

# CATASTROPHE

AN INVESTIGATION INTO THE ORIGINS  
OF THE MODERN WORLD

DAVID KEYS



BALLANTINE BOOKS

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# CONTENTS

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[Dedication](#)

[Aims and Caveats](#)

[Acknowledgments](#)

[List of Illustrations](#)

[Introduction](#)

## [PART ONE](#) THE PLAGUE

- [1](#) The Winepress of the Wrath of God
- [2](#) The Origins of the Plague

## [PART TWO](#) THE BARBARIAN TIDE

- [3](#) Disaster on the Steppes
- [4](#) The Avar Dimension

## [PART THREE](#) DESTABLIZING THE EMPIRE

- [5](#) Revolution
- [6](#) “The Cup of Bitterness”
- [7](#) Changing the Empire: The Cumulative Impact of the Plague and the Avars

## [PART FOUR](#) THE SWORD OF ISLAM

- [8](#) The Origins of Islam
- [9](#) Islamic Conquests
- [10](#) Behind the Roman Collapse

## [PART FIVE](#) THE TURKIC DIMENSION

- [11](#) The Turkish Time Bomb
- [12](#) The Jewish Empire

## [PART SIX](#) WESTERN EUROPE

- [13](#) Disaster in Britain
- [14](#) The Waste Land
- [15](#) The Birth of England
- [16](#) Irish Conception
- [17](#) French Genesis
- [18](#) The Making of Spain

## [PART SEVEN](#) DISASTER IN THE ORIENT

- [19](#) Chinese Catastrophe
- [20](#) The Rebirth of Unity
- [21](#) Korean Dawn
- [22](#) “Ten Thousand Strings of Cash Cannot Cure Hunger”

## [PART EIGHT](#) CHANGING THE AMERICAS

- [23](#) Collapse of the Pyramid Empire

- [24](#) The Darts of Venus
- [25](#) North American Mystery

---

- [26](#) From Art to Oblivion
- [27](#) The Mud of Hades
- [28](#) Birth of an Empire
- [29](#) Glory at the Heart of the Cosmos

#### [PART NINE](#) THE REASONS WHY

- [30](#) In Search of a Culprit
- [31](#) The Big Bang
- [32](#) Reconstructing the Eruption
- [33](#) The Endgame

#### [PART TEN](#) THE FUTURE

- [34](#) Beyond Tomorrow

[Appendix](#)

[Notes](#)

[Recommended Further Reading](#)

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# CATASTROPHE

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TO GRAÇA, MICHAEL,  
AND CAMILE

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## AIMS AND CAVEATS

The aim of this book is to help change people's view of the past—and of the future. Although human inventions, achievements, and actions are obviously key factors in determining the course of human history, the forces of nature and other mechanisms beyond the control of individual human beings, or even states, play an even greater role, both directly and indirectly, by conditioning the circumstances that induce, produce, or permit individual or collective human actions.

Determinist views of history have been out of favor now for several decades, and this book should rightly be seen as an attempt to reinstate respect for the basic concept of determinism—though not for the often simplistic nature of much past deterministic thinking.

In this book I will attempt to describe a process that could perhaps be labeled “evolutionary determinism.” My research does suggest that a force of nature ultimately lay behind much of the change experienced by the world in the sixth and seventh centuries A.D. But it also shows that key aspects of change, while ultimately triggered by a force of nature, were finally delivered through a plethora of consequent ecological, political, epidemiological, economic, religious, demographic, and other mechanisms that interacted with each other for up to a hundred event-filled years before producing final, irreversible change.

Moreover, toward the end of this book I suggest what triggered the sixth-century climatic catastrophe. I am reasonably sure of my conclusions as to the type of event that set all the climatological and historical dominoes falling. But, as you will see, I have also chanced my arm at pinpointing the event geographically. That is a more difficult task—and only future geological and ice-core research will reveal whether all the circumstantial evidence I have gathered was indeed pointing toward the right culprit.

Although the main title of this book is *Catastrophe*, that chiefly refers to the natural triggering mechanism that set off the collapse of so many dominoes and, through the medium of those dominoes, effected permanent historical change. This book does not attempt to deny in any way the range of other factors which, over many centuries, helped in the downfall of the ancient world. But I do believe that the final decisive factor in its demise was the mid-sixth-century natural catastrophe described in this book. And I do believe that that catastrophe was the only worldwide common element involved in that demise. It is because of that fact that I believe one can talk of semi-integrated world history even in the sixth and seventh centuries A.D. The political repercussions of commonly caused events in places as far apart as Mongolia and East Africa did interact with each other to shape history: all civilizations in both the Old World and the New were changed forever by a common catastrophe.

In many areas, these changes laid the geopolitical foundations of our modern world. That's why I prefer—in geopolitical terms (not economic or even cultural ones)—to use the term protomodern rather than early-medieval when describing the sixth- and seventh-century emergence of the post-ancient world. Moreover, I believe the evidence in, and the perspective argued for within, this book suggests that one can talk of a sixth/seventh-century protomodern geopolitical genesis in many different parts of the world—not just in Europe and the Middle East.

In order to help change people's view of history, I have tried to write this book in as accessible manner as possible. I have tried hard to make sure that the data and other information on which I have based my arguments are as accurate and up-to-date as possible. Indeed, to ensure this, I sought the help and advice of more than fifty academic specialists and authorities in more than twenty different disciplines in a dozen countries.

