's hard to cure, and he may die, but when he has only one disease, he recovers easily.

climate warming was a problem

That was the only threat, the only thing the reef had to deal with.

There was no fishing, no water pollution, no coastal development, so the reefs were in a healthy recovery process.

I remember a dinner with the Minister of Fisheries 10 years ago, when we first brought this up at dinner and I was so excited when I said, "Environmental groups might adopt this idea."

He paused and put his hands together and said, "Yeah, Greg, but it's all about the details."

was right

Over the past decade, it's been one detail after another.

We are preparing to cover it entirely with donations.

The Republic of Kiribati, which is currently fundraising, has stopped charging for the current situation.

Three weeks ago we had our first PIPA (Phoenix Islands Protected Waters) Trust Board.

It's fully operational. It's in production.

The PIPA Trust Board has the license and pays the state.

It's very solid and well thought out. It's a stable system. It's built from the bottom up. That's very important for this job.

Here are the conditions for success

you can read it yourself

What I think is most important is that we are doing well in a market economy.

We were assured that we could move forward in this way, and it was in the self-interest of both Kiribati and the world.

I'm going to show you the last slide, how we're going to scale this up.

How will Sylvia's dream come true?

where will it finally come true

This is the Pacific Ocean with large MPAs (Marine Protected Areas) with protected areas.

As you can see, it's patched

I've told you the story of one of them today, the rectangular area behind it, the Phoenix Islands, and all the other green areas have their own story.

The challenge now is to see the Pacific as a whole, to create a network of MPAs across the Pacific, so that the world's largest ocean remains protected and self-sufficient over time.

thank you very much

morning 4 am

As I wake up in my Boston hotel room, there's only one thing on my mind, my tooth hurts.

The night before, one of the ceramic fillings came loose.

Five hours later, I was sitting in a dentist's office chair.

But instead of replacing loose fillings and relieving pain, dentists touted the benefits of titanium implant surgery.

Ever heard of that?

(Laughter) Simply put, it's screwing artificial teeth into your jaw to replace the missing teeth.

The estimated cost of this implant surgery can be as high as $10,000.

$100 just to replace the ceramic filling.

Is this dentist most interested in my health, or is it how much money I can make to treat them?

My experience was actually no exception.

An American national newspaper survey found that up to 30 percent of all surgeries performed in the United States -- including stents, pacemaker implants, hip replacements and hysterectomies -- were performed without the attending physician's full consideration of non-surgical treatment options.

Are you shocked by this result?

Even if the results from other countries are slightly different, what this means is that when you see a doctor in the United States, the chances of getting an unnecessary surgery right away are a non-negligible probability.

What is the reason?

Why are some doctors rushing to recommend unnecessary procedures?

Perhaps it's because the health care system itself is less than ideal in encouraging decisions about whether or not to approve certain medical procedures or treatments.

In most health care systems, providers are remunerated for medical services rendered on the basis of the number and quality of care provided, and this economic incentive may be the reason some providers do not consider more profitable surgical procedures and alternative treatments.

Some countries have already begun to implement outcome-based compensation systems based on the combination of quality and effectiveness of care, but overall, few existing health system mechanisms encourage a broad range of health care providers to proactively prevent disease outbreaks or limit the treatment options available to patients to those that are particularly effective.

So how do we improve this?

So I think we need to fundamentally rethink how the health care system works -- a complete overhaul of how incentives work.

What we think is needed is a health care system that pays providers based on keeping patients healthy, replacing a system that pays almost exclusively for the treatment of people who are already ill.

What we think might be necessary is a shift from the current system of providing health care to the sick to a system of caring for the healthy.

It is an effort to change from the current method based on "care for sickness" to the true meaning of "care for health."

It's about shifting the mindset from treating people when they get sick to maintaining the state of health they had before they got sick.

This shift could change the focus of all players in the industry -- doctors, hospitals, pharmaceutical companies, medical device companies -- on the ultimate product that the industry sells, and that product is health.

Please try to imagine

For example, what if, by redesigning the healthcare system, instead of paying for the care given to patients, instead of paying doctors, hospitals, pharmaceutical and medical device companies, a per diem for every day a patient stays healthy and disease-free?

In practical terms, for example, public funds are used to pay insurance companies "health bills," which are accounts that are paid on a daily basis if a person stays healthy, doesn't get sick, or doesn't need urgent medical attention.

If the person becomes ill, no additional payment will be made to the insurance company for the medical treatment necessary to cure the person, and at the same time the insurance company will be obligated to pay for all evidence-based treatment necessary to restore the patient's health.

Once the customer's health is restored, the person's "health allowance" payments will resume.

In short, the system encourages all parties to take responsibility for their customers' health and to avoid unnecessary medical procedures by working to reduce the number of sick people.

