

Episode One: Out of Eden – Transcript

Drama reconstruction – Procession on mountainside/battle

Voiceover: Modern history has been shaped by conquest – the conquest of the world by Europeans. The Conquistadors led the way. A few hundred men came to the New World and decimated the native population. The secret of their success? Guns, Germs and Steel. Ever since, people of European origin have dominated the globe, with the same combination of military power, lethal microbes and advanced technology. But how did they develop these advantages in the first place? Why did the world ever become so unequal? These are questions that Professor Jared Diamond has spent more than 30 years trying to answer. One of the most original thinkers of our age, Diamond has traveled the world looking for clues. He set himself a daunting task – to peel back the layers of the past, and explore the very roots of power in the modern world.

Jared at Blacksmiths

Jared Diamond: Whatever I work on for the rest of my life, I can never work on questions as fascinating as the questions of guns, germs and steel, because they're the biggest questions of human history.

Voiceover: What separates the haves from the have nots? How have guns, germs and steel shaped the history of the world?

Titles: Episode 1: Out of Eden

Jared in boat on river, photographing birds

Voiceover: Jared Diamond's quest to uncover the roots of inequality began in the rainforests of Papua New Guinea.

Jared in rain forest with Papua New Guineans

Voiceover: Diamond is a professor at UCLA in Los Angeles. He's a biologist by training, a specialist in human physiology. But his real passion has always been the study of birds.

Jared Diamond: I love watching birds in this place. I began watching birds when I was seven years old in the United States. Then it was just a matter of identifying them. I came here when I was 26 years old, to New Guinea, and it was love at first sight.

Voiceover: Diamond has been making regular trips to New Guinea ever since..and is now a leading expert on the bird life of the island. But in the course of his fieldwork he's become just as curious about the people of New Guinea.

Jared Diamond: Over the years I've gotten to know and like thousands of New Guineans. I've learned several of the languages, and much of what I know about birds I picked up from them.

Voiceover: There have been people living in New Guinea for at least 40,000 years – much longer than on the continents of North and South America. They're among the most culturally diverse and adaptable people in the world. So why are they so much poorer than modern Americans? The question was put to Diamond bluntly by a man called Yali, whom he met on a beach more than 30 years ago.

Yali Voiceover: Why you white man have so much cargo and we New Guineans have so little?

Jared Diamond: Yali's question really threw me. It seemed so simple and obvious, and I thought it must have a simple and obvious answer, but when he asked me, I had no idea what that answer was.

Yali Voiceover: Why you white men have so much cargo and we New Guineans have so little?

Archive: B&W footage plane landing in New Guinea, New Guineans, white man with New Guineans

Archive: B&W still – New Guineans with Western objects

Archive: B&W footage New Guineans carrying goods and white men/with plane/walking

Voiceover: New Guineans use the word cargo to describe the material goods first brought to their country by Westerners. Cargo was regarded by many as evidence of the white man's power. It was treated with an almost religious reverence. For their part, Western colonials typically believed that power was determined by race. They saw themselves as genetically superior to the native population. To them, it was only natural that they should have so much cargo and New Guineans so little.

Jared Diamond: To me, any explanation based on race is absurd. I know too many really smart New Guineans to believe there's anything genetically inferior about them. It's their ingenuity and their quickness to learn that have always impressed me. They can go empty-handed into some of the most difficult environments on earth, knock up a shelter in a few hours and survive. I wouldn't know where to start. In this environment I'd be helpless without them. So

why didn't these ingenious people invent metal tools, or build great cities, or develop any of the other trappings of modern civilization?

High-speed shots New York City street scenes

Jared Diamond: The world that I'm from is so different. The modern U.S. is the richest, most powerful state on earth. It's crammed with more cargo than most New Guineans could ever imagine. But why? That's what Yali wanted to know. How did our worlds ever come so different?

Ancient Egyptian structures

Voiceover: Diamond realized that Yali's question was far bigger and more complex than it first appeared. It was really about the roots of inequality – a question as old as human history itself.

Greek and Roman ruins, Mayan sculpture

Jared Diamond: Why, since ancient times, have some societies progressed faster than others? What allowed the Egyptians to build great pyramids while most of the world was still scratching out a living? How did the Greeks ever develop such an advanced civilization? Or the Romans? Or the Maya?

Jared Diamond: All great civilizations have had some things in common – advanced technology, large populations, and well-organized workforce. If I could understand how those things came into existence, then I'd understand why some people marched faster than others during the course of history.

Globes in darkened room, pan across to Jared reading

Voiceover: Diamond set out to explore the division of the world into haves and have nots. It was a massive challenge that few scholars would have dared take on. He was a scientist, not a historian. How could he possibly solve the great puzzles of human history?

Graphic showing earth from space

Voiceover: To understand where inequality came from, Diamond needed to identify a time before inequality, when people across the world were living more or less the same way. He had to turn back the clock thousands of years, back before the first civilizations. Back into prehistory. 13,000 years ago, the ravages of the last Ice Age were over. The world was becoming warmer and wetter. One area where humans were thriving was the Middle

East. 13,000 years ago, the Middle East was far less arid than today, with more forests, trees and plants. People here lived like people everywhere at this time – as hunter/gatherers in small, mobile groups. They were frequently on the move, making shelters wherever they could find animals to hunt or plants to gather. They'd live in these shelters for weeks or months at a time, as long as they could keep feeding themselves. But as seasons changed and animals migrated, they'd move on, to the next valley or ridge, looking for new sources of food.

New Guineans and Jared hunting in rainforest

Voiceover: One of the few places on earth where it's still possible to find people hunting and gathering is the rainforest of Papua New Guinea.

Jared Diamond: Instead of just reading about this lifestyle in archaeological books, I've been lucky enough to witness it first hand, to see for myself how we all lived 13,000 years ago, and how we found food. To catch an animal requires skill, stealth, and encyclopedic knowledge about hundreds of animal species. You have to be pretty smart to be a hunter.

Early Middle Eastern people hunting deer

Voiceover: 13,000 years ago, people in the Middle East hunted in the same way, tracking down whatever game they could find. But the fundamental problem with hunting is that it's never been a productive way to find enough food. It takes time to track each animal. And with a bow and arrow, there's no certainty of how the hunt will end.

Jared learning to fire arrows with New Guineans

Voiceover: Because hunting is so unpredictable, traditional societies have usually relied more on gathering. In this part of Papua New Guinea, the gathering is done by women. An important source of food here is wild sago. By stripping a sago tree they can get to the pulp at the centre, which can be turned into dough and then cooked. Although it's physically harder work, gathering is generally a more productive way of finding food than hunting. But it still doesn't provide enough calories to support a large population.

Jared Diamond: This jungle around us, you might think it's a cornucopia, but it isn't. Most of these trees in the jungle don't yield, don't give us anything edible. There were just a few sago trees, and the rest of these trees don't yield anything that we could eat.

And then sago itself has got limitations – one tree yields only maybe about 70 pounds of sago. It takes them three or four days to process that tree, so it's a lot of work really for not a great deal of food, plus the sago starch is low on protein, and also the sago can't be stored for a long time.

And that's why hunter/gatherer populations are so sparse. If you want to feed a lot of people, you've got to find a different food supply, you've got to find a really productive environment, and it's not going to be a sago swamp.

Cereal crop being harvested

Voiceover: In the Middle East, there were very different plants to gather. Growing wild between the trees were two cereal grasses, barley and wheat. Far more plentiful and nutritious than sago. These simple grasses would have a profound impact, setting humanity on the course towards modern civilization. But it would take a catastrophic change in the climate before this would happen.

Graphic showing earth from space with ice spreading

Voiceover: 12,500 years ago, the world's climate became highly volatile. The long-term thaw that had brought about the end of the last ice age suddenly went into reverse. Global temperatures dropped, and ice age conditions returned.

Rocky mountainsides with people standing and walking

Voiceover: The world became colder and drier. The Middle East suffered an environmental collapse. Animal herds died off. So did many trees and plants. The drought lasted for more than 1,000 years. People were forced to travel farther and look much harder for any source of food. But despite the conditions, they would somehow survive, even prosper. Here in the Middle East, a new way of life would come into being, one that would change the face of the earth.

SUV driving through desert to dig site, Ian Kuijt driving

Voiceover: Ian Kuijt is a Canadian archaeologist who specializes in the Stone Age history of the Middle East. His work has focused on a site in the Jordan Valley, near the Dead Sea – a place known as Dhra'. Kuijt is a co-director of the dig, and works with an international team of archaeologists. They've uncovered the remains of ancient dwellings that were clearly more sophisticated than any hunter/gatherer shelters. They believe this was a small village, one of the earliest permanent villages anywhere in the world. People were starting to put down roots.

Dr Ian Kuijt, Notre Dame University: What we would have had is this village of, I don't know, 40, 50 people, living in the same place. We would have had a series of oval huts that would have been partially cut into the ground, and these would have been very much the, the first time people settled down and lived in communities in a really extensive way.

Voiceover: When they radiocarbon dated the site, they discovered that the village first emerged 11,500 years ago – at the same time as the end of the drought in the Middle East. But how was it possible to feed an entire village if times were so hard? After four years of digging at Dhra', the archaeologists believe they have an answer. It lies in this unique structure.

Ian Kuijt: What you can see here is the outline of a mud wall coming all the way round here, and then inside we have a series of upright stones that have been chipped in such a way where you can see a notch on them, and there would have been a series of beams over the top of that, with a floor across it, and basically you would have had a dry, humidity-controlled environment, where they could take grain, they could take any plants, they could dry them out, put them in here, protect them from insects, protect them from moisture, protect them from water percolating through. What that ends up being from our perspective is probably the world's first granary in some form – a place where they were able to store food at a particular location on a year-round basis.

