

Trailblazers with Walter Isaacson

Conservation

Theodore Roosevelt was 24 years old when he killed his first buffalo.

The year was 1883.

The place, Little Cannonball Creek in Montana.

The great outdoorsman and future president was so excited by his triumph that he danced around the bison's carcass in celebration.

Six years later, Theodore Roosevelt killed his second buffalo, but this time, his reaction was considerably more muted.

He later wrote that as he watched the great beasts he felt the eager excitement of the hunter mixed with a certain "half-melancholy feeling", knowing that the herds of bison, which had once numbered in the tens of millions on the Great Plains, were nearing extinction.

By the time Theodore Roosevelt became president in 1901, only about a thousand bison remained, and his "half-melancholy feeling" about the buffalo's extinction had morphed into a full blown determination to do something to save them.

He pressured Congress to provide funds to secure land and promote bison reintroduction projects.

Slowly, their numbers returned.

Today, several hundred thousand buffalo roam private and public lands throughout the U.S. and their numbers are growing.

In his autobiography, Theodore Roosevelt wrote that he considers his efforts to save the American buffalo to be among his most important accomplishments as president.

The story of the American bison had a happy ending.

Sadly, most stories about species facing extinction today do not.

The list of fish, animals, plants, insects and birds that scientists consider to be endangered is very long and getting longer.

Urbanization, industrialization, climate change, and poor planning all continue to take their toll.

And while political leadership of the sort shown by Theodore Roosevelt is still an important part of the struggle to preserve and conserve our natural heritage, conservationists can't do it alone.

Today, technology is increasingly seen as a critical piece of the puzzle.

Researchers are using cell phones to protect African elephants from poachers, facial recognition software to track the movement of whales, they're putting tiny radio transmitters on the backs of endangered birds, and even using cutting edge genome research to bring back species that have long been extinct.

Using next generation technology to solve many of the problems caused by an earlier generation of technology.

It sounds counter-intuitive, but it's working.

I'm Walter Issacson and you're listening to Trailblazers, an original podcast from Dell Technologies.

Theodore Roosevelt was arguably the most dedicated conservationist to ever occupy the White House.

In addition to helping save the American bison, he expanded the National Park system, and established more than fifty federal bird preserves.

In 1905, he created the United States Forest Service to manage America's forests, and chose Gifford Pinchot, a forester from Connecticut, to run it. They believed that forests, if carefully managed, could serve both private commercial interests, and the public's desire to commune with nature.

Roosevelt and Pinchot were part of a small but vocal group of politicians, civil servants, writers, naturalists and academics who, in the

late 19th and early 20th centuries, struggled to convince Americans to pay closer attention to the impact that industrialization and urbanization were having on their water, air and land.

Their critics accused them of trying to turn the clock back to a pre-modern world without cities or industry.

But Adam Rome believes that doesn't accurately reflect how these early conservationists *actually* felt about using technology to solve environmental problems.

Adam Rome is an environmental historian at the University of Buffalo.

Adam Rome

(7:47) I think actually there's a lot of misunderstanding about that. The preservationist impulse out of context sounds anti-modernist.but I don't think so. I often tell my students, there's an old Alka Seltzer commercial where a guy's eaten a sausage sub and he's gotten indigestion. "Oh my God, Oh my God, I ate the whole thing." The solution is not to stop eating the sausages. That would be unAmerican, The solution is to take a pill that then allows you to go back to eat them whenever you feel like it. That's really what the preservation movement was like. Hardly anyone at least wanted to give up the modern city and industry and the growing place in the world that America was achieving because of both. But they thought that the cities were making them sick and they needed the antidote to that. So I don't really think it was a rejection at all of modern life. It was a way of accommodating to the stresses of modern life which seems to be quite different.

By the 1920's, the concerns raised by conservationists like Theodore Roosevelt were beginning to fade from the American political consciousness.

It was not until the 1960s that a new wave of environmental awareness emerged, and at the core of the new environmentalism was a deep-seated suspicion of technology.

There was a growing awareness that many of the miraculous technologies that had fueled the post World War II economic boom had serious potential downsides.

Splitting the atom may have won the war and nuclear power was now heating our homes, but at what cost?

Pesticides greatly increased crop yields, making food cheaper and more plentiful, but those chemicals were polluting the soil and water.

In the 1960's and 70's, hundreds of thousands of young people turned their backs on technology and moved to the countryside in a massive back to the land movement.