I believe that the case for a mid-sixth-century worldwide climatic catastrophe is incontrovertible. And I think that, without doubt, the catastrophe was the major worldwide factor in finally bringing the ancient world to a close, and helping to lay the geopolitical foundations of our modern one. The mechanisms are clearest in Europe, the Middle East, Africa, and Asia. In Mesoamerica, where archaeology rather than history has to provide the bulk of the evidence, the argument is strong, but has by definition to be more circumstantial. And in South America, where there is no sixth/seventh-century written history at all, one is reliant on the relatively inexact dating and often hotly debated interpretation of purely archaeological evidence. Nevertheless I believe that even there, the evidence for a climatic catastrophe is incontrovertible and it is only the suggested mechanisms of change that remain reasonable proposals rather than totally proven theses.

Lastly, I believe that my book is not simply about the past and its influence on the present, but also, hopefully, illuminates the whole question of the influence of the natural environment in human history. This is particularly relevant now, as global warming threatens to destabilize our climate to an extent that has not occurred since the climatic crisis of the sixth century. Three-quarters of this book is about the repercussions of that Dark Age disaster—and it should serve to alert us to the sheer scale of the geopolitical and other changes that can flow from climatic catastrophe. History is usually seen predominantly as a discipline of the humanities. This book will help demonstrate that it also belongs to the realms of the natural and social sciences.

#### ACCENT NOTE

*Accents have not been used in words that have been transliterated from non-Latin scripts.*

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## ACKNOWLEDGMENTS

It took four years to research and write this book. Because it covers so many different disciplines—everything from epidemiology and astrophysics to volcanology and archaeology—I sought the often-detailed advice of dozens of academic specialists.

I am grateful to all of them for their depth of knowledge—and for their patience. I thank them for all the advice they gave me, most of which I accepted, and ask them to forgive me for the small number of instances in which, bemused by contrasting strands of counsel, I occasionally opted for one interpretation rather than another.

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I apologize to anyone I have inadvertently left off this list; and I must also point out that the responsibility for the views expressed in this book is of course mine alone.

I would also like to acknowledge the four academics who first realized that there had been a climatic disaster in the mid-sixth century—Richard Stothers and Michael Rampino, who published some of the Roman historical evidence in a paper in the *Journal of Geophysical Research* 88 in 1983; Kevin Pang, whose work on the Chinese records of the catastrophe was reported in *Science News* 121 in 1985; and Mike Baillie, who first noticed the tree ring evidence for the disaster and published it in *Nature* 332 in March 1988, and—together with the Roman and Chinese historical evidence—in *Archaeology Ireland* in summer 1988. Indeed I first heard about the climatic events of the mid-sixth century at a lecture given by Mike Baillie at an archaeology conference in Bradford in April 1994.

I want also to give special thanks to my agent Bill Hamilton; to Barbara Basham, who did so much

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Last but not least, I would like to thank a rural Victorian whom I never met but who first created my interest in human history—the anonymous man, woman, or child who, a century or so ago, in a field west of London, dropped a humble penny—a coin that I found when I was a child and which triggered my fascination with the vanished past and how it has created the present and will help create the future.

David Key  
March 1999

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## LIST OF ILLUSTRATIONS

The Dark Age Plague: A Chronology  
The Origins and Spread of the Plague  
From Gerbil to Disaster  
The Earliest Islamic Conquests  
The Consequences of A.D. 535: Islam, Avars, Plague, and The Roman Empire  
The Mediterranean and Middle Eastern World, A.D. 562  
The Mediterranean and Middle Eastern World, A.D. 720  
The Consequences of A.D. 535 for the Turkic World  
The Khazar Empire at Its Peak  
Britain and Ireland  
British Climate in the Sixth Century  
Anglo-Saxon Expansion  
China and Korea  
Major Climatic Events in Sixth-Century China  
The Consequences of A.D. 535 for China  
Korean Climate in the Sixth Century  
Korea and Japan  
The Consequences of A.D. 535 for Japan and Korea  
Archaeological Sites in Mesoamerica  
The Consequences of A.D. 535 for Mesoamerica  
The Andean Region  
The Consequences of A.D. 535 for South America  
Major Volcanic Eruptions Recorded in Ice Cores  
The Initial Suspects  
Sixth-Century Geopolitical Discontinuity in Southeast Asia  
Southeast Asia Before and After A.D. 535  
The Probable Culprit  
Sources of Climatic Data  
Inferred Summer Temperature Graph for Western Siberia and Northern Scandinavia, A.D. 1–1997  
Temperature Graph for Khatanga, North-Central Siberia, A.D. 100–1998  
Pine Tree Growth in Northern Finland, Sixth Century A.D.  
European Oak Growth, Sixth Century A.D.  
Temperature Graph for Southern Chile, Sixth Century A.D.  
Sedge Growth at Lake Marcacocha, Peru, 2200 B.C.–A.D. 600  
Western American Foxtail and Bristlecone Pine Growth, Sixth Century A.D.