The greater the number of healthy people, the lower the cost of caring for the sick, and the greater the economic returns for all involved in helping keep them healthy.

This change in the mechanics of incentives shifts the focus of the holistic health care system from individual treatment options to a holistic view of what benefits a single person to live a longer, healthier life.

So, effectively staying healthy requires willingness to share up-to-date personal health data so that the healthcare system can quickly determine if they need help staying healthy.

Through the use of physical examinations and lifelong health data monitoring, gene sequencing, cardiometabolic profiling and medical imaging technologies, customers can work with their “health coaches” and family physicians to make optimal, science-based decisions about diet, medications and physical activity that can reduce their individual odds of developing identified individual high-risk diseases.

We're already starting to use artificial intelligence to analyze data and miniaturize sensors to monitor individual health conditions.

Measuring cardiometabolic parameters with such devices and detecting tumor cell DNA in the blood during the early stages of cancer are two examples of such monitoring technologies.

Using the example of cancer

One of the major challenges with some neoplastic diseases is the delay in diagnosis that many patients experience, even though the medicines and treatments that could cure it, if only the disease was detected earlier, already exist.

New technology can detect tumor cell DNA in the blood from just a few milliliters of blood, thus making early cancer detection easier.

The impact of discovering at such an early stage could be dramatic.

The 5-year survival rate for non-small cell lung cancer is 49 percent when diagnosed in early stage 1.

Less than 1% of the same disease diagnosed at late Stage 4.

The possibility that something like a blood test for tumor cell DNA could easily save a lot of lives, positions certain types of cancer as treatable diseases, because the disease is detected earlier and the chances of a good treatment outcome increase.

In 2012, 50 percent of Americans had one chronic condition, and 86 percent of the $3 trillion in America's health care budget was spent on treating these chronic conditions.

86%

If new technology can now reduce that 86 percent figure, why hasn't the healthcare system changed to accommodate it?

Transforming our current system of "care of the sick" into a true health care system that focuses on disease prevention and behavioral change requires a change in the perspective of all parties involved in the system.

We need a positive political attitude to shift budgets and policies towards disease prevention and health education to rethink incentives, both financial and non-financial.

Collecting, using and sharing sensible personal health data will require a regulatory framework

It also requires a reassessment of the attitudes of doctors, hospitals, insurance companies, drug and medical device companies, and most importantly, the absolute imperative is individual will and motivation to sustain lifestyle changes and prioritize wellness, combined with continued open health data sharing.

A transformation like this doesn't happen overnight.

But if we look again at the current incentives in the health care industry and actively try to keep people healthy, not only will we be able to prevent more diseases in the first place, but we may be able to detect the onset of some preventable diseases sooner, which will lead to more people living healthier, longer lives.

The technology needed for this transformation already exists.

but this is not a technical problem

It's all about vision and—and will.

thank you

(applause)

You may have noticed that I wear different shoes on my left and right.

It looks weird and feels really weird, but I wanted to show you something.

The shoe on the left represents a sustainable footprint, using as much natural resources as the planet can regenerate and emitting as much carbon dioxide as the forests and oceans can absorb.

in a stable and healthy state

Today's situation is more like the other shoe.

too big

In 2017, by August 2nd, we had already used up a year's worth of the Earth's renewable resources.

It's kind of like spending a month's worth of money by the 18th and living in debt for the rest of the month.

You can live like that for a few months, but if you don't change your ways, you're going to have big problems.

We all know the devastating effects of this overuse: global warming, rising sea levels, melting glaciers and polar ice, increasingly extreme climates.

I can't help but feel frustrated by the scale of this problem.

And what's even more frustrating about this is that even though there's a solution, people don't want to change their ways.

Today I'm going to talk about how new solar technologies can contribute to the future of sustainable buildings.

40% of energy demand is consumed in buildings, so addressing this consumption can significantly reduce greenhouse gas emissions.

Buildings designed according to sustainability principles produce their own electricity.

To do this, we first need to minimize energy consumption, for example by using well-insulated walls and windows.

Such technology is already commercialized

Then we need energy for hot water and heating.

It can be obtained renewably from the ground and the atmosphere with solar thermal systems and heat pumps.

This technology is already available

All I need is electricity

There are, in principle, several ways to generate electricity from renewable sources, but how much do you know about buildings with windmills on their roofs and gardens with hydroelectric plants?

Probably not, because it doesn't make sense.

But the sun is sending a lot of energy to our roofs and walls.

The potential for collecting this energy on the surface of a building is enormous.

Let's take Europe as an example

If you use all the sides that are properly oriented to the sun and don't get too much shadow, the power you get from solar cells can meet 30 percent of your total energy needs.

But there is a problem with current solar cells.

It's cost-effective, but design-wise it's not very flexible, and it's aesthetically problematic.

When you think of a building with solar cells, you probably think of something like this.