When it came to conservation and preservation, technology was widely seen as the problem, not the solution.

But that slowly began to change, thanks to some trailblazing conservationists and the technology they pioneered.

Philippe Cousteau

(.05) My name is Philippe Cousteau and I'm an environmental advocate and the founder of Earth Echo International.

Philippe Cousteau is a third generation environmental activist.

His father, Philippe Cousteau Sr., was a filmmaker and oceanographer, and much of what we know about the ocean today is due to the incredible work of his grandfather, the legendary Jacques Cousteau.

Jacques Cousteau's story began in 1943, when he teamed up with engineer Emile Gagnan to develop an autonomous underwater breathing apparatus.

They called it the AquaLung.

Today, we call it a scuba tank, and it opened the eyes of the world to what was happening under the ocean surface.

Philippe Cousteau

(app. 15:00) *I think this is hard for a lot of people today to realize that before my grandfather co-invented the aqualung or scuba diving, that the only way people could really explore the ocean was either breath-hold diving or with those old hard helmets, the big copper ones that you see in old movies or in the 20,000 Leagues Under the Sea or reading books. There were hard helmets ~~that were in a suit~~ that were attached to a suit and you had big lead boots and you'd clump around on the bottom with a hose to the surface and guys on board of a ship pumping a huge, essentially a generator to pump air down the hose into your suit. That was how we explored the ocean.*

Until Jacques Cousteau and his AquaLung came along, the only people exploring the ocean in a serious way were military personnel and salvage divers, and neither of those groups had conservation as their primary focus.

Philippe Cousteau

(19:54) *-he was a pioneer from an ocean conservation perspective. Terrestrial conservation has been a concept that had been around for a long time. Ocean conservation not so much..... Part of that was the fact that we really didn't understand anything about the ocean.All we knew about the ocean was what we pulled out in fish and what we dumped in and trash. It was my grandfather who opened people's eyes to (a) what existed there. It's hard for people to imagine. We grew up with Nemo and Shamu and Flipper and images of sharks and coral reefs. We take all of that for granted today..... 75 years ago this year, when my grandfather co-invented scuba diving and the aqua lung, nobody knew what any of those things looked like..... It was an alien world and there was no real sense of needing to protect it until he came along with my father and grandfather and other early pioneers that they worked with that were starting to do oceanography and science.... There was nobody that was really ringing this alarm bell about the decline in the health of the oceans, and that's really what he and my father helped to contribute to from a conservation perspective and on this planet.*

Jacques Cousteau's initial interest in ocean exploration was not centred on conservation.

He was a filmmaker and the AquaLung allowed him to spend more time underwater with his camera photographing fish and coral.

But by the 1960's, Cousteau realized that the ocean life that he loved so much was in danger of disappearing.

That revelation occurred after a diving trip to the Red Sea with his son, Phillippe Sr.

Philippe Cousteau

(app. 18:30) I remember the story that he told me is in the 1960s after several years of not visiting some of his old haunts in the Mediterranean and in the Red Sea and diving in those places, he went back to them and saw even in that period of time, that between the 1950s and 1960s that there was a huge devastation in the ocean life in those areas. The reefs had been destroyed. The fishing had disappeared because post World War II we saw a massive increase in industrial development, in fishing and population growth and so huge pressures on the ocean unlike ever before. He and my father both were so devastated by what they saw. They came back from the expedition. It was really my father who said "father, this is no longer about exploration. This is about conservation". He convinced my grandfather and so then they embarked on this journey of really being as Ted Turner called my grandfather, the grandfather of ocean conservation. That was really the next problem for them to solve was they saw the declining health of the ocean and how could they do something about it.

Jacques Cousteau inspired generations of researchers.

But for a very long time, many of those researchers remained suspicious of technology and employed only the most basic technological tools to solve the ocean's problems.

It was well into the current century before that began to change.

Shah Selbe saw it happen first hand.

He was an engineer working in the space industry when he decided to go back to graduate school to figure out how he could apply his engineering skills to help save the planet.

At Stanford and joined a group called The Center for Ocean Solutions, which was looking at ways to solve the problem of illegal fishing on the high seas.

