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# WHAT KILLED THE ROMAN EMPIRE

A 52' and 90' documentary  
Directed by Frédéric Wilner  
Produced by Iliade Productions & Arte France



What if the fall of the Roman Empire was really down to climate change and pandemics? Archeologists, historians, and experts in ancient pathologies and the climate – indeed, specialists in all disciplines – are now gathering evidence which demonstrates that a significant drop in temperature along with three successive waves of deadly diseases undermined the foundations of the Empire, causing it to collapse.

## SUMMARY

The year 165 AD. The Roman Empire was struck by a pandemic as Marcus Aurelius was leading his campaign against the barbarians. At the same time, the climate underwent a sudden cooling. Studies of ancient trees suggest a fall in temperatures of around 3°C. In Roman catacombs, scientists have discovered mass graves. They believe they have found traces of smallpox, which could have wiped out up to 20% of the population. This dual environmental crisis would have led to a military one, and for the first time, the heart of the Empire was hit by Barbarian incursions.

A second event began in 260 AD, when a second pandemic struck, coinciding with the first significant defeats of the Roman army. In Atritus, in modern-day Bulgaria, 25,000 Roman soldiers were killed in battle. Archeologists have now exhumed remains from this event. This was the start of what is now known as the Imperial Crisis: Invasions, usurpations, and a financial crisis brought the Empire



to its knees.

It had barely begun to recover when a new climate crisis struck Eurasia, with its origins in the Altai Mountains in Central and East Asia, according to scientists. This drove the Huns towards the Empire, marking the beginning of the end for the Western Empire.

The coup de grâce happened some 150 years later when Justinian launched an ambitious campaign to reconquer the Empire's lost territory. A series of volcanic eruptions provoked a sudden drop in temperatures, estimated at between 3 and 6 degrees Celsius. A few years later, bubonic plague struck the Empire. Specialists in historical pandemics have found traces of this throughout the territory. In Israel, archaeologists have uncovered the consequences, revealing cities abandoned, the end of agricultural activity, and trade networks brought to a standstill. The Empire was dragged into nonexistence.



## DIRECTOR'S NOTE

### Who or what was responsible for bringing down the Roman Empire?

The Barbarians and their ever-improving mastery of the art of war have been blamed. So, too, has the Empire's very size, covering too vast a territory with borders that were indefensible. Also under suspicion is the emergence of the Christian faith, which would have destroyed ancient religions that were an integral part of the Empire and critical for keeping its citizens loyal. None of these hypotheses can, of course, be totally ruled out. But to favor them would be to overlook an aspect hitherto ignored: The environment, both in terms of the climate and in terms of public health. These issues will be at the heart of this documentary.

### How might pandemics and major climate events have caused the fall of the Roman Empire?

Only a few years ago, it would have been impossible to be sure. But now, new scientific tools have emerged. We can now decipher DNA from ancient pathologies, study climate history through tree rings, analyze ice core samples, and carry out mathematical modelling of atmospheric currents. New knowledge – which is constantly expanding – is now being cross-referenced with human evidence that has long been known to historians, along with archaeological data. All of this offers a radically new reading of the decline of the Roman Empire.

The intention of this documentary is not to show that these external factors alone were responsible for the fall of the Empire. Rather that they had a major influence on societies, both Roman and Barbarian, causing imbalances that resulted in some catastrophic consequences. How did the climate crises and pandemics determine the fate of battles and invasions? How did they impact the value of money? How did they affect the movement of people? And how, in spite of some devastating blows dealt to the Empire, did it still manage to reinvent itself multiple times before disappearing for good at the end of the 6th century?



**This film is an investigation.** It follows the work of French, German, American, Russian, Israeli, and Bulgarian scientists who have each brought new elements to help solve this formidable puzzle: **How could such a powerful and seemingly perennial Empire, with such solid institutions and without enemies of a similar scale, have simply failed?** Our scientists study ancient pandemics. They examine changes in the climate during Roman times. They study ancient documents, the testimonies of contemporary witnesses, and the remains of the Roman period. They are seeking to understand the evolution of the balance of power between the Empire's legions and their adversaries. And they see the decline in the value of money as an expression of the disasters that befell the Roman Empire.