Computer Generated Image showing likely construction of original building, people harvesting grain, mountain-sides, people sowing crops

Voiceover: The team at Dhra' believes the granary was an oval-shaped mud wall building at the centre of the village; a place where grain could be stored collectively. And the grains that were being stored were primarily wheat and barley. While other plants were no longer available, these cereal grasses were hardy enough to survive, and durable enough to be stored for years. But if this was a time of scarcity, how was there enough grain to fill a granary? The answer suggests a radical shift in human behavior. At some point during the drought in the Middle East, people started growing their own food. Unable to maintain a mobile way of life, they would have stayed close to any source of water they could find, and planted new fields of wheat and barley around them.

Ian Kuijt: Rather than just following food sources around different locations, for the first time what people start to do is that they bring these resources back to them. Not just as harvested food, but they're bringing them as seeds, and they're growing them next to their village, and that's the first time, really this is the first time we see this anywhere in the world.

Voiceover: The Stone Age people of the Middle East were becoming farmers – the first farmers in the world.

High-speed footage of plants growing

Voiceover: Without realizing it, these new farmers were changing the very nature of the crops around them. With every round of planting and harvesting, they'd favor ears of wheat and barley whose seeds were the biggest, tastiest or easiest to harvest. Traits that were useless to the plant in the wild thrived under human cultivation.

Ian Kujit: They interrupted the cycle. They interrupted the normal environmental cycle and started to select these individual plants and basically rewarding those that were going to be most profitable to them, and so even though it was accidental, once that whole process started, people were starting to control nature.

Crop laboratory with scientists working and early Middle Eastern crop harvesting

Voiceover: The way crops are changed by human interference is known as domestication. Today it happens in research labs, with scientists selecting genes and breeding crops to be ever more useful to humans. It's a very precise, deliberate process. But not so different from what the first farmers were doing unconsciously, thousands of years ago in the Middle East.

Jared in boat on river, New Guineans hunting, Women with sago, Plane taking off, View from airplane

Jared Diamond: The transition to farming was clearly a decisive turning point in human history. People who remained hunter/gatherers couldn't produce anywhere near as much food as farmers, and also couldn't produce much food that could be stored. They were always going to be at a chronic disadvantage. Now I needed to know where else in the ancient world people had become farmers. If I could establish links between the spread of farming and the spread of civilization, I'd be well on my way to answering Yali's question.

Graphic showing earth from space with areas of crop cultivation

Voiceover: There are only a few parts of the ancient world that developed farming independently. Not long after the Middle East came China, where people grew another high yield cereal grass – rice. Pockets of farming also emerged in the Americas, based on corn, squash and beans. Later, in Africa, people farmed sorghum, millet and yams. And in most places where farming emerged, a relatively large, advanced civilization followed. But there was an exception to the rule. An area where farming didn't bring the same benefits – the highlands of New Guinea.

View of New Guinea from plane, New Guinean farmers working

Voiceover: For 50 years after Westerners colonized New Guinea, they thought the highland valleys in the interior were uninhabited. In fact, they were the most densely populated part of

the island, with one of the oldest systems of farming in the world. Archaeologists now believe that people have been farming here for almost 10,000 years – almost as long as the people of the Middle East.

Jared with crowd of New Guineans, New Guinean farmers working

Jared Diamond: It's amazing to think that these people, Yali's people, were some of the earliest farmers in the world. But if they were farmers, why weren't they propelled down the same path towards civilization as the people of the Middle East or China or Central America? Why didn't they end up producing their own cargo?

Voiceover: New Guinea farmers themselves were surely no less talented than farmers anywhere else in the world. So what was the difference?

Jared Diamond: Highland agriculture was based on crops like these taro roots, which are very different from cereal crops. Taro is much more work. You've got to plant it one by one, unlike wheat where you throw your hand and spread the seed, and these New Guinea crops can't be stored for years the way wheat can – they rot quickly, they have to be eaten in a short time. They're also low in protein compared to wheat, so these farmers of the New Guinea highlands suffered from protein deficiency.

People tending banana crops, giant spiders

Jared Diamond: There's not much protein to be gotten from New Guinea's other crops, either. People here farm local varieties of bananas, but although bananas are rich in sugar and starch, like taro they're low in protein. In fact, people in the highlands have so little protein that sometimes they eat giant spiders to supplement their diet.

Jared studying in room

Jared Diamond: I'd reached a moment of realization. Farming was clearly crucial to the story of human inequality. But, just as important was the type of farming. People around the world who had access to the most productive crops became the most productive farmers.

Voiceover: Ultimately it came down to geographic luck.

Archive: B&W footage mechanized crop harvesting, B&W footage bread production, B&W footage trains and cars, B&W footage New Guineans

Early Middle Eastern crop harvesting

Voiceover: It's an audacious idea that the inequalities of the world were born from the crops we eat. According to Jared Diamond, Americans have had an advantage over New Guineans because for centuries they've grown crops that are more nutritious and productive. Crops like wheat, which provides about a fifth of all the calories they eat. The wealth of modern America could never have been sustained by taro and bananas. But Diamond's idea seems almost too simple. Could plants alone really have the power to shape the course of human history? Or was there something else at play? Another reason for the division of the world into haves and have nots?

Woman grinding corn, people harvesting crops, goats being herded

Voiceover: By 9,000 years ago, the first settlements in the Middle East were giving way to much larger villages. People were only able to live on this scale by becoming more productive farmers. They were surrounded by fields of domesticated wheat and barley, but by now they also had another steady source of food.

Dr Louise Martin, Institute of Archaeology, University College London: What we see happening about 9,000 years ago is a remarkable transformation in the way that humans are interacting with animals. We begin to see a process of animal domestication, by which we mean humans were controlling where they were moving, they were controlling their feeding, and they were controlling their breeding. Instead of having to go out to hunt, you have a dependable meat supply on the hoof, year-round, around your site, rather than being subject to seasonal variations in wild game.

Goats being milked and combed

Voiceover: As well as meat, animals could be used for their milk, providing an ongoing source of protein. Their hair and skins could be used to make clothes for extra warmth. Over time, domestic animals became an integral part of the new agricultural way of life.

Goats being watched, people harvesting crops

Louise Martin: We know that the communities which first started to have domestic animals already had cereal crops, so they were cultivators, and the combination of these particular animals and plants becomes an extremely attractive package, in that they're complementary. After the harvest period, animals could be turned out on the stubble, and they can actually eat the remains of the cereal crop harvest. In their turn, animal dung can be used to provide sort of a fertilizer for the cereal crops as well, the crops, so the whole, the whole package, you know, is seen to be mutually beneficial, both for the animals and the plants and of course for the

humans.

Goats being milked and combed, Goats, sheep, pigs and cattle in fields, Mules pulling ploughs, New Guinean farmers working, with pig

Voiceover: Goats and sheep were the first animals to be domesticated in the ancient world, and were eventually followed by the other big farm animals of today. All of them were used at first for their meat, but they all prove useful in other ways, especially with the invention of the plough. Before the industrial revolution, beasts of burden were the most powerful machines on the planet. A horse or an ox, harnessed to a plough, could transform the productivity of the land, allowing farmers to grow more food and feed more people. In New Guinea and many other parts of the world, people never used ploughs because they never had the animals to pull them.

Pigs, New Guinean men carrying poles and farmers working

Jared Diamond: The only big domestic animal in New Guinea was the pig, and it wasn't even native – it came in from Asia a few thousand years ago – while Europe and Asia had not only pigs but also cows, sheep, goats, horses, buffalo, camels and so on. Now pigs do give you meat, but pigs don't give you the other products that you get from those European and Asian animals.

Voiceover: Pigs don't give you milk, or wool, or leather or hides, and most important of all, pigs can't be used for muscle power – pigs don't pull ploughs or pull carts. The only muscle power in New Guinea was human muscle power.

Jared studying

Jared Diamond: Even today, there are no beasts of burden in New Guinea, and almost all of the farm work is still done by hand. But if farm animals were so useful, why didn't New Guineans domesticate any of their own? I decided to add up all the animals in the world that have ever been domesticated, and I was amazed by what I found.

Animals of all kinds

Archive: B&W footage people chasing elephants

Voiceover: There are nearly two million known species of wild animals, but the vast majority has never been farmed. Most insects and rodents are of no practical use to humans, and not worth the effort of farming. Some birds, fish and reptiles have been domesticated, but most are simply impractical to farm. So are most carnivores, not because they're dangerous but because you'd have to grow other animals just to feed them. The best animals to farm are

large, plant-eating mammals. And over the years, humans have probably tried to domesticate all of them, usually without success. Despite repeated efforts, Africans have never domesticated the elephant.

Elephants at work

Voiceover: In South Asia, some elephants are used as work animals. But they're not farmed for the purpose. Instead, each elephant is caught in the wild and then tamed and trained. It doesn't make economic sense to farm an animal that takes some 15 years to mature and reach an age where it can start reproducing.

Horses in corral, Goats, Sheep, Camels, Water buffalo, Cattle

Louise Martin: Animals which made suitable candidates for domestication can start giving birth in their first or second years. They will have one or maybe two offspring a year, so they're productivity is actually high. Behaviorally they need to be social animals, meaning that the males and the females and the young all live together as a group, and they also have an internal social hierarchy, which means that if humans can control the leader, then they will also gain control over the whole herd or whole flock.

Wild animals, Zebra

Voiceover: There is another crucial requirement for a domestic animal. It needs to get along with humans. Some animals don't have the temperament to live on a farm. A zebra could be an ideal domestic animal, potentially as useful as a horse. But evolving in the midst of Africa's great predators, zebras have become flighty, nervous creatures. They have a vicious streak that humans have been unable to tame. That may be why zebras have never been harnessed to a plough or ridden into battle.

Montage: Wild animals, Domesticated animals

Graphic showing earth from space with highlighted areas

Jared Diamond: I counted up 148 different species of wild, plant-eating terrestrial mammals that weighed over 100 pounds, but of those 148, the number that has ever been successfully farmed for any length of time is just 14.

Voiceover: Goats, sheep, pigs, cows, horses, donkeys, Bactrian camels, Arabian camels, water buffalo, llamas, reindeer, yaks, mithans, and bali cattle. Just 14 large domestic animals in 10,000 years of domestication. And where did the ancestors of these animals come from? None was from New Guinea, or Australia. Or Sub-Saharan Africa, or the whole continent of North

America. South America had the ancestor of just one large domestic animal; the llama. The other 13 were all from Asia, North Africa and Europe. And of these, the big four livestock animals; cows, pigs, sheep and goats, were native to the Middle East. The very same area that was home to some of the best crops in the world was also home to some of the best animals. Little wonder that this area became known as the Fertile Crescent.