Shah Selbe

(1:20) I started recommending a bunch of technologies that I thought could help in certain areas. A lot of times this was kind of rather new. I'd be in this room full of biologists and environmental lawyers talking about conservation issues, and I was the sole engineer in there and using words like drone that at that time people thought about the wars that were happening in Afghanistan and Iraq and those sorts of drones. So, drone wasn't as common as it is today. People didn't get it for Christmas presents or anything like that. It was a bit of a paradigm shift at that time. Slowly through like talking to more people, working with different organizations, volunteering my time in some places, helping them think through technology strategy, the entire industry started to slowly embrace this as technology's got easier, cheaper, faster to prototype and develop and deploy. It really created this massive shift in the entire industry.

Shah Selbe has spent much of the past decade helping researchers overcome their skepticism towards technology.

His projects use satellite data, drones, smartphone apps, and sensors to address issues like illegal poaching.

He is part of a small but growing group of researchers who call themselves “conservation technologists”.

The fact that that title even exists is perhaps the clearest indication of how much the paradigm has shifted.

Shah Selbe

(20:00) This was one of my goals when I started working in this space is how do we make sure that conservation technology becomes the norm and not something that's obscure and strange. I think during my time in working this field, we've seen exactly that. I meet people all the time that now consider themselves conservation technologists, which was quite different when there was just a handful of us calling us that in the beginning..... (20:30) I believe that technology is going to be increasingly important as these threats that we face start to accelerate, particularly with respect to extinction and climate change. I think those are some of the biggest challenges we're facing as humans and that there's no way we can do it without some help from technology.

Today, drones, sensors, and sophisticated cameras are essential parts of the environmental toolkit.

They are found not just among Silicon Valley startups, but inside some of the oldest and most venerable conservation organizations in the world.

Iain Douglas Hamilton

(.06) My name is Iain Douglas Hamilton, and I'm the founder of Save the Elephants.

Iain Douglas Hamilton made his first trip to Africa in the summer of 1963.

He was a 23 year old zoology student at Oxford, when he arrived in the Serengeti region of northern Tanzania to assist a researcher who was doing a PhD on wildebeests.

It was an exciting time to be in Africa studying animals in the wild.

A handful of pioneering scientists were already there.

Jane Goodall was living among the chimpanzees.

George Schaller was focusing on gorillas.

Iain Douglas Hamilton dreamed about being part of that group.

He wanted to study lions.

It didn't work out.

Iain Douglas Hamilton

(2:20) I wanted to come out and study lions and be the first person to do it, but I'd met this director of the Tanzania National Parks. When I put it to him, he said, "Sorry, Iain. I'm afraid that's not possible. We've got George Schaller coming to do that. But," he said, "if you like, you could study elephants in this small national park called Lake Manyara National Park on the edge of a very beautiful lake." He said that I could have an old car and a shack to live in. If I could raise the money and come out and do it, I'd be welcome. I threw myself into finishing my studies and got a scholarship to come out and plunged into the world of elephants.

It was a decision that has likely saved the lives of thousands of African elephants.

When Iain Douglas Hamilton returned to Africa from Oxford in 1972, he was shocked by what he found.

His beloved elephants were in dire straits.

Iain Douglas Hamilton

(12:58) *The situation for elephants had radically changed. It all began in Kenya where the price of ivory streaked up through the roof and everybody started shooting elephants who could. In those days it was legal to hunt them so everybody ... Lots of people who normally never shot them got a license because the price of ivory was so high. At the same time, there was a lot of illegal poaching, not so-called sport hunting. The elephants started nosediving in some of the major national parks. At that time, I realized that I should do something about, ~~having~~ ... We'd written a book and we've made a film. By the mid 70s we could become a voice talking about elephant problems.*

Iain Douglas Hamilton has spent the last 45 years talking about elephant problems and helping solve them.

His organization, Save the Elephants, which he founded in 1993, has been at the cutting edge of innovation, using increasingly sophisticated technology to study elephant behavior and stay ahead of the poachers.

Iain Douglas Hamilton

(23:30) *We started the very first radio tracking using little beacon radios that sent out a pulse of VHF waves that could be picked up on a receiver and you could home in on where the elephant was. It's a quite lengthy procedure because for every elephant you could collect one or two elephants per day if you are lucky. It wasn't changed much until the GPS system was developed by the Americans as a military system of guidance. Now everybody has GPS in their cars and we fairly early on started putting GPS receivers on elephants. Instead of getting one reading every two weeks, which was considered intensive, we got one reading every hour and now even less than hour. Literally, we can get a continuous flow of information on elephants. That's been absolutely radical in improving our understanding of how elephants move, where they live, how they cross from one favorite place to another, what are the vital corridors. Then on another aspect, it is allowed us to share this information with people who are protecting the elephants and hugely increase the efficiency of their patrolling, which can now be also based on movements of the elephants as an extra factor.*

Today, researchers and park rangers can track the movement of individual elephants on their smartphones.