That's fine for a solar power plant, but when it comes to buildings and streets and architecture, aesthetics becomes an issue.

Here's why you don't see many buildings with solar cells.

it just doesn't fit

Our team is working on a completely different solar cell technology: organic solar cells.

"Organic" means that it uses carbon-based materials instead of metals for light absorption and charge transport.

What we're using is a mixture of macromolecules with different repeating units, like strings of pearls, and fullerenes, small molecules that look like soccer balls.

Mix the two together and melt them into an ink.

It can then be printed using a printing technique like slot die, which applies continuous coating to a roll of flexible material.

The printed thin layer becomes the active layer that absorbs the solar energy.

This active layer is very efficient.

It can absorb solar energy with a thickness of only 0.2 μm

It's 1/100th the thickness of a human hair.

To use another analogy, if ink is made from 1 kilogram of this polymer

With that amount, you can print solar cells the size of a soccer field.

Organic solar cells can be made with very few raw materials, which I think is important in terms of sustainability.

When you print it out, you get a solar module like this.

It looks like a plastic film and has similar properties.

lightweight

can bend

Translucent

But it can still gather sunlight from outside, or light from inside, and as you can see, it can light up a small LED.

It can be used in plastic form, and it takes advantage of the fact that it's lightweight and bendable.

Light weight is important for buildings in warm climates.

Because the roof wasn't designed to carry extra weight.

For example, we don't anticipate snowfall in the winter, which means we can't use heavy silicon solar cells, but this lightweight solar film is perfect.

The ability to bend is important when it comes to combining membrane architecture with solar cells.

Imagine the "sail" of the Sydney Opera House turned into a power plant.

This solar cell film can also be combined with normal building materials such as glass.

After all, the exterior glass is often made up of laminated safety glass with a membrane in between.

It wouldn't be too hard to add another layer of membrane in the manufacturing process, and that would create a building material that contains solar cells and can generate electricity.

Besides being nice to look at, this integrated solar cell has two big advantages.

Remember those solar cells on the roof that I showed you at the beginning?

In this case, the roof is laid first, and then the solar cells are installed as the second layer.

This increases the cost of installation

In the case of integrated solar cells, you only have to install one thing on the building site, and you can install the outside of the building and the solar cells at the same time.

Not only does it save installation costs, but it also saves resources because it combines two functions into one element.

I talked about using light before.

I like this solar panel, but your tastes and design needs may be different.

but it's okay

These solar cells can easily change shape and design during the printing process.

This gives architects and building owners the flexibility to incorporate this power generation technology in any way they like.

I just want to stress that this isn't just in the lab.

It's still a few years away from widespread adoption, but it's already on the verge of commercialization, and we already have several companies with manufacturing lines.

Companies are expanding their manufacturing capacity, and we're making our inks available for mass production.

(Change shoes) Smaller footprint is more comfortable

(Laughter) Right size, right size.

we need to get our energy consumption back on the right scale

It's also important to make buildings carbon neutral.

Europe has a goal of decarbonizing existing buildings by 2050.

I expect organic solar cells to play a big role in that.

Let's see some examples

This is the first commercial case of large-scale printing of organic solar cells.

When I say "commercial," I mean the solar cells were printed on industrial equipment.

This is the German pavilion at Expo Milano 2015, called the Solar Tree.

It provides shade during the day and also produces electricity for lighting at night.

Do you know why the hexagon was chosen as the shape of the solar cell?

It's simple: the architect wanted to create a pattern of shadows on the floor, so he commissioned it, and that's exactly what was printed.

Although it is quite different from the actual product, this free-form example seems to have stimulated the imagination of the visiting architects more than we expected.

This example is closer to what we're targeting.

In an office building in São Paulo, Brazil, translucent organic solar panels are integrated into the glass exterior and serve multiple purposes.

One is to provide shade for the conference room inside.

The other is to display the company's logo in an innovative way.

And, of course, power generation reduces the energy consumption of buildings.

This points to a future in which buildings become producers of energy rather than consumers of it.

I'd like to see solar cells integrated harmoniously into the exterior of a building to be both resource efficient and aesthetically pleasing.

In some cases, silicon solar cells may be suitable for roof applications.

But if you want to keep all the exterior walls and other areas alive as well -- the translucent areas, the curved surfaces, the shades, organic solar cells, which can be shaped in whatever shape the architect wants, would be a great help.

thank you

(applause)

I am a "translator"

It translates from biology to mathematics and vice versa.

I'm building mathematical models -- in my case, differential equations -- that describe biological mechanisms, like cell growth.

It's basically like

First, find out what drives a certain mechanism, its basic elements.

Then we hypothesize how those elements will interact with each other and with their surroundings.

For example

And then we rewrite that assumption into an equation, for example something like this

Finally, we analyze the equations and translate the results into the language of biology.