Sky, tilt down to village ruins with man walking, Man sowing seed, Goats, Guar site with ruins

Voiceover: The people of the Fertile Crescent were geographically blessed, with access to some of the best crops and farm animals in the ancient world. It gave them a huge head start. What had begun with the sowing of wheat and the penning of goats was leading towards the first human civilization. The archaeological site of Guar in Southern Jordan is 9,000 years old. But it has all the hallmarks of a town. A few hundred people lived here, in rows of houses that were a wonder of technology.

Dr Mohammad Najjar, Department of Antiquities, Jordan: Every time I come here, I'm amazed by what those people were doing. Some of the houses have a kind of air conditioning, a, this window here is for, to control the air coming from the street inside the house, and the houses, the walls and the floors of the houses from the inside at least, were covered with plaster.

People plastering walls

Mohammed Najjar: So people were moving to a concept of homes. It's, it's not a place just to sleep, it is a proper home, and people started to decorate the houses from the, from the inside, and people were starting to invest in their homes, because if we are talking about plaster, it is time-consuming, it's effort-consuming – it's very expensive to have plastered house.

People sowing seeds, making cement, weaving, making plaster

Voiceover: As villages grew bigger, there were more people to work on the land. More people could produce more food more efficiently – enough to support specialists within the community. Freed from the burden of farming, some people were able to develop new skills, and new technologies. Making plaster from limestone was a major technological breakthrough. The stones had to be heated for days at a time, at a temperature of 1,000 degrees. It may seem insignificant today, but understanding how to work with fire was the first step towards forging steel – a technology that would transform the world.

People making steel

Montage: steel-based products in use

Mountains of New Guinea, New Guinean farmers working

Voiceover: By contrast, places like New Guinea never developed advanced technology. Even today, some people in the highlands are working in ways that have barely changed for centuries.

Archive: B&W footage New Guineans working, Jared with axe, New Guinean farmers working

Jared Diamond: When I first came to New Guinea in the 1960s, people were still using stone tools like this axe in parts of the island, and before European arrival, people were using stone tools everywhere in New Guinea. So why didn't New Guinea develop metal tools by itself? And eventually I realized that to have metalworking specialists who can figure out how to smelt copper and iron, requires that the rest of the people in the society who were farmers, be able to generate enough food surpluses to feed them.

Voiceover: But New Guinea agriculture was not productive enough to generate those food surpluses, and the result was no specialists, no metalworkers, and no metal tools.

Archive: B&W footage New Guinean people building/creating/working/on water with plane

Voiceover: The way of life in New Guinea was perfectly viable. It had survived intact for thousands of years. But according to Diamond, people didn't advance technologically because they spent too much time and energy feeding themselves. And then Westerners arrived, and used their technology to colonize the country.

Pan across Middle Eastern mountains

Voiceover: Yet for all its advantages, the Fertile Crescent is not the powerhouse of the modern world, nor is it the bread basket it once was. How did it lose its head start?

Abandoned village

Voiceover: Within 1,000 years of their emergence, most of the new villages of the Fertile Crescent were abandoned. Ironically, the region had a fundamental weakness. Despite having some of the most nutritious crops on the planet, its climate was too dry, and its ecology too fragile, to support continuous intensive farming.

Arid landscape, Jordanian village site

Mohammed Najjar: People were destroying the environment. The waters had been over-exploited, the trees had been cut, and this is what when, when, when you, when you face the, the end, I mean you are facing the wall. You will end with landscape like that, mean with, with few trees, with no grass, and with less water. So what we are looking at today is the outcome of over-exploiting the environment.

People and goats walking, Craggy mountains, Sunset

Voiceover: Unable to farm their land, entire communities were forced to move on. The advantages they'd accrued from centuries of domestication might have been lost. But again, geography was on their side.

Graphic showing earth from space, with highlighted areas and arrows

Jared Diamond: The Fertile Crescent is on the middle of a huge land mass, Eurasia. There were plenty of places for farming to spread, and crucially, many of those places were to the east and west of the Fertile Crescent, at roughly the same line of latitude.

Computer Generated Image – landscape with arrows

Jared Diamond: Why's that so important? Because any two points of the globe that share the same latitude automatically share the same length of day, and they often share a similar climate and vegetation. Crops or animals domesticated in the Fertile Crescent were able to prosper at other places along the east/west axis of Eurasia. Wheat and barley, sheep and goats, cows and pigs all spread from the Fertile Crescent, east towards India and west towards North Africa and Europe. Wherever they went they transformed human societies.

Ancient Egyptian art showing farming

Voiceover: Once the crops and animals of the Fertile Crescent reached Egypt, they caused an explosion of civilization.

Ancient Egyptian farming and construction

Pharaoh in temple, Builders, Pyramids

Voiceover: Suddenly there was enough food to feed the pharaohs and generals, the engineers and scribes, and the armies of people required to build the pyramids.

Roman buildings and sculptures, Fireworks and fire-eaters, Ceiling of Sistine Chapel

Voiceover: The same is true of European civilization. From ancient times until the Renaissance, the crops and animals of the Fertile Crescent fed the artists, inventors and soldiers of Europe. In the 16th century, the same crops and animals were taken by Europeans to the New World. At the time there was not a single cow or ear of wheat in all the Americas. Now there are 100 million cattle in the US alone. And Americans consume 20 million tons of wheat a year.

Aerial view New York City at night

Voiceover: There are some who think Jared Diamond's argument is too neat and easy. Can the distribution of wealth and power really be reduced to cattle and wheat? What about culture, politics and religion? Surely they've been just as important? Diamond's been criticized for being too deterministic, for ignoring the part people have played in shaping their own destiny.

Jared in boat on river, New Guinean hunters, Women harvesting sago, Jared with New Guineans,
New Guinean farmers working

Jared Diamond: My years in New Guinea have convinced me that people around the world are fundamentally similar. Wherever you go, you can find people who are smart, resourceful and dynamic. No society has a monopoly on those traits. Of course there are huge cultural differences, but they're mainly the result of inequality, they're not its root cause. Ultimately what's far more important is the hand that people have been dealt, the raw materials they've had at their disposal.

Voiceover: New Guineans acquired pigs from Eurasia, but not cows or sheep or goats, or horses, or wheat or barley. They didn't develop in the same way as Europeans or Americans, because they didn't have the same raw materials.

New Guinean marketplace with throngs of people

Jared Diamond: I'm not saying that those divisions of the world are set in stone and can't be changed; it's quite the opposite. The towns of Papua New Guinea are becoming bigger and more developed, populated by modern New Guineans trying to keep up with the rest of the world. Unfortunately for them, there's still a big gap to overcome.

Yali asking question: Why you white man have so much cargo and we New Guineans have so little?

Jared Diamond: Yali caught me by surprise 30 years ago. I had no idea what to say to him then but now I think I know the answer. Yali it wasn't for lack of ingenuity that your people didn't

end up with modern technology. They had the ingenuity to master these difficult New Guinea environments. Instead the whole answer to your question was geography. If your people had enjoyed the same geographic advantages as my people, your people would have been the ones to invent helicopters.

Helicopter taking off, Jared in helicopter

Voiceover: Jared Diamond set out to explore the division of the world into haves and have nots. He's convinced the blueprint for that division lies within the land itself.

Conquistadors entering South American city and engaging locals in battle

Voiceover: But can his way of seeing the world really shed light on the turning points of human history?

Man firing gun to camera, Computer Generated Image of microbes, Swords

Voiceover: Can it explain how a few hundred Europeans conquered the New World, and began an age of domination? The age of guns, germs and steel.

Episode Two : Conquest – Transcript

Spanish coming into Inca city and challenging Ataxalpa

Voiceover: One day in November, 1532, the New World and the Old World collided...

Spaniards and Incas in battle, Spaniards moving on with captured Incas

Jared on river in boat, in helicopter, studying old maps

Voiceover: 168 Spaniards attacked the imperial army of the Incas in the highlands of Peru. Before the day was out, they had massacred 7,000 people, and taken control of the Inca Empire. Not a single Spanish life was lost in the process. Why was the balance of power so uneven between Old World and New? And why, in the centuries that followed, were Europeans the ones who conquered so much of the globe? These are questions that fascinate Professor Jared Diamond. He is on a quest to understand the roots of power, searching for clues in the most unlikely places. He's developed a highly original theory that what separates the winners from the losers is the land itself – geography. It was the shape of the continents, their crops and animals that allowed some cultures to flourish while others were left behind. But can this way

of seeing the world shed light on the events of 1532? How can geography explain the conquest of the world by guns, germs and steel?

Titles: Episode 2: Conquest

Conquistadors traveling, led by Pizarro, on mountainside

Voiceover: For two years, a band of Spanish conquistadors has been traveling in search of gold and glory. They're not professional soldiers, but mercenaries and adventurers, led by a retired army captain, Francisco Pizarro. He's already made a fortune for himself in the colonies of Central America. Now he's taking his men south, into unknown territory. They are the first Europeans to have climbed the Andes, and ventured this far into the continent of South America.

Pizarro and conquistadors finding local inhabitants

Voiceover: As they travel, they find evidence of a large native civilization. They've reached the edge of the mighty Inca Empire. For Indians and Spaniards alike, any encounter is a clash of cultures. These Indians have never seen white men before, and have no idea of the threat they represent. They can't imagine that within a few days, these strangers will turn their world upside down.

Earth from space, with highlighted areas

Voiceover: By the 1530s, the Inca Empire was enormous. It stretched along the length of the Andes, from modern-day Ecuador to central Chile, a distance of 2,500 miles. But just 500 miles to the north began the colonies of Central America and the Caribbean – prized possessions of the Spanish empire. At the time, the Spanish king controlled a third of mainland Europe, but Spain itself had only recently become a unified state, having fought off 700 years of occupation by Islamic Moors.