Sensors and accelerometers allow them to instantly identify when an elephant is in distress.

Machine learning algorithms will eventually allow even more sophisticated observations.

And while the threat of poaching has not been eliminated, technology has made life much more difficult and dangerous for prospective poachers.

And it has allowed us to learn more about elephant behavior than Iain Douglas Hamilton could ever have imagined when he first started studying them in the wild 50 years ago.

And while he celebrates the success that technology has brought, Iain Douglas Hamilton believes there's still no substitute for the kind of good old fashioned field work that first got him hooked on elephants back then.

Iain Douglas Hamilton

(40:52) Yes, it has been extraordinary. Everything is improving. But, at the same time, I think we have to keep our feet on the ground and check up that we're not diving too deeply into the world of models and models only, because we want real animals and real data..... I think it is still the same need for field observers in the field, actually looking at animals through binoculars. I mean, maybe that's making me anti-delusion, I don't know. But, I do believe it's important. We can't only look at proxies for what's going on that will fit into the model. We have to always root ourselves back in direct observation, whether it's a machine that's doing the observing, or it's us. We have to keep very closely in touch with natural processes in nature.

But what if the elephants you're hoping to study or save from extinction can't be observed through binoculars?

Not because they're too rare or too elusive, but because they're already extinct, and have been for about 4000 years.

Surely there's nothing we can do about that.

Well, don't be so sure.

Stewart Brand

My name is Stewart Brand. I don't know. How do you want to identify me?

There are lots of different ways of identifying Stewart Brand, but let's start by calling him one of the most influential Americans of the past half century.

In 1968 he started The Whole Earth Catalogue, a magazine that perfectly captured the zeitgeist of the back-to-the-land movement. It offered the young counter-culture communards tools to survive in a strange and sometimes hostile environment.

Most of those tools were decidedly low tech, but Stewart Brand was also one of the first to understand that personal computers could be a tool of empowerment, and could be used to form virtual communities as meaningful as the ones being forged by the back to the landers.

Today, Stewart Brand is still focused on developing tools; technological tools to help solve some of the most pressing environmental issues of our day.

And that now includes finding ways to not just save species that are close to extinction, but to bring back those like the woolly mammoth that haven't been seen on this planet in millennia.

Stewart Brand

(1:30) The deal with elephants is they used to live absolutely everywhere,.... They were [00:02:00] especially important in everywhere in the Arctic and Subarctic, in Northern Canada, and Siberia, and so on. They were an essential part of the ecosystem there....when we got the warming after the passing of the last Ice Age, the last glaciation, mainly we killed off most of the large [00:02:30] animals, large megafauna, of the Arctic and Subarctic, including the woolly mammoths that were there....

In 2012, Stewart Brand and his wife Ryan Phelan founded a nonprofit organization called Revive and Restore, with the audacious goal of using cutting edge genomic technology to save species that are currently nearing extinction, like the black footed ferret, and revive long extinct species like the passenger pigeon and the woolly mammoth.

Stewart Brand

(23:29) In a sense Revive and Restore is all about access to genetic and biotechnology tools for conservation purposes..... I want the innovators in biotechnology to have conservation in mind as they develop the tools from scratch, the way they have biomedicine in mind now, the way they have agriculture in mind. This is the nature of the [00:24:30] Anthropocene, is humans have an enormous role to do harm and an increasingly important capability to undo harm. And so that's the side I'm on.

The idea of using biotechnology to revive extinct species was sparked by a conversation that Stewart Brand and Ryan Phelan had with acclaimed Harvard geneticist and molecular engineer George Church back in 2010.

Ryan Phelan is the co-founder of Revive and Restore.

Ryan Phelan

(2:30) At one point, George Church actually showed Stewart and I the kind of the state of the art at Harvard for genetically altering more than one trait at a time. He opined and Stuart asked, "Could you use something like this to actually bring back an extinct species if you had the skeleton of the scaffold of the [00:03:00] closely related species?" And George very clearly said, "Absolutely. This is where the technology's going." One thing led to another. We just kept asking more questions and George kept showing us more and more opportunity for advancing the field of genomic engineering for conservation.