Each of these scientists will bring their expertise to the project. Each of them will add their own expert piece to the puzzle. As such, we will bring together a great deal of evidence that together will paint a more complete picture of the fall of the Roman Empire over the last four centuries of its history.

**They include pandemic specialists** Dominique Castex from the University of Bordeaux, who is excavating and analyzing Roman burial sites in France and Italy; Johannes Krause, researcher at the Max Planck Institute in the German city of Jena, who is studying the DNA of certain diseases that struck the Empire; and Véronique

Boudon-Millot from the École Normale Supérieure, who examines ancient Roman texts to understand the nature of epidemics and their consequences on populations.

**There are joined by climate specialists** Ulf Buentgen, a German researcher and Cambridge professor, who sheds light on changes in rainfall and temperature change through the study of tree rings and Paul Mayewski and Michael McCormick from the Universities of Maine and Harvard, who are revealing some incredible data from the detailed study of an Alpine ice core.

**There are also archaeologists** who are studying the vestiges of the declining Empire: Guy Bar Oz from the University of Haifa, who is excavating the ancient cities of the Negev in Israel. Finally, the film will feature two specialists in Roman antiquity, namely Kyle Harper from the University of Oklahoma and Benoit Rossignol from the Sorbonne in Paris, both leading lights in the latest discoveries regarding ancient pandemics and climate events. Their valuable contributions will highlight the coherence of the work of each of these scientists and put their results into perspective.





There is a danger that too many characters and perspectives in the film might bring complexity and confusion to a narrative that must, by its very nature, be a summary. However, we believe this scientific “kaleidoscope” is an asset and will result in a coherent, accessible, and compelling investigation into the decline of the Roman Empire. It will help audiences understand how a series of interdependent elements occurred over centuries, itself the result of an accumulation of failures that irremediably condemned the Empire to its downfall.

One might imagine a fortress. Its assailants break down the door with a battering ram. They can't do it in one go, but their insistence gradually breaks down all its defenses. The Roman Empire is the fortress. The enemy is the pandemics and climatic crises that assailed it on multiple occasions between the second and 6th centuries AD. Barbarian invasions, monetary crises, and emerging Christianity could be seen as a second wave of attackers that waited for a breach in order to rush inside and decimate its occupants.

This fortress metaphor is expressed through a film structured in three acts that set out the timeline of the fall of the Roman Empire. Each act functions in a similar way, exploring a cycle of climate change/pandemic/military defeat/

political disorder/monetary crisis. The first act begins in the second half of the second century, at the time of Marcus Aurelius. The second act takes place during the second half of the third century with the Imperial Crisis followed by climate change in Eurasia and the beginning of the great migrations. The third and final act begins with a series of volcanic eruptions in the sixth century that were followed by a devastating epidemic of the bubonic plague. There were no invasions this time. The already weakened Empire collapsed all by itself, like a house of cards. These three acts are interspersed with moments of resilience or recovery. But together, all these events over this long period in time were fatal to the Empire. Its final collapse should be understood as the consequence of their accumulation.

This film will show sequences of the scientists and their work alternating with sequences that recount the unfolding of events, as established by historians. We will follow the scientists in their laboratories in Germany, France, and the United States; on archaeological sites in Israel, Greece, and Italy; in forests in the Czech Republic, and through the Altai Mountains in Russia. As far as possible, each sequence will start with aerial images to reveal this epic scientific journey across diverse and spectacular landscapes.