The key to building a mathematical model is not to think about what things are, but how they behave.

Whether it's a cell, an animal, a human, I think about how these elements are related to each other, how they interact with each other and with their surroundings.

Let me give you an example

What do foxes and immune cells have in common?

They're both predators, except that foxes eat rabbits, and immune cells eat invaders, like cancer cells.

But from a mathematical point of view, qualitatively, the same predator-prey equation describes the relationship between foxes and rabbits, and between cancers and immune cells.

The predator-prey system is well documented in research papers, and is described as the interaction of two populations, where the survival of one depends on eating the other.

That same equation provides a framework for understanding the interaction between cancer and immune cells, where cancer is the prey and immune cells are the predators.

Preys do everything to avoid being killed by predators, from disguising themselves to stealing predators' food.

this can mean a lot of interesting things

Immunotherapy, for example, has had great success, but still has limited efficacy against solid tumors.

But from an ecological point of view, cancer and immune cells—both predators and predators—need nutrients like glucose to survive.

If cancer cells outperform immune cells in gaining shared nutrients in the tumor microenvironment, immune cells will be unable to perform their function.

It's this model of shared resource between predator and prey that I've been working on in my research.

It has recently been shown experimentally that by restoring the metabolic balance of the tumor microenvironment, by ensuring that immune cells are properly fed, the immune cells can regain the upper hand in the fight against their predators, cancer.

If we were to abstract it a little, we could think of the cancer tissue itself as an ecosystem, in which different types of cells compete and cooperate for space and nutrients, interact with the predator of the immune system, migrate, or metastasize.

What can we say about many ecosystems from the perspective of conservation biology?

It's a more effective way to kill a species by targeting its environment than by targeting it directly.

So if we can identify the key elements of the tumor environment, we can create hypotheses, simulate scenarios and treatments in a completely safe and inexpensive way, and find ways to target different elements of the microenvironment to kill only the cancer and not harm the host like me or you.

The direct purpose of my research is to advance research and innovation and reduce costs, but the real purpose is to save lives.

I'm trying to do that by applying mathematical models to biology, specifically drug development.

The field didn't get a lot of attention until relatively recently, but it's mature now.

We have very well developed mathematical methods, and there's a lot of software out there, some of which are free, and the amount of computational power available is increasing every day.

The power and beauty of mathematical models is that they allow us to formulate exactly what we think we know.

When we create a hypothesis, we rewrite it into equations, and we run a simulation, we are trying to answer one question: if our hypothesis is correct, what do we see?

This is a very simple conceptual framework.

It's most important to ask the right questions first.

This provides many opportunities to test biological hypotheses.

If what the model predicts matches what we observe, that's great, because the model is working so well that we can tweak it here and there to make more predictions.

But if our predictions don't match our observations, it means that something is wrong with our assumptions, and that our understanding of the underlying biological mechanisms is still incomplete.

Fortunately, since this is a model, we can control all the assumptions.

So you can check each assumption and identify where it's broken.

Both experimental and theoretical tools can be used to fill newly discovered knowledge gaps.

Of course, all ecosystems are so complex that trying to describe all the variables is not only tedious, it's also not very helpful.

There's also the issue of timescales, some processes lasting seconds, others minutes, days, even years.

It's not always possible to pull it out in a real experiment.

It may also occur too quickly or too slowly to be physically measured.

But mathematicians can focus on any subsystem on any timescale, and simulate effects that occur on any timescale.

Of course, this is not something modelers do alone.

It must be done in close cooperation with biologists.

And both sides need some level of translation ability.

The theoretical formulation of the problem opens up a lot of possibilities for testing hypotheses and simulating scenarios and treatments in a completely safe way.

It can identify where there are holes in knowledge and logical inconsistencies, and it can point out where to look and where dead ends.

In other words, mathematical models can help answer questions that directly relate to human health, or perhaps better, individual health, because mathematical models are the key to driving personalized medicine.

And to do that, ask the right questions, build the right equations,

It's about making sense of it biologically.

thank you

(applause)

(Music) The sun is shining high in the sky It's minus 20 degrees here on earth I'm heading to a place where the road is paved with gold Two trains should be running side by side Some of them are about to leave Two trains are running side by side There is no melancholy and no worries Oh God, the triumph of sweet Jesus, One ray of glory from the moon God, One more ray of glory from the sun

(applause)

Ever since I can remember, I've loved math.

No, I can't say 100 percent true.

I love math, but my two weeks in senior high school were different.

(Laughter) I was at the top of my class, and the mathematics extension course was about to begin.

I was really excited to learn about a brand new subject: complex numbers.

I like it complicated

My teacher introduced me to the concept beforehand by asking a question about the square root.

The square root of 9 is 3 The square root of 256 is 16

It's easy

It was after that that the hook problem came up Then what about the square root of -1?