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CATASTROPHE

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## INTRODUCTION: FIFTEEN CENTURIES AGO, SOMETHING HAPPENED

In A.D. 535–536 mankind was hit by one of the greatest natural disasters ever to occur. It blotted out much of the light and heat of the sun for eighteen months, and the climate of the entire planet began to spin out of control. The result, direct or indirect, was climatic chaos, famine, migration, war, and a massive political change on virtually every continent.

As the engine for extraordinary intraregional change in four great areas of the world—Afro-Eurasia (from Mongolia to Britain, from Scandinavia to southern Africa), the Far East (China, Korea, Japan), Mesoamerica (Mexico/Central America), and South America—the disaster altered world history dramatically and permanently.

The hundred-year period after it occurred is the heart of history's so-called Dark Ages, which formed the painful and often violent interface between the ancient and protomodern worlds. This period witnessed the final end of the supercities of the ancient world; the end of ancient Persia; the transmutation of the Roman Empire into the Byzantine Empire; the end of ancient South Arabian civilization; the end of Catholicism's greatest rival, Arian Christianity; the collapse of the greatest ancient civilization in the New World, the metropolis state of Teotihuacan; the fall from power of the great Maya city of Tikal; and the fall of the enigmatic Nasca civilization of South America.

But it was also the hundred-year period that witnessed the birth, or in some cases the conception, of Islam, France, Spain, England, Ireland, Japan, Korea, Indonesia, Cambodia, and the power of the Turks. It also produced a united China and the first great South American empires, the forerunners of the Incas.

Until now, these geographically widely dispersed tragedies and new beginnings—occurring well before the Old and New Worlds knew of each other—have been viewed by historians as largely separate events. Now, for the first time—as a result of the research done for this book—the origins of our modern world can be seen as an integrated whole, linked by a common causal factor.

This climatic disaster half destroyed the Roman Empire, unleashing hordes of central Asian barbarians against the empire's northern borders, triggering geopolitical processes that created Arab pressures on its southern flank, and causing a series of killer epidemics that drastically reduced its population.

In Arabia and the Mediterranean world as a whole, an apocalyptic zeitgeist, which at base was the result of the shift in climate, led to the emergence of Islam.

In western Europe, the climatic catastrophe and its epidemiological aftereffects destabilized the demographic and political status quo and led to the birth of at least four major nations.

In western Asia, the disaster triggered the rise of the Turks—a process that eventually led to a massive expansion of Turkic influence everywhere from India to eastern Europe and ultimately to the emergence of the Ottoman Empire.

The same worldwide climatic chaos also destabilized economies and political systems in many areas of the Far East, opening up the way for the reunification of China, the birth of a united Korea, and the emergence of Japan as an embryonic nation-state.

In the New World, a popular revolution was triggered that destroyed the greatest of all ancient American civilizations, the Mexican empire of Teotihuacan. That collapse freed up the Mesoamerican world and led to the rapid growth, and consequent collapse, of much of Maya civilization. In Peru

power shifted from the arid lowlands to the wetter, mountainous Andes, which paved the way centuries later, for the rise of pre-Columbian America's largest empire.

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The mystery climatic disaster of 535–536 resynchronized world history.

The contemporary Roman historian Procopius wrote of the climate changes as “a most dreadful portent.” In describing the climate in that year, Procopius wrote that “the sun gave forth its light without brightness like the moon during this whole year.” Other accounts of the event say that the sun became “dim” or “dark” for up to eighteen months. Its light shone “like a feeble shadow,” and people were terrified that the sun would never shine properly again. In some parts of the empire, there were agricultural failures and famines.

In Britain, the period 535–555 saw the worst weather that century. In Mesopotamia there were heavy falls of snow and “distress among men.” In Arabia there was famine followed by flooding.

In China in 536 there was drought and famine, and “yellow dust rained down like snow.” The following year, the crops were ruined again—this time by snow in the middle of August. In Japan, the emperor issued an unprecedented edict, saying that “yellow gold and ten thousand strings of cash [money] cannot cure hunger” and that wealth was of no use if a man was “starving of cold.” In Korea 535 and 536 were the worst years of that century in climatic terms, with massive storms and flooding followed by drought.

In the Americas, the pattern was similar. Starting in the 530s, a horrific thirty-two-year-long drought devastated parts of South America. In North America, an analysis of ancient tree-ring evidence from what is now the western region of the United States has shown that some trees there virtually stopped growing in the years 536 and 542–543, and that things did not return to normal until some twenty-three years later, in 559. Similar tree-ring evidence from Scandinavia and western Europe also reveals a huge reduction in tree growth in the years 536–542, not recovering fully until the 550s.

Up until now, there has been no explanation for such extraordinary climatic deterioration. Certainly the dimming of the sun (without doubt caused by some sort of atmospheric pollution) and the sudden worldwide nature of this deterioration point toward a massive explosion in which millions of tons of dust and naturally occurring chemicals were hurled into the atmosphere.

But what was the nature of that explosion?

I believe that I have discovered what happened so many centuries ago—and, toward the end of this book, I make my case for proving exactly what this staggering disaster was. Before you reach that portion of the book, however, you will see, in substantial detail, the effect that event had on the entire world that existed then—and how an ancient tragedy shaped the world in which we live today.

In doing the research for this book, I have developed a greatly increased respect for the forces of nature and their power to change history. That respect, as well as the new perspective it engenders, has changed my view of the very nature of history, which must be understood in holistic terms and which really functions as an integrated, planetwide phenomenon.