We are planning extensive use of 3D imagery. Firstly, to show missing monuments, of which, at most, only ruins remain. **The sanctuaries of Seleucia on the Tigris, the temple of Eleusis, the baths of Caracalla, and the catacombs and tombs of Saint Peter and Marcellin, which occupy a central place in our story, will be partly reconstructed.**

We will also use an augmented reality process that may be used to highlight an inscription, the contours of a long-gone building, or the graphs plotting climate change on the video image. We will use 3D maps to illustrate the Empire and its downfall, using graphic techniques we developed for previous productions. These maps will allow us to show all the invasions, incursions, coups d'état and usurpations that occurred. Each of these events will be marked by an impact that, like a bomb being dropped, will expand according to the size and duration of the incident. Thus, without going into too much detail, but nonetheless stimulating

the viewer's imagination, we will be able to illustrate the Imperial Crisis, the Hun and Goth invasions during the following century, or Justinian's abortive attempts to regain power during the sixth century.

The resonance of this film with current events is obvious. More often than not, it will read between the lines, while other times, our speakers will explicitly mention it in their interviews. When I began writing this script, the crisis of the Roman Empire was a distant echo of our own climate crisis. Now it is also a health crisis – although COVID-19 is very different in terms of mortality than the pandemics that struck the Roman Empire during the second, third and fifth centuries. However, you will see how the same dialectic connects them, today as in the past: **The pandemic is linked to the climate crisis, and the climate crisis determines the health of individuals, society, the economy, and its currency: This documentary will underline this interdependence.**



## SYNOPSIS

It was the greatest empire of its time: 75 million people, an unrivalled army, a thriving economy, and a currency without competition. At its peak, Rome enjoyed a favourable climate, described by scientists today as the Roman Climatic Optimum. However, infectious diseases were rife, with life expectancy of around 27 years. But from the middle of the second century onwards, events occurred that had a greater impact than anything the Empire had experienced up to that point. Three times it was subjected to major upheavals with an accumulation of climatic cooling and pandemics that eventually led to its downfall.

### Act one

165 AD. The Roman Climatic Optimum came to an abrupt end. Through the study of tree rings, German dendrochronologist Ulf Buentgen has demonstrated that temperatures fell by at least three degrees, causing harvests to fail and resulting in malnutrition and famine throughout the Empire. At the same time, a pandemic struck. In Rome, archaeologist Dominique Castex has excavated one of the city's catacombs. **She is now convinced that the city's underground funeral network was not dug by the first Christian martyrs, rather it was constructed to accommodate the epidemic's countless victims.** As for the disease itself, the writings of the Roman Empire's most famous physician Galen suggest to scientists that it may have been smallpox. It is believed to have claimed **between seven and nine million victims**

**across the Empire.** The consequences were significant for the Roman army and we follow Benoit Rossignol, a specialist in the military history of the Empire, to the museum of Pozarevac, Serbia, where there are clues that suggest how legions were decimated by the disease. This could explain the very long wars fought by Marcus Aurelius during which, for the first time, the Empire really struggled to stop the Barbarians. The Barbarians carried out many raids within the borders of the Empire, and the aftermath of some of these is revealed by Benoit Rossignol at the sanctuary of Eleusis, near Athens, one of the holiest places in all Roman antiquity.





## Act two

249 AD and a new epidemic. An excavation in Bordeaux recently uncovered a cemetery from this period and Dominique Castex and her team are studying bodies exhumed there. Clues as to what disease killed these individuals come from Cyprian, Bishop of Carthage, whose description suggests a **hemorrhagic flu, with several million victims**. It's certainly no coincidence that two years after the outbreak began, the Goths won a great battle against the Romans. Diocletian and Constantine just managed to save it, but at the same time, a new catastrophe was brewing in the heart of Eurasia: Ulf Buentgen can now show through his examination of tree rings in the Altai mountains, that a devastating climate event hit this part of the world in the middle of the third century. Drought and famine caused the exodus of the Huns to Europe. The Goths were already on their way to the Empire and the Huns pushed them within its borders. This was the beginning of a series of events that would put an end to the Western Empire forever.