Pizarro's home, with Jared walking around it

Voiceover: It was still a rural society. Most of the conquistadors came from villages and small towns in the heart of the country; towns like Trujillo, where Pizarro grew up. He spent much of his childhood here, working as a swineherd in the fields nearby. Today he's remembered as a great warrior. His statue dominates the main square in Trujillo, and his family home has been turned into a museum. Jared Diamond has come here to explore the world of the conquistadors, and understand the secret of their success.

Statue of Pizarro

Jared Diamond: This is Francisco Pizarro, a Spaniard who conquered the most powerful state in the New World, the Inca Empire. Why did Pizarro and his men conquer the Incas instead of the other way round? It seems like a simple question. The answer isn't immediately obvious. After all, Pizarro started out as a rather ordinary person, and Trujillo here is a rather ordinary town. So what is it that gave Pizarro and his men this enormous power?

Pizarro and conquistadors traveling

Jared Diamond: Why am I so interested in Pizarro's conquistadors? Because their story is such a grimly successful example of European conquest. And for 30 years I've been exploring patterns of conquest.

Voiceover: Jared Diamond is a professor at UCLA in Los Angeles. But most of his fieldwork has been done in Papua New Guinea. His time there inspired him to explore the roots of inequality in the modern world. To understand why some people have been able to dominate and conquer others. Looking back thousands of years, he argues that farming gave some cultures an enormous head start, and those who were lucky enough to have the most productive crops and animals became the most productive farmers. Agriculture first developed in a part of the Middle East known as the Fertile Crescent. Over time, crops and animals from the Fertile Crescent spread into North Africa and Europe, where they triggered an explosion of civilization. By the 16th Century, European farms were dominated by livestock animals that had come from the Fertile Crescent. None were native to Europe. They provided more than just meat. They were a source of milk and wool, leather and manure. And crucially, they provided muscle power.

Mules pulling ploughs, Incas cultivating land as llamas look on, Conquistadors riding onto Inca land

Voiceover: Harnessed to a plough, a horse or an ox could transform the productivity of farmland. European farmers were able to grow more food to feed more people, who could then build bigger and more complex societies. In the New World, there were no horses or cattle for farming. All the work had to be done by hand. The only large domestic animal was the llama, but these docile creatures have never been harnessed to a plough. The Incas were very skilled at growing potatoes and corn, but because of their geography, they could never be as productive as European farmers. Horses gave Europeans another massive advantage – they could be ridden. To the Incas, the sight of Pizarro's conquistadors passing through their land is extraordinary. They've never seen people carried by their animals before. Some think they are

gods, these strange-looking men, part human, part beast. The horses that seemed so exotic to the Incas had already been used in Spain for 4,000 years. In an age before motorized transport, they allowed people to be mobile, and control their land.

Jared watching Javier riding

Voiceover: When Javier Martin is not herding cattle, he gives displays of traditional horsemanship.

Javier Martin: This style of riding is known as jimeta. The emphasis is on control and maneuverability, using bent knees to grip the sides of the horse, and only one hand on the reins. Very different from the more formal style of medieval knights. By the 16th century, the jimeta way of riding had become the dominant style of the Spanish cavalry. This is how the conquistadors would have ridden their horses.

Jared Diamond: It's an amazing display of a big animal being controlled by a person, precise control, stopping and starting and turning. Javier told me that he has been riding since he was five years old, and when I watched this, I have a better understanding where the conquistadors were coming from. They were masters of these techniques, and they learned these techniques for working with bulls, but the techniques were also good in a military context as well, and I can see that this control would let you ride down people in the open. People who had never seen horses before would have been absolutely terrified watching this. It would be strange and frightening, and that's even before one of these animals is rushing towards you, riding you down, about to lance you and kill you.

Inca messenger running to give news to Ataxalpa

Voiceover: News of the godlike strangers on their four-legged animals is taken by royal messenger to the emperor of the Incas, who's camped in the valley of Cajamarca in northern Peru, guarded by an army of 80,000 men.

Ataxalpa being beautified

Voiceover: Ataxalpa is revered as a living god, a son of the sun itself. He's in Cajamarca on a religious retreat, giving thanks for a series of recent military triumphs.

Messenger giving Ataxalpa the news

Voiceover: When he hears about the progress of the Spaniards, he chooses not to have them killed. Instead, he sends back a message. He invites them to join him in Cajamarca, as quickly as

possible.

Messenger running to give reply

Efrain Trelles, Historian: Ataxalpa wanted the Spaniards to come to Cajamarca and enter into a trap, and to be sure that they would do so; he played like a psychological game with them, sending presents, asking them to come. Ataxalpa knew that the Spaniards were not gods. The intelligence reports speak of people wearing wool on their faces, like a lamb or like an alpaca, they're just like an animal. Then they went from one place to the other wearing on top of their heads a little pot that has never been used for cooking.

You need to be crazy to walk with a pot, but you must be beyond salvation if you arrive to a camp and you don't use that pot to cook. Ataxalpa had an idea that these were sub-humans. What could a few horsemen and a hundred or so Spaniards do to the powerful Inca? Virtually nothing.

Art depicting Spanish in battle

Voiceover: But Ataxalpa's spies don't realize that the Spanish are armed with some of the best weapons in the world. At the time of the conquistadors, Spain had the biggest army in Europe, orchestrated from the imperial capital, Toledo. For more than 700 years the Spaniards had been at war, fighting against the Moors and other European armies. There was an arms race in Europe. To survive, the Spaniards needed to keep up with the latest in weapons technology.

Man and Jared firing and loading guns

Voiceover: By the 1530s, the Jacobus was an important part of the Spanish arsenal. Gunpowder had originally come from China, but its use as a weapon was pioneered by the Arabs. In European hands, guns became lighter and more portable, and were used for the first time by foot soldiers on the battlefield. The Jacobus was still a crude weapon, but would go on to change the face of warfare.

Jared Diamond: To us moderns, this gun doesn't seem useful for anything, it's like a joke. Its aim is terrible, it takes a long time to reload, and while the shooter's reloading it a swordsman would come in and kill him, but the Incas hadn't even gotten this far, and even this gun, with its sound and with the smell and with the smoke and with every now and then a person that it manages to kill, would have been terrifying to someone who had never seen this before. This would have been shock and awe, 1532 style.

Sword smith at work as Jared watches

Voiceover: For all its bluster, the technology of gunpowder was still in its infancy. The real power of the conquistadors lay elsewhere, with the production of steel. Toledo had some of the best sword smiths in the world. But why were people here able to craft deadly steel weapons, while the Incas were still making simple bronze tools?

Man handling sword

Jared Diamond: There was nothing innately brilliant about Europeans themselves that allowed them to be the ones to make high quality swords. Just as with guns, swords were the result of a long process of trial and error that began outside Europe. People started working with metal in the Fertile Crescent 7,000 years ago, and because Europe is geographically close to the fertile crescent, Europeans inherited this metal technology.

But they took this technology on to a new level. European soldiers demanded stronger, longer, sharper swords.

Jared Diamond: This is what a Toledo sword looks like when it's finished. This particular one is modeled on the sword that Pizarro carried. It's a fearsome weapon.

It's used for stabbing and it's also used for slashing, and I can easily understand how the person wielding the sword could kill dozens of people within a short time.

Mike Loads, Historical Weapons Expert: Swords like this, rapiers, represented a high point in a very sophisticated metalworking technology. You think about what the qualities are that are needed in a sword. First of all, it has to be hard enough, the metal has to be hard enough to take a sharp edge, and that requires steel that is iron infused with carbon, and the more carbon you put into the iron, then the harder the metal is. But if you make it too hard, then it's brittle, and that's no good because as you hit somebody, your sword would break, and so you also need your sword to have a certain pliability, an ability to bend and spring back into shape. And it's got by heating it to certain temperatures, plunging it into cold water, immense amount of experimentation, it took centuries to get to the level of sophistication where you could get something so long and elegant and fine, and deadly as the rapier.

Swordfight

Voiceover: The rapier, with its extra long blade, was developed as a dueling weapon, but became so fashionable in Renaissance Europe; it was the sword of choice for any aspiring gentleman.

Mike Loades: The word rapier derives from the Spanish term "espara ropera", and that means dress sword. And for the first time in Spain, we start to see people wearing the sword with their everyday clothing, their civilian dress, going about their everyday business. They didn't do that

in the Middle Ages. This is something new in the 16th century, and it's saying I have arrived, I am a gentleman, I am upwardly mobile, and I claim ancestry from the knights of the Middle Ages. It was very much a symbol of the conquistadors' aspiring greed. The thing that drove them through all their hardships, the thing that made them go to the Americas, was their lust for gold, their lust for self-advancement, and the rapier absolutely symbolized that overbearing avarice.

Conquistadors traveling, looking across valley to huge town and massed troops

Voiceover: On November 15th 1532, Pizarro's band of adventurers entered the valley of Cajamarca. They've been told that Ataxalpa is waiting for them here. But they're not prepared for the sight that greets them. In the hills beyond the town of Cajamarca is the imperial Inca army – 80,000 men in full battle order. The conquistadors' own journals bear witness to their first impressions.

Diary Reading: Their camp looked like a very beautiful city. We'd seen nothing like it in the Indies until then, and it scared us, because we were so few and so deep in this land.

Spanish entering Inca camp and being taken to Ataxalpa

Voiceover: Pizzaro sends a party of his best horsemen into the heart of the Inca camp. They are led by Captain De Soto. They are gambling that Ataxalpa will allow them to pass through the camp unharmed, and agree to meet them.

Efrain Trelles: Soto's visit had a very important psychological purpose; to intimidate the Inca in front of his people. Challenging him with the horse. Ataxalpa at first didn't react to Soto's presence, as if nobody had entered the room. Once the, the horse comes eye to eye with the Inca, the Inca is still calm, showing that the horse has no impact on him, calling Soto's bluff. The captain advanced so close that the horse's nostrils disturbed the fringe of the Inca's forehead. But the Inca never moved. And then, after a brief silence comes Ataxalpa's explosion. He was telling them, the time has come for you to pay.