Naturally, we gave up and said, "Okay, sir!

There's no way you can take the square root of a negative number."

"In the world of real numbers," said the teacher.

"But in the world of complex numbers, the square root of -1 becomes the imaginary number i."

(Laughter) That day, my whole math world came crashing down.

(laughs) "Imaginary numbers?

Really?

Mathematics is a reliable source of information, but I beg you, don't make abstractions.

If you want to play with imaginary numbers, study art."

(Laughter) "This is a public lecture. Let's get back to our assignment!"

But he didn't come back, and I was forced to spend the next two weeks doing pointless calculations (Laughter) to find the imaginary solution to the quadratic equation.

(Laughter) But then something amazing happened.

By starting in the world of complex numbers with imaginary numbers, we began to find wonderful answers to problems in the real world that had no solutions before.

That's why mathematicians 500 years ago decided to create this imaginary number for fun, so that we can derive these wonderful identities in fields such as electrical engineering by applying them to the world of real numbers.

Wow!

I had a whole new level of appreciation for mathematics.

After a little distrust, I fell in love with this subject even more.

Mathematician Francis Hsu aptly sums it up, "We learn mathematics for play and beauty and truth and justice and love."

But ask any student today, and you're likely to hear a different story.

"Difficult" "boring" like that

Of course it may be difficult

But it's definitely not boring

In fact, part of the beauty of mathematics is that it's difficult to master.

Nothing worth doing is easy

So I want my students to persevere through the difficult parts, and to experience the beauty when it all comes together.

Just a few weeks in high school, like I did

Unfortunately, our school system pushes students toward mathematics in a cookie-cutter way.

So when you fall behind a little bit, it feels almost impossible to catch up and appreciate the beauty.

But why is this a problem?

why should i care?

Today, more than ever before, the public demands that everyone be familiar with mathematics.

With the advent of artificial intelligence and automation, many of the jobs we see today will either cease to exist, or will be replaced by those requiring less menial work or requiring more specialized analysis and application.

But it's not producing enough mathematics students to take on new roles.

This graph shows the number of students who have taken standard mathematics and advanced mathematics in Australia over the last 20 years.

It's clear that the demand for math skills is growing rapidly, while the supply is steadily declining.

To put it in perspective, half of the students in Australia who finish high school are not trained to understand the argument for rates of change in data.

In this digital age, where fake news influences election results, this is very worrying.

Please give me an example

Let's take a closer look at the graph

Do you know what I did to emphasize it?

If you don't know, I'll show you now. The vertical axis starts at 0.

Do you understand?

It's the exact same data, but manipulated the presentation to affect you.

That's my job here.

(Laughter) Jokes aside, if we don't do something to significantly improve student engagement with mathematics, we're not only going to have an immense talent shortage, but we're going to have an increasing number of fickle people who are easily swayed by those who make the most of advertising.

So what's the solution?

I have a lot of work to do

Curriculum reform is needed

We also need to encourage select talent to become teachers.

We also need to put an end to high-stakes exams and adopt a proficiency-based approach to learning.

But it will take time

and i'm impatient

I've been thinking about it for eight years

It's been a long time since I quit my job as a financial trader and decided to build a web app to help students learn math.

Today, our app is used in schools all over the world.

Students who use it regularly see great progress.

But there's a problem: only regular students see progress.

most are different

I've spent many years developing and refining the app, but the biggest challenge wasn't product-related, it was motivating students to want to fill in their gaps.

Look, we're trying to compete with Facebook and Snapchat and PlayStation in today's concern economy for student time.

So we went back to the prototyping stage and started thinking about how we could get students to use the "Focus Budget" for their own education.

We tried game elements like points, badges, and avatars, which temporarily improved engagement, but quickly returned to normal when the novelty wore off.

Then one day, co-founder Alvin saw a study of students in Chicago, led by behavioral economist Stephen Levitt, that paid students to improve their test scores.

He started telling me about the things they'd tried and the interesting discoveries they'd made.

It turns out that students who are motivated by inputs, such as effort, work harder than those who are motivated by outputs, such as test scores.

And if you're a kid, you can fish for trophies, but if you're an older student, you actually need cash.

(Laughter) Money mattered. $10 is good, $20 is even better.

But perhaps most importantly, the reward had to be on the spot, not promised to come later.

I gave the student $20 and he said, "Touch it, feel it, smell it."

But if your grades drop, I'll pay you back."

this really worked

Right away, we were excited to see if we could use this in our programs.

But once the excitement subsided, some worries came to mind.

First, is it morally right? and

(Laughter) And then where are we going to get funding for this stuff?

(Laughter) And finally, if the students are no longer paid, will the results persist? and

Let's look at the moral side first.

I'm a bit of a math purist

So I'm one of the people who sparked the idea that we should learn math for the sake of math.