If I have done my job well, what you are about to read is an analysis of the mechanisms and repercussions of catastrophe, a hitherto unknown explanation of our history, and a chilling warning for the future.

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PART ONE

# THE PLAGUE



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THE WINEPRESS OF  
THE WRATH OF GOD

“With some people it began in the head, made the eyes bloody and the face swollen, descended to the throat and then removed them from Mankind. With others, there was a flowing of the bowels. Some came out in buboes [pus-filled swellings] which gave rise to great fevers, and they would die two or three days later with their minds in the same state as those who had suffered nothing and with their bodies still robust. Others lost their senses before dying. Malignant pustules erupted and did away with them. Sometimes people were afflicted once or twice and then recovered, only to fall victim a third time and then succumb.”<sup>1</sup>

Thus wrote the sixth-century church historian Evagrius, describing the gruesome symptoms of the bubonic plague, which devastated the Roman Empire and much of the wider world between the middle of the sixth century and the latter part of the seventh.

The first area of the empire to be hit by plague was Egypt. The town where it first appeared was the Mediterranean port of Pelusium—traditionally the point of entry for Egypt’s enemies for over a thousand years. Persians, Syrians, Romans, and Greeks—even Alexander the Great himself—had invaded Egypt through it. But this time the enemy was not proudly clad in armor. It was invisibly carried ashore on the backs of scuttling rats. It had arrived in Pelusium from the south via the Red Sea and the Roman equivalent of the Suez Canal—a waterway built by the emperor Trajan more than four centuries earlier to help link the Indian Ocean with the Mediterranean.

After devastating Pelusium, the disease quickly spread to Alexandria, then on to Constantinople and the empire as a whole. Up to a third of the empire’s population died in the first massive outbreak, and in the capital, more than 50 percent of the inhabitants are thought to have perished.<sup>2</sup>

“God’s wrath turned into, as it were, a wine-press and pitilessly trampled and squeezed the inhabitants [of many cities] like fine grapes,” wrote another eyewitness of the catastrophe, the hagiographer and historian John of Ephesus, in a moving and vivid account of the horror unleashed by the epidemic.

There were “homes, large and small, beautiful and desirable, which suddenly became tombs for the inhabitants and in which servants and masters at the same time suddenly fell [dead], mingling their rottenness together in their bedrooms.”<sup>3</sup>

Everywhere one looked were “corpses which split open and rotted on the streets with nobody to bury [them].” There were those “who perished falling in the streets to become a terrible and shocking spectacle for those who saw them, as their bellies were swollen and their mouths wide open, throwing up pus like torrents, their eyes inflamed and their hands stretched out upward, and [over] the corpses rotting and lying in corners and streets and in the porches of courtyards and in the churches.” There were “ships in the midst of the sea whose sailors were suddenly attacked by [God’s] wrath and [the ships] became tombs adrift on the waves.”

John tried to flee from the plague, but no matter where he went, the epidemic caught up with him. In the end, there was nowhere else to run to. On his journeys, after trying in vain to find a safe haven, he witnessed the ferocity with which the plague devastated the countryside just as much as the cities.

“Day by day, we too—like everybody—knocked at the gate of the tomb [literally, “on death

door”]. If it was evening, we thought that death would come upon us in the night, and again if morning had broken, our face was turned the whole day towards the tomb [i.e., “toward thoughts of death”].”

On the journey “we saw desolate and groaning villages and corpses spread out on the earth; staging posts on the roads full of darkness and solitude filling with fright everyone who happened to enter and leave them.” And “cattle abandoned and roaming scattered over the mountains with nobody to gather them.”

He saw fields “abundant in grain which was becoming white and stood erect” yet had no one “to reap or gather it in.” And he observed “flocks of sheep, goats, oxen and pigs which had become like wild animals, having forgotten [life in] a cultivated land and the human voice which used to lead them.”

In Constantinople, John recorded in considerable detail the scale of the catastrophe. “When the scourge weighed heavy upon this city, first it eagerly began [to assault] the class of the poor, who lay in the streets.

“It happened that 5,000 and 7,000, or even 12,000 and as many as 16,000 of them departed [to the world] in a single day. Since thus far it was [only] the beginning, men [i.e., government officials] were standing by the harbours, at the cross-roads and at the [city] gates counting the dead.

“Thus the [people of Constantinople] reached the point of disappearing, only a few remaining whereas [of] those only who had died on the streets—if anybody wants us to name their number, for in fact they were counted—over 300,000 were taken off the streets. Those [officials] who counted having reached [the number of] 230,000 and seeing that [the dead] were innumerable, gave up [reckoning] and from then on [the corpses] were brought out without being counted.”

The authorities quickly ran out of burial places. “The city stank with corpses as there were neither litters nor diggers, and corpses were heaped up in the streets.” Some victims would take days to die. Others became ill and died within minutes.

“In some cases, as people were looking on each other and talking, they [began to] totter and fell either in the streets or at home. It might happen that a person was sitting at work on his craft, holding his tools in his hands and working and he would totter to the side and his soul would escape.

“It might happen that [a person] went out to market to buy necessities and while he was standing and talking or counting his change, suddenly the end would overcome the buyer here and the seller there, the merchandise remaining in the middle with the payment for it, without there being either buyer or seller to pick it up.