So how do you revive the woolly mammoth?

The short answer is “very carefully”.

What George Church and his colleagues are doing is basically using gene editing techniques like CRISPR to introduce woolly mammoth genes into Asian elephant cell lines.

Asian elephants are genetically closer to the woolly mammoth than those found in Africa.

With each edit, the Asian elephant more closely resembles the genetic make-up of the woolly mammoth, adapted to survive in the sub-zero temperatures where the woolly mammoth once roamed, and may one day roam again.

So far, all this is just happening in the lab, but the project, even in this early stage, is not without its critics.

Some argue that the money and time being spent reviving extinct species would be better spent trying to save endangered species that are still with us.

And once we get used to the idea that extinction is not forever, we may not pay enough attention to saving those endangered species.

And many people are simply uncomfortable with the ethics and morality of manipulating the genetic code of large mammals.

After all, “don’t mess with mother nature” is a maxim that many people subscribe to.

But Stewart Brand is not one of those people.

Stewart Brand

(26:30) Well, Mother Nature is [00:27:00] a bitch. Mother Nature messes with itself, with us, with all these things. We did not have any problem messing with Mother Nature when we got rid of smallpox. I don't think we have any problem with trying to mess with Mother Nature in getting rid of the Guinea worm, cause of the Guinea worm sickness in Africa. [00:27:30] Mother Nature mostly is entirely resilient and robust. There's a lot of thought that it's very fragile and we have to be careful or it will break. Happily, I'm trained as an ecologist and I've done a certain amount of fieldwork and I've been around a lot of field biologists and what you keep finding is that nature is incredibly robust, incredibly active up to all sorts of things that we're still discovering.

The odds of success for the woolly mammoth project are very long.

This is uncharted territory.

Lots can go wrong.

Ecosystems are messy, murky and highly complex.

If anything is certain, it’s that genetically engineering nature will probably not go as intended.

And for many people all those unknowns are sufficient reason to avoid bringing biotechnology into conservation.

Ryan Phelan understands the risks, but she rejects the idea that they can't be successfully managed.

Ryan Phelan

(32:00) I believe that is the case, that what is out there in the zeitgeist is this idea that every time man interferes, we get it wrong. It's very doomsday. That's just not true. There are many, many cases, literally hundreds of biocontrols being used by the agricultural [00:32:30] field, in all the vegetation that is part of our common diet, that has been done through humankind influence, that we consider benign or beneficial. I think what I'm excited about trying to unearth is not just to quantify the number of how many times we get it right, and how many times we get it wrong. But, what makes for right, [00:33:00] what are those ingredients? What is the criteria? What's the best practice? When we get it wrong, were there ways that we could've seen that in the works, and mitigated it much earlier on? This is this idea of really establishing best practices and standards for this field.

Maybe one day, probably not in our lifetime, some variation of the woolly mammoth will once again be roaming the arctic permafrost.

If it happens, it would probably rank as one of the great scientific achievements of all time.

But then what?

For environmental historians like Adam Rome of the University of Buffalo, it's the unintended consequences of applying cutting edge technology to conservation that we need to pay more attention to.

Adam Rome

(25:30) I think that if there's one thing that we should learn from the 20th century and that will help us in the 21st it's that, that, that technology, miraculous as it is, never has only the intended consequence..... (19:00) There's a long record now of technologies that

appeared to solve problems that have caused others. I mean the auto is a perfect example. In 1900 the problem that people talked about a lot was horses in cities. They were shitting all over the place and they died and then their carcasses would sit in the road for days and they are surrounded by flies.....The automobile solved that problem. We don't have horses in cities anymore but it created a whole bunch of other problems as well as other opportunities.

Adam Rome believes the key ingredient that is too often missing in the discussion of technology and the environment is humility.

Computers, satellites, devices that detect and measure toxins and pollutants, have all allowed us to gain a far greater understanding of problems from climate change to biodiversity than we ever thought possible.

But along with those benefits, we still have to be mindful of the overall environmental effects of technology, which can be both positive and negative.

I'm Walter Issacson, and you've been listening to Trailblazers, an original podcast from Dell Technologies.

If you want to find out more about any of the guest on today's show, head to our website at delltechnologies.com/trailblazers.

Thanks for listening.