## Act three

From 536 onwards, a series of volcanoes erupted in Iceland. In a laboratory at the University of Maine in the United States, scientists have now identified Eldgjá as the first to blow. Its fumes darkened the atmosphere for several years, and witnesses spoke of an endless night. This climatic disaster then set the stage for the emergence of a new pandemic in the form of the bubonic plague. This was the first outbreak on such a scale in history, and it hit all the provinces of the Empire. Today, it is the subject of a vast European study and the Max Planck Institute in Jena, Germany, has developed a revolutionary process for identifying the pathogens of ancient diseases. Samples taken during archaeological excavations in England, Greece, Italy, France, Germany, and Spain have been analyzed by geneticist Johannes Krause, who has revealed the DNA of this pandemic that killed more than half of the Roman population. Meanwhile in Israel, an archaeological excavation directed by Guy Bar Oz of the University of Haifa has determined the precise moment of the collapse: In the Negev region, houses were walled up, towns and crops abandoned, and trading networks suddenly dismantled, painting a striking portrait of the twilight of the great Eastern Empire.





## SCENARIO

### Seleucia on the Tigris The first pandemic

165 AD. Rome was at its peak. Emperor Verus set off on a campaign against the Parthian Empire. He conquered the city of Seleucia on the Tigris, near present-day Baghdad, and set it alight. We will show 3D images of the sanctuary in flames. In the temple of Seleucia, the Romans seized the statue of Apollo with Long Hair, the goddess of the plague. When Verus returned to Rome, the city was in the grip of war, even though a pandemic had just broken out in the capital. Its inhabitants decided it was Apollo who brought disease to them. Kyle Harper from Oklahoma University and Benoit Rossignol from the Sorbonne, two experts on the Roman Empire and the history of climate and pandemics, discuss this event. It is the first in a series of incidents that set the slow decline of the Roman Empire in motion.

### Brno, Czech Republic In search of second-century climate change.

At the same time, the Roman Climatic Optimum came to an end. By studying tree rings and wood from archaeological excavations, German dendrochronologist and Cambridge professor Ulf Buentgen demonstrates that from 165 onwards, temperatures fell by around 3°C on average. Ulf travels all over Europe in search of wood from Roman times, and we follow him to Brno in the Czech Republic. He explains how such a drop in temperature could only lead to failed harvests and famine among the population, which in turn would certainly help a pandemic to develop.

### Rome, Italy The catacombs are not what we thought

In Rome, Dominique Castex from the University of Bordeaux and her team have discovered a collective burial site in the heart of one of Rome's catacombs. Hundreds of bodies were deposited here between the middle of the first century and the start of the third. This is exactly when the pandemic first happened and the subsequent later waves occurred, as attested by accounts from that time. Scientists have proved that these collective and simultaneous burials predate the emergence of Christianity in Rome. Therefore, the catacombs were not created after the persecution of the Christians but for burying the many victims of the plague.



## The Ambrosian Library, Milan

### What Galen said

It is critical to establish exactly which disease was behind the pandemic in order to evaluate its consequences on the Empire. Galen, one of the greatest physicians of antiquity, describes its symptoms in his many writings, and Véronique Boudon-Millot, historian of medicine, shows us the most beautiful medieval manuscripts that are copies of Galen's original writings, now kept in the Ambrosian Library in Milan. Galen describes the illness he tried to cure in Aquileia, where Marcus Aurelius' army was stationed during the winter of 166-167. Everything points to smallpox, which could – given what we know today about its mortality rate – have killed at least 15% of the population of the Empire; between seven and nine million people.