“And in all ways, everything was brought to nought, was destroyed and turned into sorrow alone and funeral lamentations. The entire city then came to a standstill as if it had perished, so that its food supply stopped.”

At first, when burial space ran out, the dead were buried at sea. Vast numbers of corpses were taken to the seashore. “There, boats were filled with them and during each sailing, they were thrown overboard and the ships returned to take other [corpses].

“Standing on the seashore one could see litters colliding with each other and coming back to carry and to throw upon the earth two or three [corpses] to go back again and to bring [further corpses]. Others carried [the corpses] on boards and carrying-poles, bringing and piling [them] up one upon another. For other corpses, since they had rotted and putrefied, matting was sewn together. People bore them on carrying-poles and coming [to the shore] threw them [down] with pus running out from them.”

Thousands of corpses “piled up on the entire seashore, like flotsam on great rivers, and the piling flowed, discharging itself down into the sea.” Even with the ships busy dumping their macabre cargoes at sea, it was proving impossible to clear the backlog of dead bodies.

The emperor, Justinian, therefore decided on a new corpse-disposal strategy—the creation of giant

mass graves, each capable of accommodating seventy thousand individuals. The high official who was given the gruesome task of organizing the scheme was one of the emperor's *referendarii* (top civil servants), a man by the name of Theodore. The emperor "gave him instructions to take and spend as much gold as should be necessary."

Theodore arranged for the mass graves to be dug on a hill, immediately north of the city, on the other side of the Golden Horn waterway. "He took along many people, [and] gave them much gold" to dig the pits and start burying the dead. "He placed there [some] men who brought down and turned over [the corpses], piled them up and pressed the layers one upon another as a man might heap up hay in a stack.

"Also [Theodore] placed by the pits men holding gold and encouraging the workmen and the common people with gifts to carry and to bring up [corpses], giving five, six and even seven and ten dinars for each load. While men stood below [in the pits], deep as in an abyss, and others above, the latter dragged and threw down [the corpses], like stones being thrown from a sling, and the former grabbed and threw them one on top of another, arranging the rows in alternate directions.

"Because of scarcity [of room] both men and women were trodden upon, young people and children were pressed together, trodden upon by feet and trampled like spoiled grapes. Then again from above [other corpses] were thrown head downwards and went down and split asunder beneath, noble men and women, old men and women, youths and virgins, young girls and babies.

"Whole peoples and kingdoms, territories and regions and powerful cities were seized [by the plague]. Thus, when I [John of Ephesus], a wretch, wanted to include these matters in a record of world history, my thoughts were seized many times by stupor, and for many reasons I planned to omit it. I did so firstly because all mouths and tongues are insufficient to relate it, and moreover, because even if they could be found such that would record [at least] a little from among the multitude [of matters], what use would it be, when the entire world was tottering and reaching its dissolution and the length of human generations was cut short? And for whom would he who wrote be writing?

"[But] then I thought that it was right that, through our writings, we should inform our successors and transmit to them [at least] a little from among the multitude [of matters] concerning [God's] chastisement [of us]. Perhaps [during] the remainder of world [history] which will come after us, they will fear and shake because of the terrible scourge with which we were lashed through our transgressions and become wiser through the chastisement of us wretches and be saved from [God's] wrath here [in this world] and from future torment."

John was describing the epidemic of 541–543—the first visitation of the plague. But the full social and political impact of the disease lay in its remorseless habit of returning to claim the lives of those it had previously spared.

The church historian Evagrius lived through four great plague epidemics and lost most of his family to them. In the year 593, at the age of fifty-eight, he wrote down his memories in a very personal lamentation.

"I believe no part of the human race to have been unafflicted by the disease," for it occurred in some cities "to such an extent that they were rendered empty of almost all their inhabitants." Evagrius regarded it as his responsibility to describe these events, as he was present at the beginning of the spread of the bubonic plague, and was struck by it while still a schoolboy.

"And during the course of the various visitations, I lost to the disease many of my children and my wife and much of the rest of my kin . . . For now, as I write this, I am 58 years old and it is not quite two years since the fourth outbreak of plague struck Antioch and I lost my daughter and the son born to her in addition to those [I lost] earlier.

"The means by which one contracted this disease were diverse and beyond telling. For some

perished just through association and living together, others by physical contact, or by being in the same house, or even [through contact in] the market-place. Some people had escaped infected cities and themselves remained well, but passed on the disease to those who were not sick. There were those who remained entirely unaffected, even though they lived with many of the afflicted, in fact coming into contact not only with many sufferers but also with the dead. Others positively embraced death on account of the total loss of their children and family, and for this reason went cheek-by-jowl with the sick, but still were not struck down, as if the disease resisted their will.”

Many historians have tended to see the plague pandemic that devastated so much of the world in the sixth and seventh centuries as consisting of a series of distinct outbreaks. Some church historians and others who were alive at the time even saw it that way, but they were often looking at the catastrophe from the vantage point of the large cities where they lived—places such as Constantinople, Antioch, and Alexandria.

In reality, both the major plague epidemics and the less extensive outbreaks should be regarded as one integrated event, albeit a very long one, which lasted for between 180 and 210 years. Rather than looking at the records of simply the most prolific contemporary historians, it is vital to trawl through a wider number of sources to find even the smallest reference to plague.