See, for play, beauty, truth, justice and love.

It's for the money!

(Laughter) After working on it, I finally realized that my current view of mathematics is only because I've studied it until I know how good it is.

It's very difficult to tell students who are struggling with math right now to study hard for the future.

Bribes don't work in and of themselves, because I could convince my students that when they were financial traders, they were good at math, and that's why they got big bonuses.

but it doesn't work long term

so it's really pointless

Behavioral economists call this "hyperbolic discounting."

Levitt goes so far as to say that when there's a delay in rewards, all the power to motivate disappears.

So from a purely economic point of view, if we don't immediately take advantage of incentives, we're underinvesting in student outcomes.

And that's what made me think, as a society, we're used to subsidies all the time.

Whether it's by the government, by your employer, or by your family.

For example, many parents will pay their children a dime or pocket money if they help out.

It's hardly controversial per se.

When I thought about this, the answer to the second question, how to raise money, came to me.

Parents are, of course, the ones who do most of the work in educating their children.

So we thought we'd charge a fee for our program on a weekly basis, but if the student hits their weekly math goal, we'd put that fee straight back into the child's bank account.

We picked three assignments that paid $10 to complete in a week.

So, instead of grades, I used motivation as a motivator, in a reasonably short period of time, and at a good price for my students.

I was talking to my wife about this new business model.

If my wife had doubts that I was completely crazy, she would have been almost certain.

She says, "Mo

If everyone did their homework the way you wanted it, you wouldn't have to earn money you didn't want.

It's a great business model."

(Laughter) Well, it's sort of an anti-business model: if you use it, you pay for it.

And I knew from experience that not everyone in this country jumped in and did their math homework every week.

If that had happened, we would have been bankrupt long ago, but it would have saved this country's math skills crisis.

(Laughter) As a company, it was a double-bottom line operation, because we were looking to both return for our investors and improve student achievement.

We know that the long-term benefits come from improving student achievement.

So dual goals are never at odds.

We always care about how our product decisions help students reach their math goals each week and make sure they're getting paid. We're not.

You must have been wondering, how is this insane business model going?

Don't worry, we're not bankrupt yet

We've spent the last five months testing exclusively with private home users in Australia before considering a school release.

Here are the results so far

Green represents students who are meeting their weekly math goals, and red represents students who are not.

You can see that there are a lot more students who have finished their homework.

In fact, we've found that as the user base grows, this percentage stabilizes at around 75%.

So we usually take a weekly subscription every four weeks and reward students for the remaining three weeks.

Of course, I'm considering leaving the money here, but guess what?

We can see that these students are 70% more likely to achieve their goals than those not participating in the rewards program.

one goal achieved

From a business point of view, they're less likely to churn and more likely to refer them to friends, so our goal is to have a larger, more engaged user base, even if they earn less revenue per user.

Both goals achieved

Now about your last question

Even if the payment is lost, will it be returned?

Mathematics is much more than just a subject you learn in school.

it is a human effort

Things that help us make sense of the world around us

The more you know, the more you want to know

Yeah, we created that opportunity with the power of money.

But in the long run, money doesn't matter anymore.

Because in the long run, the wonders of mathematics will inspire you, and understanding it will reward you.

thank you

(applause)

At some point in life, most people experience a broken heart.

For example, one of my patients, Cathy, made a life plan when she was in middle school.

The plan was that she would meet her future husband at 27, get engaged the next year, and marry the next year.

In fact, when I turned 27, it wasn't my husband that I found.

It was a lump in one breast

For months, she endured grueling chemotherapy and painful surgeries, and just as she was recovering and ready to be romantically involved, she discovered a lump in her other breast, and the same treatment was repeated.

Kathy hoped to resume her search for a mate once she had recovered and had all of her eyebrows that had been removed from the treatment.

To find love in New York and go on a first date, you have to be able to express a range of emotions.

(Laughter) Not long after, she met Rich and fell in love.

Everything in their relationship went smoothly, just as she had hoped.

And half a year later, after a lovely weekend in New England, Rich had booked their favorite atmospheric restaurant.

Cathy expected to be proposed to, and managed to keep her cool under control.

But Rich didn't propose to Kathy that night.

I said goodbye

He really loved Kathy, but he didn't feel the excitement.

Cassie was disappointed

Her heart was literally broken and she had to face another day of recovery.

But five months after their breakup, Cathy still can't forget Rich.

her heart is still shattered into pieces

Now the question is why is this happening?

Why is it that even a woman as amazingly strong and strong as she is, can't sort out her feelings? A strong woman who endured four years of cancer treatment.

Why are so many people so reluctant to move forward when it comes to recovering from a heartbreak?

Why is it that the coping strategies we use to navigate life's challenges seem to work for broken hearts, but are never successful?