I understand this as the time has come for you to pay with your lives. Soto I understand was nervous enough to come back with fear to the, the camp, and as we know, the Spaniards spent the night before in extreme fear.

Spaniards' camp at night

Voiceover: The conquistadors had made their camp in the town of Cajamarca. Many of them are now convinced they are facing oblivion. 168 soldiers, 1,000 miles from any other Spaniard,

facing an army of 80,000 Incas.

Diary Reading: Few of us slept that night. We kept walking the square, from where we could see the campfires of the Indian army. It was a fearful sight, like a brilliantly star-studded night.

Voiceover: Pizarro and his most trusted officers debate their options for how to deal with Ataxalpa. Some advise caution, but Pizarro insists their best chance is to launch a surprise attack the next day. It's a tactic that's worked successfully in the past. Twelve years before Pizarro went to Peru, another famous conquistador, Hernan Cortez, had gone to Mexico and encountered another formidable civilization; the Aztecs. He conquered the country by kidnapping the Aztec leader and exploiting the ensuing chaos. Cortez's story was later published and became a bestseller, a handbook for any would-be conquistador. It can still be found in the great library of Salamanca University in Northern Spain.

Jared Diamond: This wonderful library here can be thought of among other things as a repository of dirty tricks, because in these books are the accounts of what generals had been doing to other generals for thousands of years in the past and across much of Eurasia, and here from this library we have a famous account of the conquest of Mexico with all the details of what Cortez did to the Aztecs and what worked. That was a model for Pizarro to give him ideas what exactly to try out on the Incas, whereas the Incas without writing, had only local knowledge transmitted by oral memory, and they were unsophisticated and naïve compared to the Spaniards because of writing.

Voiceover: But if books were so useful, why couldn't the Incas read or write? To develop a new system of writing independently is an extremely complex process, and has happened very rarely in human history. It was first achieved by the Sumerian people of the Fertile Crescent at least 5,000 years ago. They pioneered an elaborate system of symbols called cuneiform, possibly as a way of recording farming transactions.

Ever since, almost every other written language of Europe and Asia has copied, adapted or simply been inspired by the basics of cuneiform. The spread of writing was helped enormously by the invention of paper, ink and moveable type, innovations that all came from outside Europe but were seized upon by Europeans in the Middle Ages to produce the ultimate transmitter of knowledge – the printing press. The written word could now spread quickly and accurately across Europe and Asia. The modern world would be impossible without the development of writing.

Jared studying maps

Voiceover: But there's another part of the world where a new system of writing was invented independently. In Southern Mexico, at least 2,500 years ago, native people developed a way of working with symbols that involved into the Mayan script. But if the Maya had writing, why didn't it spread south to the Andes and help the Incas become literate? For Diamond, the answer lies in the shape of the continents.

Jared Diamond: Here were Europe and Asia forming the continent of Eurasia, a giant continent but it's stretched out from east to west, and narrows from north to south. The American continent is long from north to south, narrow from east to west – very narrow at Panama where it narrows down to less than 100 miles. The two continents are of the same lengths, about 8,000 miles in maximum dimensions, but Eurasia is 8,000 miles from east to west, and the Americas are 8,000 miles from north to south, it's as if these continents were rotated 90 degrees of each other.

Voiceover: Diamond has already shown that crops and animals could spread easily east and west across Eurasia. Because places the same latitude automatically share the same day length and a similar climate and vegetation. But the American continents were the opposite of Eurasia. A journey from one end of the Americas to the other is a journey from north to south, a journey through different day lengths, different climate zones, and dramatically different vegetation. These basic differences hindered the spread of crops and animals as well as people, ideas and technologies. The people of the Andes were chronically isolated, without access to writing or almost any other innovation from elsewhere in the Americas. By contrast, Pizarro and his men were geographically blessed. As Spaniards, they enjoyed the benefit of technologies and ideas that had spread easily across Eurasia.

Jared Diamond: The events of 1532 were clearly influenced by deep causes, over which no individual Spaniard or Inca had any control. The shape of the continents, the distribution of plants and animals, the spread of Eurasian technology, these were facts of geography, and at almost every turn of the drama, geography was tilted in favor of the Europeans.

Conquistadors preparing for battle, inter-cut with Ataxalpa being prepared for day's events

Inca party en route to meeting

Voiceover: It's the morning of November 16th, 1532. Ataxalpa has agreed to meet the Spaniards in the town of Cajamarca, and sends his entourage ahead of him. But he makes a fateful decision; that his soldiers should not carry weapons.

Efrain Trelles: The Indians were musicians and dancers. They were soldiers, but unarmed. Why

would Ataxalpa unarm his own soldiers? Why, because he was in the festivity, he was celebrating. He wasn't going to war. He was going for a celebration so that the whole people could see how the alleged gods would run away in fear. The fact that some people believed that the Spaniards were gods would play better in the hands of Ataxalpa's purpose. If I know they are not gods and I defeat the gods, then of course everybody will be with me. But what if I defeat the gods with no show of force at all? Then I am beyond the gods.

Party with Ataxalpa on litter

Voiceover: While Ataxalpa and his men enter Cajamarca, the Spaniards are waiting, hidden from view. Ataxalpa coming into main square with troops

Diary Reading: There were five or 6,000 men and behind them, the figure of Ataxalpa, seated in a very fine litter, lined with feathers and embellished with gold and silver. Many of us pissed ourselves out of sheer terror.

Efrain Trelles: The square is filled with Ataxalpa's people, but there's, there's not one Spaniard at sight. Ataxalpa asks, 'Where are these dogs?' One of his right hands answers, 'They have run away because they are afraid of magnificent Inca'. Of course the whole crowd listened to this and believed that this was the case.

Ataxalpa receiving visit from Spanish priest

Subtitles: I come before you in the name of Christianity...

Pizarro sends out his priest to confront Ataxalpa.

Subtitles: ...to show you the path of truth

The conquistadors are obliged to try and convert native people before any resort to violence.

Subtitles: What are you talking about hair face?

Subtitles: I am the Son of the Sun!

Subtitles: I have the right to govern my people

Subtitles: What right do you have to speak to me in this way?

Subtitles: My authority comes from The Lord

Subtitles: His Word is written in this book

Subtitles: This is your power?

Ataxalpa has never seen a book before. He doesn't know what to do with it.

Subtitles: It's worthless

Subtitles: I don't hear the word you speak of

Subtitles: How dare you, Indian dog!

Subtitles: Come out, Spaniards!

Subtitles: Destroy these dogs who don't respect things of God!

Spaniards open fire and battle begins

Efrain Trelles: At that moment, with the crowd absolutely unprepared, the horses come. There was massive panic.

Mike Loades: Just imagine the scene in Cajamarca. The Incas hadn't seen horses before, and these aren't ordinary horses, these are Spanish horses, fierce, big, fighting horses. They could get in amongst men, they would trample men and they made the most excellent platform. From the horse, you could stab down to the left, stab down to the right, you could cut, you could scythe, hacking all about you.

Voiceover: If only the Incas had known that what you had to do against cavalry was stand firm, then they'd have been alright, they had superior numbers, but they didn't know that. They fled, they broke ranks, and then the horsemen could get in amongst them and they cut them down.

Mike Loades: There was an Inca god called Viracoxa, and he was a white man, and he was the god of thunder, and they thought these men with their aquabuses were the very incarnation of Viracoxa.

Efrain Trelles: The Inca Ataxalpa was in his litter, held by his carriers. As soon as they were able to do it, the Spaniards went after the litter. And they started killing the carriers. One carrier would fall, and another one would replace him. Only at the very, very, very end of the tragedy, the litter started to move because there were no more carriers left. As the litter falls, Pizarro himself captures Ataxalpa. His plan has worked to perfection. Ataxalpa is taken to a makeshift prison in the royal quarters at Cajamarca.

Diary Reading: He thought we were going to kill him, but we told him, no. Christians only kill in

the heat of the battle.

Voiceover: Outside, thousands of Incas are dead. The rest of the army has retreated to the hills. In spite of a massive imbalance in number, Spanish horses, swords and strategy have proved decisive. But the Spaniards possessed another weapon they didn't even know they had – a weapon of mass destruction that had marched invisibly ahead of them.

Spanish slave showing signs of illness

Voiceover: Today, the war against infectious disease is waged at biological research centers like Porton Down in Southern England. They produce vaccines here against the world's deadliest viruses. In the 16th century there were no vaccines, and there was no protection from the rampant spread of infectious disease. Twelve years before Pizarro arrived at Cajamarca, a Spanish ship sailed to Mexico. On board, one of the slaves was suffering from the first signs of a fever. He was the first person to bring a deadly disease to the American mainland. The disease was smallpox. Within weeks, the smallpox virus would spread from a single source to infect thousands of native Americans.

Dr Tim Brooks, Health Protection Agency, Porton Down: Smallpox gets into the body when you breathe in the particles, and they attach themselves to the back of your throat and the inside of your lungs. About two to three days into the illness, then the classic rash appears, and in its worst forms, this takes over the whole of the body with initially pimples and then enormous blisters until the whole of the skin, starting with the hands and the face and then spreading down to cover the rest of the body, is taken over by the smallpox blisters. From that time on, the patient is highly infectious. Because each of those blisters is packed full of smallpox particles, then if you burst a blister, fluid will come out and large numbers of viruses will be spilt onto whatever it touches. Ten to twelve days later, his friends would be taken ill, and then ten to twelve days after that, their friends. That kind of rate means the disease spreads exponentially. Its rate of increase gets bigger and bigger and bigger the more people are infected, until eventually it will cause tremendous devastation in the population.

Depiction of smallpox victims, Smallpox victim being nursed

Jared in field looking at cows and sheep, Livestock in fields

Voiceover: The first smallpox epidemic of the New World swept through Central America and reached the Inca Empire. Wherever it went, the virus decimated native populations, making them easier prey for Spanish conquest. But why were the germs so one-sided? Why did the Spaniards pass their diseases onto the Incas, and not the other way around?