Historians have found that there were *dozens* of outbreaks over the years from 541 to 717, and perhaps even as late as 745.<sup>4</sup> And those are just the epidemics and outbreaks that are recorded. From A.D. 600 onward, there appears to be a reduction in the frequency of plague outbreaks in the Roman Empire, but this may simply be a function of the paucity of sources from the seventh century. Indeed, probably only a small percentage of the outbreaks were ever recorded, and of those records that were made, only an even smaller percentage have survived to the present day. These records are best for the eastern Mediterranean region and for western Europe; the pandemic also affected, though not initially, China and Persia. Yemen was almost certainly hit by some time in the 540s. And then there are vast areas—such as Africa or central Europe—that no doubt were affected but for which virtually no written records exist.

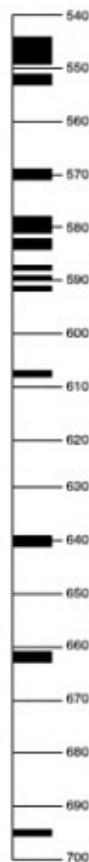
The plague passed from rat to human, sometimes from human to human, hardly pausing on its unpredictable journeys. Everywhere it rampaged, it must have substantially reduced population levels, thus creating vast tracts of abandoned agricultural land.<sup>5</sup> Sometimes it would spread to myriad towns and villages in a single year, while on other occasions it would bide its time, skulking in a few quiet or remote localities, only to burst forth from these nameless havens of death a few years later. Indeed, it is likely that at no time between 541 and c. 750 was the plague ever entirely absent from the Mediterranean region and its various hinterlands.

# THE DARK AGE PLAGUE: A CHRONOLOGY

Middle East and Roman Empire



Western Europe



The horizontal black marks indicate those years or groups of years in which plague is recorded as having raged in some part of the Roman Empire, Middle East, or Western Europe.

## THE ORIGINS OF THE PLAGUE

Twenty-five days' sailing time down the east coast of Africa, one arrives at a "metropolis" called Rhapta.<sup>1</sup> This information, recorded by the second-century A.D. Greek geographer Ptolemy, is the last known contemporary reference to a now long-lost African city that once flourished somewhere along the coastline of what is now Kenya and Tanzania.<sup>2</sup>

The only other reference—in a first-century A.D. pilots' manual called *The Periplus of the Erythraean Sea*—says Rhapta was a source for "great quantities of ivory and tortoiseshell" and was inhabited by "very big bodied men."<sup>3</sup> The metropolis was located on a river "not far from the sea" and was also involved in the export of "rhinoceros horn, and a little nautilus shell" and the importation of glass beads and iron goods, especially "axes, knives and small awls."<sup>5</sup>

According to *The Periplus*, written around A.D. 40, the place was at least nominally under the control of Arab merchants from Yemen. It appears that these merchants intermarried with local women, gave gifts of wine and grain to the local chiefs, and had royal Yemeni approval to exact tribute from the area.

From *The Periplus* and Ptolemy, it is clear that Rhapta was the most remote—and the largest—of four ancient East African trading ports, from north to south: Opone (now known as Ras Hafun, Somalia), Essina and Toniki (both near modern Barawa in Somalia), and Rhapta itself.

Opone—spectacularly sited on what is essentially an island linked to the coast by a thirty-mile-long sandbar—may have had several hundred inhabitants, covered up to five acres, and appears to have been abandoned some time in the mid-sixth century A.D. The latest pottery found by archaeologists at the site dates from the fifth or early sixth century. Up till that time, it seems to have acted as a transshipment point for Mediterranean, African, and Indian trade goods.

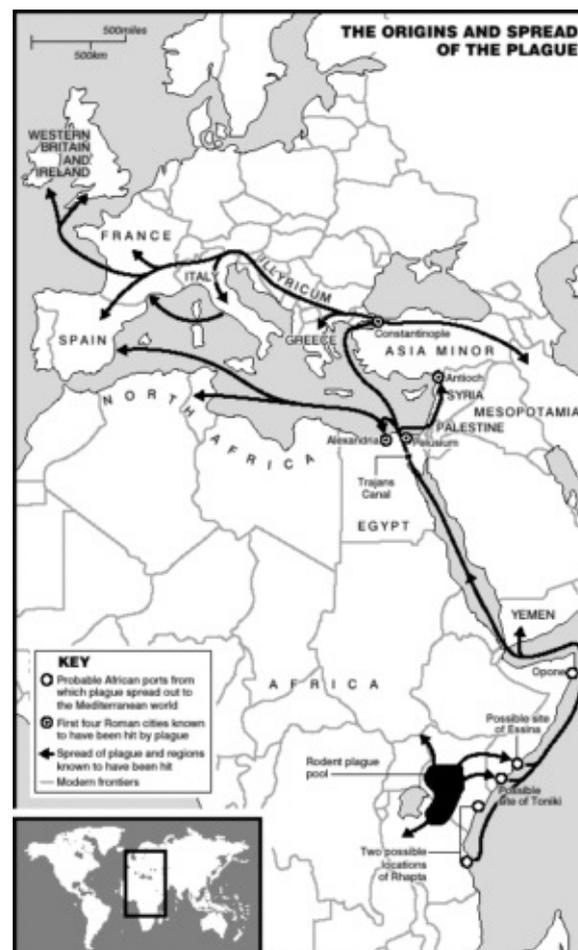
The other three ports, Essina, Toniki, and Rhapta, have never been archaeologically detected—probably because, like Opone, they never made it into the medieval period. Certainly an examination of the twenty-two pre-eleventh-century settlement and trading sites on the East African coast that have been archaeologically investigated shows that nineteen started functioning only between the seventh and ninth centuries A.D., two may possibly have started up before the sixth century, and only one definitely came into existence before the sixth. That strongly suggests severe settlement discontinuity in the sixth century. What is more, throughout East Africa, the pottery type abruptly changes exactly the same time. Before the sixth century it is all early Iron Age (Kwale ware), while after the sixth century it is all late Iron Age (Tana ware). There was also a move in some areas at the same time from a concentration on agriculture to a more pastoral economy.<sup>6</sup>