Over the course of more than 20 years in my practice, I've seen people of all ages and backgrounds face different types of heartbreak, and I've learned that when you're broken and heartbroken, your own instincts, which you should normally rely on, can lead you astray again and again.

Only this time, don't follow your heart

For example, studies of broken hearts have shown that having a clear sense of why a relationship ended is critical to moving forward.

Even if the other person explains the reason for the breakup over and over again in a simple and straightforward manner -- like Rich did to Cassie -- the mind refuses to understand.

Because heartbreaks are so intense and hurtful, they assume that the reason for the breakup must be just as serious as the hurt.

That instinctive voice is so strong that even the most rational and calm people can come to the conclusion that mystery and conspiracy are to blame, when there are none.

Kathy thought something had happened. Something had happened during her excursion with Rich that chilled her. She was obsessed with figuring out what had gone wrong.

I spent an inordinate amount of time looking back, minute by minute, at what I had done that weekend, searching my memory for clues that didn't exist.

Cathy was misled by the voice of her heart and began a futile attempt.

But what kept her trying for months?

Heartbreak is far more dangerous than people can imagine.

There's a reason why we fall into a dead end fallacy, even though we know it's only going to make us feel more self-loathing.

What brain studies have found is that when a relationship ends, mechanisms in the brain that are similar to those experienced by certain experiences are activated, similar to the withdrawal symptoms of cocaine and opioid addicts.

Cathy was having withdrawal symptoms.

Now that she can't get heroin, "spend time with Rich," she subconsciously clings to methadone, a substitute for "memories with him."

In your head, you think you're solving a mystery, but what you're actually doing is taking drugs.

That's why recovering from a broken heart isn't easy.

drug addicts are aware of their addiction

I remember injecting myself

People who are heartbroken don't know they're addicted

now you know

If your heart is broken, don't ignore it

No matter how strong the urge is, you have to admit that every time you go back through memories, reread emails, and stalk your ex on social media, you're only exacerbating your addiction, deepening your wounds, and compromising your recovery.

The process of overcoming a heartbreak is not a "journey"

It's a battle. Reason is the greatest weapon.

There's no reason to break up that I can fully agree with

The pain in your heart that you feel cannot be removed by reasoning

Don't look for reasons to break up, don't wait, just take their word for it, or make up your own.

And that's not all it takes, it's a willingness to forget the past and accept that the relationship is over.

If you don't, your fleeting hopes will make you want to cling to them and pull you down.

Hope can be very harmful when you're heartbroken.

Heartbreak is a master at manipulating people's minds

It's easy to use your emotions to steer you in a certain direction, but when you're swept away by it, you get further and further away from what you need to get back to who you really are.

One thing we tend to do in times of heartbreak is to idealize the other person.

I spend hours thinking about that person's smile, I think of the good times we had together, we went hiking in the mountains together, and we made love under the stars.

Even if I remember, my sense of loss only increases

even if you know

This kind of rehearsal of "best memories" over and over again is like listening to your own "passive-aggression" playlist on Spotify.

(Laughter) Being heartbroken brings these thoughts into your mind.

You have to strike a balance to avoid idealizing. You remember not only the smiles, but the frowns, how badly you were treated, how you really made love in the mountains, then got lost on the way home, got into a big fight and didn't speak for two days.

What I ask my patients to do is make a thorough list, a list of the reasons why the ex-partner doesn't suit you, detailing what's wrong with you, and I save it on my phone.

(Laughter) Now that I've made this list, I have to use it.

In the middle of my counseling session, if a patient feels even a little nostalgic, I immediately say, "Look at your phone."

(Laughter) The human brain wants to think that the person you broke up with is the ideal person.

Actually, it's not at all.

To get over a heartbreak, you have to tell yourself that, again and again.

There is no one who is broken in love and is not hurt

Another patient, Miguel, was 56 years old and an executive at an IT company.

My wife passed away five years ago, and I was finally thinking of looking for a new partner.

He met Sharon and a whirlwind romance soon began.

A month later, we introduced each other's adult children to a partner, and two months later, we moved in together.

When I reach middle age, I don't get lost in relationships.

It's like "Love Actually" plus "Fast and Furious."

(Laughter) Miguel was looking happy for the first time in years.

But on the eve of their one year anniversary, Sharon dumped him.

She didn't want a long-distance relationship when she decided to move to the West Coast to be closer to her kids.

For Miguel, it came as a total surprise, and it devastated him.

I was unemployed for months, and as a result, I almost lost my job.

Another effect of heartbreak is that emotional pain and loneliness can significantly impair intellectual capacity, especially in complex tasks involving logic and reasoning.

Temporary drop in intelligence quotient (IQ)

And it wasn't just the depth of his grief that puzzled Miguel's employers, it was how long it lasted.

Miguel himself seemed confused and embarrassed by this.