Jared Diamond: This is Pizarro's secret weapon; pigs and cows, sheep and goats, domestic animals. Remember that Pizarro was a swineherd. He grew up in huts like this, in intimate contact with domestic animals, breathing in their germs, drinking the germs in their milk, and it was from the germs of domestic animals that the killer diseases of humans evolved, for example our 'flu evolved from a disease of pigs transmitted via chickens and ducks. We acquired measles from cattle; we acquired smallpox from domestic animals, so that these worst killers of human people were a legacy of 10,000 years of contact with our beloved domestic animals.

Voiceover: During the Middle Ages, infectious diseases swept through Europe and claimed millions of lives. But paradoxically, repeated epidemics made Europeans more resilient. In each outbreak, there were always some people who were genetically better able to fight off the virus. These people were more likely to survive and have children. In the process, they'd pass on their genetic resistance.

Over centuries, whole populations acquired some degree of protection against the spread of diseases like smallpox – a protection the Incas never had.

Tim Brooks: Once smallpox was taken to the New World, nobody in the New World had ever seen a disease like this before, so the number of people who were susceptible was much greater. There was no natural immunity, and so therefore the number of people who could both contract the disease and then spread it, and the number of people to receive it once it had spread, was much higher.

Voiceover: More people would die, and more people would be susceptible to catch it in the first place. It would spread rapidly throughout the population, and the death toll would be enormous.

Jared Diamond: Why hadn't Native Americans encountered smallpox before? And why didn't they have any deadly diseases of their own to pass on to the Spaniards?

It's simply because they didn't have the same history of contact with farm animals. The Incas had llamas, but llamas aren't like European cows and sheep. They're not milked, they're not kept in large herds, and they don't live in barns and huts alongside humans. There was no significant exchange of germs between llamas and people.

Voiceover: The key to Diamond's argument is the distribution of farm animals around the world. Aside from the llama, all the large farm animals were native to Eurasia and North Africa. None was ever domesticated in North America, Sub-Saharan Africa, or Australia. As a result, the worst epidemic diseases were also native to Eurasia and North Africa, and were then spread

around the world with deadly effect. There's been a long debate about the number of indigenous people who died in the Spanish conquest of the New World. Some scholars think there may have been a population of 20 million Native Americans, and the vast majority, perhaps 95%, were killed by Old World diseases. A continent virtually emptied of its people.

Ataxalpa playing chess

Voiceover: After the initial shock of his capture, Ataxalpa became a cooperative prisoner. He learned to speak Spanish, and play chess with his captors. The Spaniards realized he was more useful to them alive than dead. He was allowed to re-establish his court in prison, as long as he ordered his people to accept Spanish rule. He also ordered them to melt down a vast amount of treasure. Pizarro had promised Ataxalpa his freedom in return for the gold. It proved to be an empty promise. Having handed over 20 tons of gold and silver, Ataxalpa was no longer useful to his captors. He was garrotted to death, in the same square where so many of his followers had been slaughtered eight months earlier. With Ataxalpa dead, the conquistadors went on to colonize the rest of Peru. Relying on the power of their guns, germs and steel.

Voiceover: Gold from the Spanish colonies was brought back to Seville in Southern Spain. There's little activity in the Guadocreata River today, but in the 16th century, this was among the most important, busiest ports in the world. A steady flow of ships carrying treasure from the Americas helped Spain become one of the richest nations on earth. The conquistadors had changed forever the relationship between Old World and New.

Jared Diamond:: I came to Spain to answer a question – why did Pizarro and his men conquer the Incas instead of the other way around? There's a whole mythology that that conquest and the European expansion in general resulted from Europeans themselves being especially brave or bold or inventive or smart, but the answers turn out to have nothing to do with any personal qualities of Europeans. Yeah, Pizarro and his men were brave, but there were plenty of brave Incas. Instead, Europeans were accidental conquerors. By virtue of their geographic location and history, they were the first people to acquire guns, germs and steel.

Steam train, Slaves in chains, Guns being loaded and fired on people armed with spears

Voiceover: By the end of the 19th century, European powers had ventured down the Americas and colonized Africa, Australia and much of Asia. The process that began at Cajamarca had reached its logical conclusion. European guns, germs and steel were reshaping the world.

Episode Three: Into the Tropics – Transcript

Sunrise over African landscape, African mountains and landscapes

Jared in Zambian hospital, with sick children

Voiceover: Africa. It's been called the birthplace of humanity, the land where our ancestors took their first steps. Yet only recently revealed as the home of a vast tropical civilization. Cities and kingdoms once spread across the continent, then vanished, leaving barely a trace. What happened to this great achievement? Professor Jared Diamond has set out to explore the great patterns of human history. It's a journey that has taken him from the jungles of New Guinea to the snow-capped peaks of Peru. His quest, to understand why one people, Europeans, have conquered so much of the world. Diamond argues that the roots of European triumph stretch back thousands of years, and rest in the power of geography. Geography gave Europeans the most productive crops and animals on the planet, and these allowed them to develop guns, germs and steel – three great forces of conquest that have shaped human history. Now, Diamond is setting out on the last stage of his quest to discover what happened when guns, germs and steel came to Africa. And to ask what role these forces still play. But Diamond's journey will test much more than theories. It will also test the man himself.

Titles: Episode 3: Into The Tropics

Steam train

Voiceover: A Class 19D South African Railways steam locomotive. Built Glasgow, Scotland, 1932. It is a testament to technology and human achievement. A tool built to carve a path across a continent. A lasting symbol of the triumph of European guns, germs and steel.

Jared aboard steam train

Voiceover: This engine and its tracks of steel will carry Jared Diamond through the story of Africa. It is a tale with its roots in ambition and greed, peoples of Europe reaching out beyond their native lands in a quest for global conquest.

Jared Diamond: As Europeans expanded around the world, they conquered other people, they built railroads, they developed rich societies modeled on Europe, they had done this successfully in North America and South America, in Australia, and then they arrived in Africa, and it looked as if the same thing were starting all over again.

Voiceover: But Africa would be different. A place of dangers and secrets, hidden from these foreign invaders. The first European settlers arrived in Southern Africa in the mid 1600s. They landed here, in the Cape of Good Hope, at the southernmost tip of the continent. They quickly established themselves in this new land, laying out farms, planting wheat and barley, ranching cattle and sheep.

African landscape with train

Jared Diamond: This may sound strange but it's from ordinary agriculture like this that my theory of guns, germs and steel arose. My quest began more than 30 years ago, on a trip to Papua New Guinea, when I began to try to understand why the people there lived so differently from Europeans and Americans. The beginnings of the answer, I realized, depended on farming. New Guineans had only a few native crops that they could grow, and no native farm animals, while my ancestors, even 10,000 years ago, had been blessed with an abundance of domestic plants and animals. Over the centuries this had given them a huge advantage that let them develop cities, nations and even colonies abroad.

Voiceover: But Southern Africa is 5,000 miles from Europe. How was it possible for the settlers to import European crops and animals to such a distant part of the world? As much as skill, it came down to good fortune. Geography had dealt the settlers an immensely lucky hand. They had stumbled across one of the few parts of the southern hemisphere that feels just like Europe. Because the Cape and Europe lie at a similar latitude, or distance from the equator, and this means that the temperature and climate of these widely separated regions are almost exactly the same. The Europeans were able to establish prosperous farms and settlements, properties now owned by their descendants – people like Hempies Du Toit.

Jared Diamond: So your family has been here for centuries on this land. How do you feel about the land yourself then?

Hempies Du Toit, Annandale Farm, South Africa: Well I've always loved the land since childhood days and it comes, agriculture's been in our family for so many generations.

Jared Diamond: Tell me about the history of this farm.

Hempies Du Toit: Well the, the land was occupied in 1683, I mean that was only a couple of years after the first settlers came to the Cape.

Voiceover: But settlers like the Du Toit knew that this was not an empty land. Even today their

farms turn up evidence of the Cape's original inhabitants, a people known as the Koysan.

Hempies Du Toit: Oh this is interesting. This is a, this is from the Stone Age. Prior to the occupation of this land in 1683 by the settlers, this land was most probably occupied by Koysan people. These were the tools they used to, to scrape the skins when they tanned the skins.

Jared Diamond: Beautiful.

Hempies Du Toit: And you can see how easily, how nicely it fits into your hand.

Jared Diamond: Yeah.

Voiceover: With the arrival of Europeans, these native peoples were driven from their land. But they also faced an invisible and even more devastating agent of conquest. A force Diamond has identified as one of the greatest in human history – germs.

Jared Diamond: Realizing the importance of farming led me to the next big surprising discovery of guns, germs and steel. Domesticated animals had given Europeans one advantage of which they were completely unaware. By living in close proximity to their livestock, they had become infected with viruses and germs of those animals, which evolved into diseases of humans. Through exposure over centuries, Europeans had developed some resistance to those diseases. But as Europeans spread around the world, they encountered peoples who didn't have that same resistance, and who then fell victim to devastating outbreaks of infection, especially of smallpox. In the Americas, millions of native people died from this one disease, and here in the Cape it wrought the same havoc on the Koysan peoples.

Voiceover: Through their farming and their germs, Europeans had established a firm foothold in the southern tip of Africa. Now, they looked to expand.

Jared Diamond: In the 1830s there was a burst of the pioneer spirit such as had been seen in the European expansion across North America and Australia. This time it was Dutch settlers, and these pioneers moved into the interior like the pioneers moving across North America and Australia.

Voiceover: Over the course of the 1830s, thousands of Dutch farmers with their families and possessions loaded into wagons left the Cape in search of new land to settle. They called themselves the voertrekkers, and these pioneers all wielded another agent of European conquest – the gun.

Paul Garner, Battlefield Historian: This is a muzzle-loading rifle, typical of the weapon that every Voortrekker would have had in his wagon. The Boers were particularly adept at using this weapon.

Voiceover: They could reload it and fire from horseback. These muzzle-loading rifles are still much admired by the voortrekkers' descendants.

Derek Engelbrecht, Settler Descendant: Every single man that was in, in good health had at least two or three of these particular rifles.