The sixth century was a great watershed in East African history—a period of very rapid change and probably decline, in which the key ports simply ceased to exist and the agricultural economy shrank. The culprit was almost certainly plague—the same epidemic that devastated Europe and the Near East in that same fateful century.<sup>7</sup> Indeed, it was most likely from an ancient East African wild-animal reservoir of plague that the disease broke out to infect so much of the late antique world.

Historically, there have been several major natural plague reservoirs in which the disease circulated

harmlessly among specific high-immunity wild animals. These areas—the Himalayas, Central/Eastern Africa, and the central Asian steppes—have been the ultimate sources for the plague epidemics that have hit Europe and elsewhere over the centuries.<sup>8</sup>

Evidence that the sixth-century pandemic originated in Africa rather than Asia is very clear.<sup>9</sup> First of all, the major Asian high-population region, China, did not become infected until half a century after the Mediterranean region had suffered its first visitation. Indeed, China was infected from the Mediterranean region via the Middle East. Certainly the major Middle Eastern power, Persia, was infected only after the disease had hit the Roman Empire. The Persians apparently contracted it from Roman soldiers. Second, there is no evidence of plague being endemic on the central Asian steppes prior to the later medieval period. Third, a major contemporary source, the Syrian-born historian Evagrius, actually recorded that the epidemic came from Africa (“Aethiopea”).



As already described, the first town in the Mediterranean world to be hit was the port of Pelusium, where, after transiting the Roman world’s equivalent of the Suez Canal, cargo originating in the Red Sea area and in Africa was unloaded for transshipment to the rest of the Roman world. What’s more, Yemen—halfway between East Africa and the Mediterranean—seems to have been an early victim of the plague, being hit by the disease sometime in the 540s.<sup>10</sup>

But why did the plague break out of its animal reservoir in East Africa at that particular time?<sup>11</sup> The answer is prosaic in the extreme—the weather.

Modern research on surviving wild-animal reservoirs of plague—monitored by the U.S. Centers for Disease Control—has concluded that most plague outbreaks are caused by sudden and severe climate change. Massively excessive rainfall is the most likely cause of plague spread, especially if it follows a drought, although a severe drought followed by normal weather could theoretically also spark an outbreak.

When there is excessive rainfall, vegetation growth increases. Thus there is more food available for herbivorous animals and insects, and rodents—including those that are carriers of the plague bacterium but are themselves immune to it—therefore breed more. Their larger numbers enable a greater survival rate vis-à-vis the slower-breeding predators who feed off the rodents, and a rodent breeding explosion occurs. In order to find their own foraging territory, the cumulative range of the rodents has to increase, and a virtual bow wave of these plague-carrying wild animals spreads inexorably outward over a period of months. Soon the creatures come into contact with other normal, plague-free rodents, which then spread the disease to humans.

In the slightly less likely, though theoretically feasible, drought scenario, lack of rainfall and food kills huge numbers of plague-carrying wild rodents and the larger predators that normally eat them. However, the minute the drought is over, the fast-breeding rodents recover their numbers quickly compared to the slower-breeding predators. There is then, for a few years, a great imbalance between hunter and hunted in favor of the hunted. A breeding explosion takes place and the plague-infested rodents spread like wildfire.

However, the most dramatic scenario of all is one in which a severe drought is followed by significantly increased rainfall. That, or something very much like it, is almost certainly what took place in East Africa during the worldwide climatic chaos of the 530s.

While weather was without doubt the motor that drove the spread of plague in East Africa, the key vector was the humble flea. Although the rodents were immune to plague, the fleas that lived on them were not. Fleas die of plague—but it's actually the process of dying itself that helps them spread the disease.

As a flea becomes ill, and under specific climatic conditions, part of its gut becomes blocked by a mixture of multiplying plague bacteria and clotted blood.<sup>12</sup> The flea then begins to starve, and becomes so ravenous that it will jump onto virtually anything that moves, irrespective of whether it is its normal host species or not. Of course, the flea's hunger will not be satisfied, because its gut is blocked. So it will move rapidly from host to host, biting each one—and consequently spreading plague—in an impossible mission to quell its hunger.<sup>13</sup> The disease itself thus produces the very mechanism for its own spread.