## The Pozarevac Museum, Serbia

### A desperate need for new soldiers

What were the consequences for the Empire's armies? This question is crucial as in parallel with the pandemic, the Barbarians are, for the first time, managing to carry out incursions into the Roman Empire's territory. Ten years of war led by Emperor Marcus Aurelius followed, and one must wonder whether the epidemic weakened Roman legions to the point of leaving them unable to defeat their adversaries? In the museum of Pozarevac, in Serbia, Benoit Rossignol is interested in a stele inscribed with the names of the soldiers recruited during the years when the pandemic was raging. Not only were these recruits particularly numerous compared to earlier eras, but they all shared the name of the reigning emperor, indicating that these new Roman soldiers had just been naturalized. This suggests that many Barbarians were hurriedly conscripted into the Roman army during the years of the pandemic. According to Benedict Rossignol, they would never have been admitted into its ranks and would instead have become mere auxiliaries if a pressing need had not arisen.

## Eleusis, Greece

### The first Barbarian raids

These accelerated recruitments did not, however, prevent Barbarian raids within the borders of the Empire. The area around present-day Venice was sacked, as well as the sanctuary of Eleusis near Athens, one of the holiest places in the Empire. We travel there with Benoit Rossignol, who shows us the traces of the barbarian incursion, where the temple and its outbuildings were plundered of their treasures and burned. Although the Empire subsequently recovered, this first episode was deeply destabilizing and for the first time since its foundation, the Empire's silver currency was devalued in a key step towards its downfall.





## Bordeaux The cemetery of the second pandemic

249 AD. A century after the beginning of the first crisis, a new epidemic hit the Empire. Dominique Castex, a French archaeologist who has excavated the catacombs of Rome, now invites us to Bordeaux, where she is examining bones unearthed during a recent excavation. Nearly a thousand individuals have been found, many buried in mass graves. All social classes are represented, from people dressed in clothes sewn from gold thread to slaves with irons still attached to their feet. These burials have been dated precisely to the time of the so-called Cyprian pandemic. The Bishop of Carthage spoke of it in his sermons, describing a high fever, necrosis of the extremities, and hemorrhaging, suggesting an Ebola-type virus or an epidemic similar to Spanish flu, although much worse. One witness to the pestilence in Athens speaks of 5,000 victims every day in the city at the peak of the epidemic. But because the disease has never been formally identified, its mortality cannot be accurately estimated.

### 3D Images

## The Ile de France Archeological Centre, Paris The Imperial Crisis

Greece, the Balkans, Asia Minor, Gaul, and Hispania were ravaged by the invaders. This is known as the Imperial Crisis, and we will illustrate it for the most part with 3D maps. Benoit Rossignol and Kyle Harper summarize the events. The Empire was threatened with division and its emperors, powerless in the face of events, were assassinated and replaced. Several of them reigned simultaneously over different regions of the Empire, surviving for just a few years at best. Roman currency soon lost weight in silver. We will illustrate this with the treasure of Arpajon, which comprises 34,000 coins that contain only 1% of their weight in silver. During the Imperial Crisis, the Empire almost collapsed for good until Diocletian and then Constantine reformed the monetary system and power structure from top to bottom. A new era and new capital: Constantinople replaced Rome as the center of power in the Empire shifted east.



## Altai Mountains, Russia Fourth century climate chaos

At the same time in the early fourth century, the destiny of the Empire was being played out elsewhere, in the Altai Mountains on the border of Russia, China, and Mongolia. Ulf Buentgen, the dendrochronologist we previously encountered in the Czech Republic, has discovered that a major climate event struck the heart of Eurasia, leading to a great migratory event. By studying the rings of excavated trees that date back to that time, he shows that at the end of the third century, the climate became hostile, causing famine and offering ideal conditions for pandemics to occur. The result was the exodus of the Huns, who crossed the Volga in the middle of the following century, putting pressure on peoples living on the borders of the Roman Empire.

### 3D Images

## The breakdown of the Western Empire

We explain how this unfolded through a series of 3D images. The Goths were in the path of the Huns and asked the Empire if they might be admitted within its borders. The Romans allowed them to settle in a border area, but the Huns were treated extremely badly, and this resulted in the Battle of Andrinople, where, against all odds, the Roman legions suffered a rout. At least 25,000 lay dead and the Empire's armies were decimated. The Goths were soon imitated by the Alamans and Alains, who settled first in Gaul, then in Hispania, and finally in Numidia, the granary of the Western Empire. With the capture of Rome by Alaric in 410, defeat was a real possibility and it was now Constantinople's turn to perpetuate the Roman legacy.