Posselt Lawrens, Settler Descendant: In those days it must have been the person's life, you know. Everything depended on that, you know.

Derek Engelbrecht: They hunted with them, they protected themselves with them.

Posselt Lawrens: It was part of him, you know, if you didn't handle a gun in that day there was something wrong with you. Yeah.

Man firing gun and Jared watching and firing it himself

Jared Diamond: Guns and the steel from which they're made were the last two of the great advantages that Europeans carried with them around the globe.

Sword smith working as Jared watches

Jared Diamond: Guns are the result of thousands of years of complex technological developments, which began outside Europe but which Europeans perfected. And that was all because of the head start that their farming had given them thousands of years previously.

Derek Engelbrecht: You know, the flintlock rifle, it was, you know, I shouldn't really say this but it was nearly like as important as a cellphone is today. You can't go without your cellphone; in those days you couldn't go without your flintlock rifle.

Fire, with settlers tending it and in encampment at night

Voiceover: Armed as they were, the European settlers must have been confident they could overcome any obstacle as they pushed further into the African interior. By February 17th 1838, the voortrekkers had reached 800 miles inland from the Cape. But they were entering an alien and unexplored land.

Zulus approaching settlers' encampment and attacking it, leaving camp burning

Voiceover: Suddenly out of the darkness swept a native African army. Their victims barely had time to fire a single shot from their rifles before they were completely overwhelmed. Within hours, nearly 300 voertrekkers lay dead.

Child crying in camp at morning as settlers lie dead

Voiceover: Their enemy had struck without mercy. Killing men, women and children alike. Who could have committed such a ruthless and calculated assault, stopping the Europeans in their tracks? In fact, the voertrekkers had trespassed across the border of a mighty African kingdom. Inhabited by people very different from the Koysan of the Cape. They had encountered the Zulus.

Paul Garner: When they ran into the Zulus, they ran into a group of people who were very different to anybody else they'd been up to, up against up until that point in time. This was an organized group of people.

Archive: B&W still – Zulu warriors

Voiceover: The Zulus were the authors of a unique and highly developed African state. Their military skills had allowed them to overwhelm their native African neighbors. They held more than 30,000 square miles of land, and had established a sophisticated economy and society. The ferocity of the Zulu defense of their land was something the voertrekkers had simply not expected.

Paul Garner: It was more than the voers could handle. They, they, they were not prepared for the attack from the Zulus. They were up against a king who could mobilize an army of 10-15,000 men without any problem at all. It could take on almost anybody, they were absolutely fearless.

Voiceover: The voertrekkers were stunned and devastated. Had they, and the power of guns, germs and steel met their match in Africa? The voertrekkers showed little interest in who the Zulus were, or how they'd developed such a sophisticated state. They wanted a showdown. They gathered their scattered forces behind a great circle of wagons, and readied themselves for battle. At dawn on 16th December 1838, more than 10,000 Zulus stormed across the horizon, charging in to destroy the outnumbered settlers. But this time, the Europeans were able to use their technology to maximum effect. To increase the rate of fire from their muzzle-loading rifles, some would shoot while others would reload.

Derek Engelbrecht: They would shoot, hand the gun over, take the next gun, fire, hand the gun over. So every five or six seconds you could fire a shot. See that, that was the important thing.

Voiceover: This time, not a single Zulu could get within ten paces of the encampment. It was a massacre.

Paul Garner: The voertrekkers had probably killed an estimated 3-3,500 Zulus. The Boers themselves suffered only three injuries.

Voiceover: The conflict became known as the Battle of Blood River. The Zulus had been broken. Guns, germs and steel had prevailed.

Steam train being stoked, Jared studying on train

Jared Diamond: The victorious European settlers pushed on beyond Zulu lands, while new developments in their technology let them increase the pace of conquest. Railroads were key. With railroads one could transport lots of people and their supplies over vast areas. And so in Africa, Europeans started to build railroads, move into the interior and transport themselves and their supplies.

Voiceover: This was the era of the industrial revolution, a revolution that introduced one further weapon to the colonization of Africa. A weapon that put the same devastating firepower seen at Blood River into the hands of just a single man.

Paul Garner: This is a Maxim gun. What made this weapon such a great weapon, as opposed to the old single-shot weapons that had been used in years before, is this gun could fire continuously for up to 500 rounds a minute. It had the equivalent firepower of probably 100 men in a company with single shot weapons.

Voiceover: As they drove further into Africa, Europeans encountered new tribes, some just as hostile to invasion as the Zulus had been. But for peoples like the Matabele, there was simply no answer to the world's first fully-automatic weapon. The Matabele conflict of October 1893 lasted a matter of hours.

Paul Garner: The settlers mowed down those Matabele warriors until there were only a few of them left. It was a real case of ancient technology up against the latest and greatest as far as European inventions were concerned.

Jared Diamond: It seems like the birth of a new age. Europeans carving the path into the interior of Africa. Conquering tribe after tribe, settling where they pleased. Guns, germs and steel triumphant. Except now, those settlers would find themselves facing an entirely new enemy – one that had once been their greatest ally. Geography.

Voiceover: As they moved north, settlers cleared land for farms, confident they could build a prosperous life in Africa. But with little warning, things began to go awry. The land became impossible to plough. Their crops refused to grow. Their shoes fell apart in the mud. And that was only the start.

Jared Diamond: The second big problem that Europeans encountered was their animals died. Their horses and oxen had been a big part of the European advantage elsewhere in the world – oxen as draught animals, and horses as their military animals, but here their animals were dying.

Voiceover: For thousands of years, these domesticated animals and crops had sustained European civilization. Without them, there would have been no guns, germs and steel; no history of conquest and colonization. And now the settlers themselves began to fall ill with terrible fevers, while all around them they could see native Africans farming, herding cattle, healthy and alive. How was this possible? What were the secrets of this strange new land?

Jared Diamond: The ideas behind guns, germs and steel all spring from an understanding of geography. And geography explains why Europeans were now failing.

Voiceover: European crops had grown well in the Cape, because the Cape was a mirror of the European world, lying on a similar latitude. But as the settlers progressed into the African interior, they'd been moving north, closer and closer to the Equator. At about 23 degrees south, near the River Limpopo, they passed a major geographical boundary known as the Tropic of Capricorn. They were leaving behind their familiar European climate and entering a totally different world. They had entered the Tropics. Compared to the European or temperate zones, the Tropics operate by entirely different rules. Instead of the four seasons of Europe, North America and the Cape, here there are just two – the dry season, and the rainy. Wheat and barley, the crops that had sustained European civilization for centuries, had not evolved to survive in this tropical climate. Yet the native Africans, the Zulus, the Matabele, all the tribes that the settlers had encountered, depended on agriculture just as much as the Europeans. How were they succeeding as the Europeans failed? Even today, the continent of Africa is composed of thousands of different tribal groupings. Each is subtly distinct from the next, in custom and language.

Children singing in classroom as Jared watches

Jared Diamond: Such diversity means that most Africans have to master more than one language, and they acquire those skills at a very young age.

Jared asking children about the languages they speak

Jared Diamond: I would like to find out how many languages you speak. Who here speaks, knows how to speak Bemba? Aha. Does anybody else know how to understand or speak Lozi? You speak Lozi.

Child: Yes.

Jared Diamond: Do you also speak Bemba?

Child: Yes.

Jared Diamond: Is there another language that you speak also?

Child: Lovak.

Jared Diamond: Lovak. That's four languages. That's good. Most Americans speak only one language. After a little exposure to these different languages, you begin to realise one thing – they all sound remarkably similar. I'm fascinated with languages, and wherever I've been going I'm asking Africans, what's your language and tell me some words in your language, so here's what I found out for the word for sun. In the Neanga language, sun is azuba, in the Bemba language it's haka zuba, in Chiwa it's dzuba, and in the Senga languages, zuba again. Or the word for water. In the Neanga language it's manzi and in Bemba it's amenchi, and in chiwa it's manzi, similar to each other again.

Marketplace with people buying and selling

Jared Diamond: What do these linguistic similarities tell us? That there is a common root for most of the modern languages of tropical Africa. A single ancestral language spoken by a single group of people from which the many languages of today have descended.

Voiceover: Linguistic analysis has isolated a family of languages known as Bantu, which originated in tropical West Africa. About 5,000 years ago, the early Bantu speakers began to spread into new lands, bringing their crops, their animals and their language with them. And

over centuries, Bantu culture evolved, diversifying into hundreds of tribes, expanding across the tropical region of Africa. But the truth of this pan-African civilisation was suppressed for many years. Dr Alex Schoeman is trying to overturn the legacy of South Africa's racist past. She has been excavating an archaeological site on the banks of the Limpopo River.

Alex Schoeman, University of the Witwatersrand, South Africa: In the early part of the 20th century, and there were rumors in the white South African community about this place, in their minds linked to the Queen of Sheba or some other early white civilization in Southern Africa, trying to show that the Phoenicians or the Subeyans, basically anybody who was a bit lighter-skinned than Africans, were here first, and they found the opposite, that Africans actually had amazing great history and that they had earlier states running before, way before any white set foot in Africa.

Voiceover: This site, known as Mapungudwe, the place of the jackal, formed the heart of a kingdom similar to the earliest civilizations in Europe.

Alex Schoeman: Mapungudwe was the core, it was the capital of a massive state, and about 5,000 people living around this hill, but then you had several thousand other people living in the valley who produced the agricultural surplus to feed the city or town. They had cattle, they had sheep, they grew sorghum, millet, and they worked iron. It was a massive, amazing development that occurred in Southern Africa.

Voiceover: And this was not an isolated state. It formed part of a much larger economic network that had spread across Southern Africa and beyond.

Alex Schoeman: These are Mapungudwe beads, they're gorgeous blue ones, these are glass beads that came down the Indian Ocean coast, and through them we know that Mapungudwe's part of an international trade network, linking it all the way to the coast. It's an incredible African accomplishment, to set up such a complex trade network that links all the way into Northern Botswana, bringing material from there and taking it all the way to the Indian Ocean coast.