During counseling, he said, "What's wrong with me?"

He lamented, ``How can a good adult break up with someone he dated for a year and drag it on for a year?''

Actually there are many people like this

A broken heart can lead to so-called bereavement symptoms: insomnia, intrusive thoughts, and even a weakened immune system.

40% of people experience medically recognized depression

Heartbreak is a complex psychological trauma.

Influence appears in various scenes

Sharon, for example, was a very outgoing and active person.

I had a dinner party at my house every week.

They even went camping with another couple.

Miguel isn't religious, but he and Sharon went to church on Sundays and were warmly welcomed into the worship congregation.

What Miguel has lost is not just his lover, he has lost all his social activities, the warm interactions with the people he meets at Charon's church.

I lost my status as a couple.

Miguel felt that the breakup left a huge hole in his life, but what he didn't realize was that there was more than just one hole.

This is very important, because not only does it explain why heartbreak is such a disaster, but it also gives you some tips on how to get back on your feet.

To heal the wounds of a broken heart, you have to identify the holes in your life and fill them.

A hole in my identity, I need to rethink my life's purpose.

A hole in your social life, that's an activity you're no longer able to do, and that's the empty space left on your wall by removing the pictures you had on display.

But once you've identified and filled a hole, it doesn't make sense unless you avoid doing things that get in the way of moving forward. Don't waste your time searching for reasons to break up, or idealize your ex's flaws to forget and fall into thoughts and actions that make him the star of the next chapter of your life.

It's hard to get over a broken heart, but if you don't let your feelings get in the way and take steps toward recovery, it can be a lot less painful.

You're not the only one who can be saved

You'll be able to spend more time with your friends, you'll spend more time with your family, not to mention the billions of dollars lost in productivity loss at work.

If you know someone who has lost a loved one, give them some comforting words. Support plays an important role in their recovery.

Be patient, because it's going to take longer than you think to take that next step.

If you're heartbroken right now, remember, you're facing an uphill battle going on inside of you, and you'll have to work hard to win.

but you have a weapon

so let's fight

I will definitely get back on my feet

thank you

(applause)

They say that history is written by the victors, and if that's true, what happens to the losers? Without knowing their own past glory, they can't hope to have great ambitions.

Officially, I'm just a fashion designer, but I've found a higher mission in old fabrics and modern fabrics.

Through my work as a designer, I've discovered the importance of speaking for marginalized people, and the importance of telling the most vulnerable: "You no longer have to pretend to be yourself in order to come to terms with the unyielding majority."

Many people think of fashion as something of a trifle, but in fact, it can be a powerful tool for breaking down stigma and for the underrepresented to express themselves.

I wanted to change society through design for personal reasons.

As a Nigerian-American, I know how easily the term "African" can be used pejoratively outside of its geographical connotation.

For those with a background in the beautiful continent of Africa, being African means being inspired by the culture and staying hopeful for the future.

So in order to dispel the misconceptions about my native Africa, I use design as a vehicle to tell stories -- stories of joy, stories of triumph, stories of perseverance in the midst of Africa's diaspora.

With these stories, I hope to correct the wrongs of history, because no matter where we come from, we've all been touched by the complex histories of families who were forced to move to other countries.

This history has shaped the way we see the world, and that way of thinking has given rise to many prejudices.

To break down this prejudice, my work uses beauty styles from around the world to highlight the importance of fighting for a world without prejudice.

By merging European design classics with African aesthetics, we can put black people in the center and portray them with a dignity they never had before.

It's upending the historically accepted narrative that Africans are inferior and inspiring blacks who have become wary of being seen as unsophisticated and inelegant.

This is how subversive fabrics are made into clothes and scarves that I happen to be wearing.

(Laughter) While framed by European classicism, these narratives boldly promote African empowerment.

In this way, the virtuoso's tools become masterpieces to honor those who were once oppressed.

This metaphor extends beyond the world of art to the real world.

Whether it's a refugee or an innovative entrepreneur wearing this garment, when people have the freedom to express themselves as they are, in ways that allow them to fully express their individuality, something magical happens.

keep your chest up

You can take pride in it because it represents your true, authentic self.

And you'll inspire others to open up and be more tolerant of differing opinions.

In this way, the clothes we wear can become a diplomatic soft power.

Clothing can be a bridge between cultures that seem divided.

So, on the surface, I'm just a clothing designer.

My work has always meant more than fashion.

Our goal is to reframe our cultural narratives so that we have a new and nuanced understanding of black people so that we -- proud sub-Saharan Africans -- can go out into the world with pride and pride.

Yes, history has been told by the winners of the past, but I am the new generation.

My designs speak to those who look to the future without worrying about the past.

We are now ready to tell our story without compromise or shyness.

The question that remains is this: Are you ready to listen?

Be prepared, for we will speak anyway

(applause)