### 3D Maps

## Sainte Sophie A last-ditch attempt to rebuild the Empire

A century later, in 530 AD, Emperor Justinian and his General-in-Chief Belisarius made a last-ditch attempt at shoring up the Empire. The construction of Saint Sophia and the compilation of Roman texts into the Code of Justinian illustrated this new ambition. Belisarius set out to conquer lost territories and took back North Africa, which had been snatched by the Vandals a century earlier. He then turned to Italy. 3D maps, images of Saint Sophia, and illustrations of the Code of Justinian will allow us to introduce this new period that was decisive in terms of the fate of the Roman Empire.





## University of Maine, USA

### The climate disaster of the sixth century

At the Climate Change Institute in Maine, Professor Paul Mayewski and his team have developed an incredibly precise climate analysis tool. It comprises a micro-laser that extracts information from a “small” ice core taken from the Swiss Alps three years ago. Only 78 meters long, compared with several kilometers for a core from the Arctic, it contains the climate “memory” of Western Europe. This new process allows him to isolate the data from each year of Roman history, concentrated in a few millimetres of ice. This is how Paul Mayewski and his team have demonstrated that a series of volcanic eruptions starting in 536 plunged the Mediterranean Basin into an endless night. **The dust and gases resulting from these explosions darkened the atmosphere for at least 18 months, confirmed by contemporary accounts of Polar cold (between -3°C and -6°C) followed by crop failures and terrible famines.** The culprits have been identified as three Icelandic volcanoes, including Eldgja, the most powerful, which brought the agriculture and thus the economy of the Empire to its knees.



## Poitiers, Halle, Jena The third pandemic and the twilight of the Eastern Empire

**Four years after the first of these volcanic eruptions, a new disaster descended on the Empire in the shape of the first bubonic plague pandemic in history.** Today, it is the subject of a European study programme to assess its geographical impact and intensity. Dominique Castex has been examining the bones from an ancient cemetery in Poitiers, France, while Johannes Krause and his team are doing the same at the State Museum of History in Halle, Germany, which has an important bone collection, preserving the results of past archaeological excavations. Krause is one of the leading experts on the DNA of ancient pathogens and has developed a technique for identifying them that is used at the Max Planck Institute in Jena. Specialists in ancient pandemics, including Dominique Castex, send him samples taken from the bones of individuals from across Europe, who may have been killed by the sixth-century plague. Krause carries out very sophisticated analysis, which we explain with 3D images, to ascertain this, and has drawn up a map of plague outbreaks across the Empire and on its edges. **His provisional conclusion is that the pandemic struck everywhere, from England to Spain and from Greece to Germany, and probably killed more than half of the Roman population.**

## The Halutza and Shivta sites in Negev, Israel The twilight of the Eastern Empire

The climatic crisis and the bubonic plague pandemic caused a dislocation of societies within the Empire. Excavations carried out by Guy Bar Oz and his team from the University of Haifa of the small Byzantine towns of Halutza and Shivta are clear in this respect, precisely dating the disruption of the Empire's trading networks and its economy. **Excavations of old houses, irrigation systems, and deposits of household refuse reveal that these cities in the Negev were abandoned between the 540s and the beginning of the following century.** Houses were carefully walled up, sanitation services cut off, and crops abandoned. This excavation project provides a moving photograph of the twilight of a civilization that lasted a thousand years. At the same time, only 30 million people still lived within the borders of the Empire, and **Rome, once the first city to pass the one million mark, now had only about 20,000 citizens.** The Byzantine Empire would live for many more centuries, but cut off from most of its territories, it would be a shadow of its former self.



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