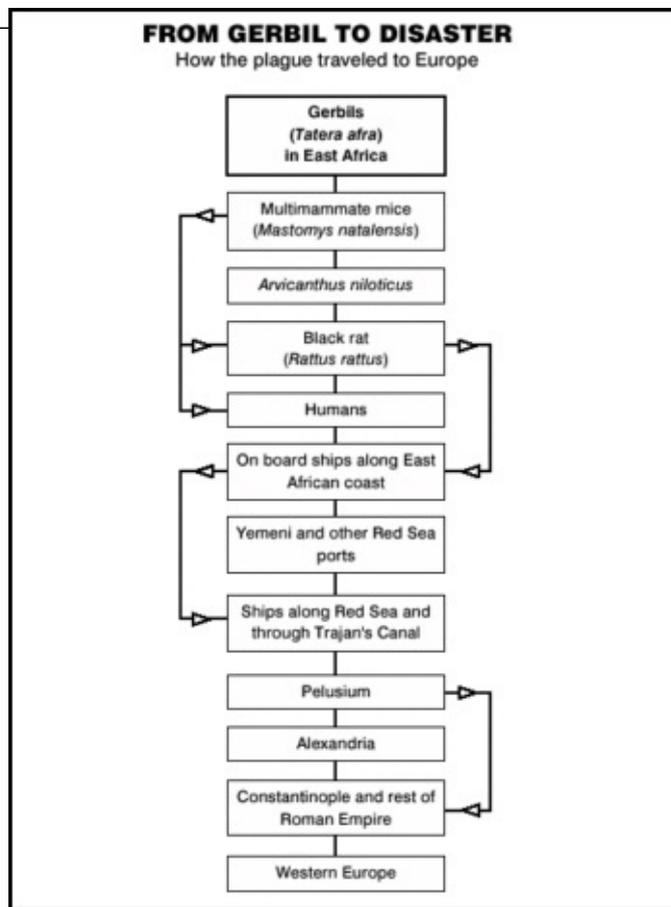
The species in East Africa that were probably the reservoirs for the disease were gerbils and multimammate mice. The sandy-colored gerbil normally has two litters (totaling ten offspring) per year. Gerbils are very territorial, and an individual will travel two to three miles per season in search of an area it can control as its own exclusive territory. Thus in optimal food conditions, when gerbil numbers increased, the need of each gerbil to find its own territory would have resulted in a wave of plague-carrying individuals spreading outward at substantial speed.

The multimammate mouse—a dark brown rodent about the size of a golden hamster—lives in colonies consisting of up to fifty individuals. Their gestation time is twenty-three days, and they have two litters per year. Normally they have only five offspring per litter, but when there is optimal food availability, the number can treble to fifteen. A pair can produce over a thousand descendants in a year. Today they are still a principal wild host of plague in Africa.

It is likely that the gerbils and multimammate mice then passed the disease to a ratlike creature of the genus *Arvicanthus*. The latter would not have been immune to plague, but in appropriate climatic conditions would have outbred even the multimammate mouse: In wet weather it can achieve densities of up to a hundred per acre, and it and its offspring can produce thousands of new individuals per year. Neither the multimammate mouse nor *Arvicanthus* is averse to invading human settlements, and would therefore have come into direct contact with nonimmune *Rattus rattus*—the black rat, a species that specializes in infesting human environments, including farms, storehouses, houses, village towns, markets, ports, and ships.

## FROM GERBIL TO DISASTER

How the plague traveled to Europe



In good climatic conditions, one pair of black rats (also known as house rats and ship rats) can produce thousands of descendants each year, especially if their slower-breeding predators are rarer than normal (due to, say, a recent drought). The species is aggressive, highly adaptive, and able to eat virtually anything—insects, seeds, meat, bones, fruit, even each other!

Once the starving fleas had jumped in their billions from gerbil and multimammate to *Arvicanthus* and on to the black rat, it would have been only a matter of days, even hours, before the first humans started contracting the plague.<sup>14</sup>

Transported by ships from port to port, *Rattus rattus* carried the plague bacterium from community to community. The archaeological evidence suggests that as the disease rolled northward up the Red Sea to Egypt, in its wake a whole way of life collapsed in East Africa and probably in southern Africa as well. The metropolis of Rhapta was inhabited by early Iron Age Bantu people, and the other ports of Opone, Essina, and Toniki were probably inhabited by late Neolithic Cushites, or possibly early Iron Age Bantu people.<sup>15</sup> At the time of the plague, as already noted, these ports seem to have virtually disappeared. Apart from Opone, their precise locations are not even known.

Inland, Bantu agriculture seems to have declined, and the Bantu appear to have rapidly and increasingly adopted from the Cushites both the latter's cattle-based pastoral economy and the latter's particular style of pottery. In the seventh century (i.e., after the plague had started), this cattle-based pastoral tradition began to spread south and supplant cereal growing all over southern Africa.

Two questions remain, however. How did the plague give an advantage to pastoralism (a livestock-based economy) over agriculture (a crop-based economy)? The answer lies in the number of rats and other plague-carrying rodents attracted to the two different economic systems. Food crops—whether in fields or in storage—attract rats. Food sources on four legs—in this case, cattle—do not. It was this difference that appears to have given pastoralism an advantage over agriculture at this critical time.

The second question is, what were ships carrying between East Africa and the Roman Empire

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