Early African farmers

Jared Diamond: So, Africans had overcome the problems of agriculture that defeated the European settlers. They had developed a unique tropical system of agriculture that had spread across the continent, and become the foundation of complex societies, trading as far afield as India. But there was an even more extraordinary story at the heart of this flourishing tropical civilization.

Voiceover: As soon as they entered the tropics, Europeans and their imported animals had fallen victim to terrible disease. Fevers wracked their population. Yet tropical Africans showed fewer of the same effects. Many of them even survived that most lethal of European weapons; smallpox – the disease that had devastated the native peoples of North and South America and the Koysan of the African Cape. How was this possible?

Diamond believes it all comes back to geography. Many of the diseases that were killing the settlers and their European livestock were unique to the tropical world. They had never encountered them before. It was a complete reversal of the usual pattern of conquest.

Jared Diamond: In the New World, the germs had been a weapon on the side of the Europeans killing indigenous people. Here it was indigenous germs, to which Europeans had not a history of exposure, and so here we have guns germs and steel again, but the germs working in the opposite direction, killing Europeans. The settlers and their imported livestock had fallen victim to a host of tropical infections and diseases. But African cattle, over thousands of years, had developed resistance to many of these tropical germs. And these cattle might also explain why tropical Africans had not succumbed to smallpox on the same scale as the Koysan people of the Cape. The smallpox virus originally crossed over from cattle to man centuries ago, and experts now believe it may have first originated in tropical Africa. Africans were certainly familiar with the disease. They had even developed methods of vaccination that bestowed immunity for life. And there was more. Native Africans had also developed antibodies against one of the most virulent diseases on earth. Malaria. Carried by the humble mosquito, this was the disease that was now overwhelming the European settlers. But tropical Africans were combating malaria with more than just antibodies. Their entire civilisation had evolved to help them avoid infection in the first place. They tended to settle in high or dry locations, away from the wet, humid areas where mosquitoes breed. And by living in relatively small communities, spread out over vast areas, Africans could limit the level of malaria transmission. It was an extraordinary achievement. But the Europeans understood little of the Africans' way of life. They built settlements by the rivers and lakes they used for water, in places infested by mosquitoes. Thousands died.

Jared Diamond: So it seemed that the tropics had defeated European guns, germs and steel. And that Africans had emerged triumphant. They had evolved a complex civilization well suited to the tropical world. A civilization that had spread throughout the continent in a vast cultural Diaspora.

Voiceover: Was this the end of European guns, germs and steel in Africa? What would the future hold for this mighty tropical civilization? The Europeans had failed to settle Africa's land. This would become no North or South America. But Africa still had one great draw for the colonizing powers – vast reserves of natural resources; copper;

diamonds; gold. European conquest and the story of guns, germs and steel would now enter a whole new age.

Archive: B&W footage Africans laboring and building

Voiceover: In the late 1800s, in what is now the Democratic Republic of the Congo, the Belgians drove millions of native Africans from their villages, setting them to work gathering rubber, mining copper and other minerals. Burning their homes behind them. Reducing their 1,000 year old tropical civilization to dust and ashes. Few were as brutal as the Belgians, but across the continent, millions of Africans were compelled to abandon a way of life perfectly adapted to the tropics, and to labor for Europeans. To ferry Africa's natural wealth back to Europe, the colonizers turned again to their technology, building ever greater railroads. After more than half a century and the labor of tens of thousands, tracks of shining steel reached all the way from the Cape into the very heart of the tropics. Constructed for Europeans to extract Africa's wealth. Built on the ruins of African civilization.

Jared Diamond: All this time, I've been uncovering the train of guns, germs and steel across Africa. And even this train and the track it rides on lie at the heart of my story. These tracks are still in use, still fulfilling their original purpose. Trains travel from the southern tip of Africa into modern Congo and Zambia, ferrying back tons of copper and other minerals. But Africa today is no longer a continent of colonies. Its nations are free and independent. What place is there for my theory of guns, germs and steel in modern Africa?

Voiceover: The end of the line for Jared Diamond. Civil war in the neighboring Congo makes it too dangerous to travel the last few miles of this track. But even here, the reality of modern Africa is clear.

Jared Diamond: I'm now in the centre of the African tropics, and I'm in Zambia, one of the poorest countries in Africa and really in the whole world. The average annual income here is a few hundred dollars, and the lifespan, average lifespan of a Zambian is 35 years, so I myself have now lived nearly two average Zambian lifetimes. What goes through my mind here is, what can history and geography and guns, germs and steel tell us that would help us understand the plight of Zambia today? In modern Zambia I see few signs around me of the great native civilizations that once flourished in tropical Africa. What I see instead is a country shaped by colonization. I see towns and cities that grew up next to the mines and railroads established by Europeans, and built on the European model. What about the great forces that originally shaped this continent and its people? The forces behind its conquest by Europeans. Where are guns, germs and steel in modern Africa?

Hospital interior with patients and families

Dr Christine Manyando, Tropical Diseases Research Centre, Zambia: In Zambia, malaria is endemic. It is the number one public health problem, and when you look at the children particularly, when you go to a health facility, up to 45% of the children in the outpatient facility of the hospital will actually be presenting with malaria.

Hospital with patients and their parents

Coffin shop exterior

Voiceover: Germs, one of Diamond's great forces of history, are still shaping the story of modern Zambia. Not just the recent scourge of AIDS, but also that ancient tropical disease that defeated Europeans – malaria. Malaria is now the number one killer of African children under five years old.

Christine Manyando: This old register will just show you the picture of, of the number of deaths that would have occurred within the hospital. Most of them are children below five years, one year six months, three years, five months, one year, most of them are really below five years.

Voiceover: Tropical Africans once lived in settlements spread out over large areas, which minimised the spread of malaria. But now they're living in modern high-density cities and towns, and the rate of infection has increased dramatically. The burden of germs is one of the greatest problems afflicting the country.

Christine Manyando: Undoubtedly malaria has a very big economic burden on us as a country, because as you may be aware, if so many children would be suffering from malaria, if we just look at the children who are in this ward, these mothers would be working somewhere and being productive, so that's one direct way in which we know productivity's been affected to a large extent.

Professor Nick White, Centre for Tropical Medicine, Oxford University: It's been estimated by eminent economists that the 1% negative growth each year in Africa over the last half a century can be attributed entirely to malaria.

Voiceover: The immunities and antibodies that Africans had developed over thousands of years to protect them from malaria no longer provide sufficient protection. The strains of the disease are mutating, and standard drugs are becoming less effective. In the high malaria season, up to

seven children a day die in this hospital.

Jared Diamond: You're used to this. I'm, I'm not. I'm – what is this, what does this scene make you feel about – your work in Zambia?

Christine Manyando: Exactly. To be frank with you, Jared, I wouldn't say I'm used to this, because I don't think there's anyone who can be used to sickness and eventually death, especially of people that you love so very much and are a part of you. It is, it is something that in fact I would say because of the magnitude of the problem, one would wish to do everything they possibly could do.

Children in hospital, and Jared crying

Christine Manyando: Because of the fact that.....

Jared Diamond: There's a difference between understanding something intellectually and experiencing it at first hand. In my book, germs was one of the three main forces of history and it's impersonal, and it's still different and it hits me to be in a place where germs are in action.

Jared on plane/view from plane

Jared Diamond: Thirty years ago I set out on a journey. A quest to understand the origins of inequality in our world. I discovered that this story stretched back to the beginning of civilization, and rested on the geography of our planet. When humans first started farming, one small area in the world was lucky enough to have the best crops and animals, which gave one group of people a unique advantage in history. Europeans perfected guns and steel evolved lethal diseases and germs. They then used these tools to conquer continents and to build extraordinary wealth. I conclude that geography, and guns, germs and steel, have been the strongest forces to shape the history of our world. Here in Zambia, these forces are still shaping the world today. Tropical germs are overwhelming this country and its people, and driving them into poverty. Does that mean that Zambia will always remain a victim of these great forces of history and geography? And that Africa is condemned to a future as poor as its present? Absolutely not. And I would say that the message is a hopeful one, it's not a deterministic, fatalistic one that says, forget about Africa and underdeveloped areas. It says there are specific reasons why different parts of the world ended up as they did, and with understanding of those reasons, we can use that knowledge to help the places that historically were at a disadvantage.

Voiceover: Malaysia and Singapore are among the richest and most dynamic economies in the world. Like Africa, they are tropical countries, with the same problems of geography and health,

the same endemic malaria. But both transformed themselves by understanding their environment. Fifty years ago, these countries realized the burden that geography and germs could be. Through concerted effort, they managed to almost entirely eradicate malaria from their land, transforming their economies and way of life.

The story of Malaysia and Singapore shows what an understanding of geography and history can do.

Jared Diamond: Explanations give you power, they give you the power to change. They tell us what happened in the past and why, and we can use that knowledge to make different things happen in the future.

Voiceover: The government of Zambia agrees. They have set up a nationwide project to try to eliminate malaria from the country, just as in Malaysia and Singapore. New drugs, even a possible vaccine, are giving them an increasing chance of success.

Christine Manyando: The control of malaria will mean an improvement in the welfare of the people, and an improvement in the welfare of the people will mean increased productivity, and increased productivity will mean that we will be a wealthy nation, because that will mean that then people will have sufficient, not only food but sufficient time to do things that make a human being complete and whole and able to lead a fulfilled life.

Voiceover: Jared Diamond's quest has been to understand the great forces of human history. But it is still the very smallest of details, the lives of individual human beings, that lie at the heart of his work.

Jared Diamond: When we talk about history we talk about development, we talk about competition between societies and the wealth of nations, it can sound intellectual, but here in Africa there are human faces on it.

Voiceover: And for Diamond, even after 30 years of thought and enquiry, the questions behind guns, germs and steel remain as important as they ever did. Why is our world divided between rich and poor, and how perhaps can we change it?

Jared Diamond: I feel that whatever I work on for the rest of my life, I can never work on questions as fascinating as the questions of guns, germs and steel, because they're the biggest questions of human history.