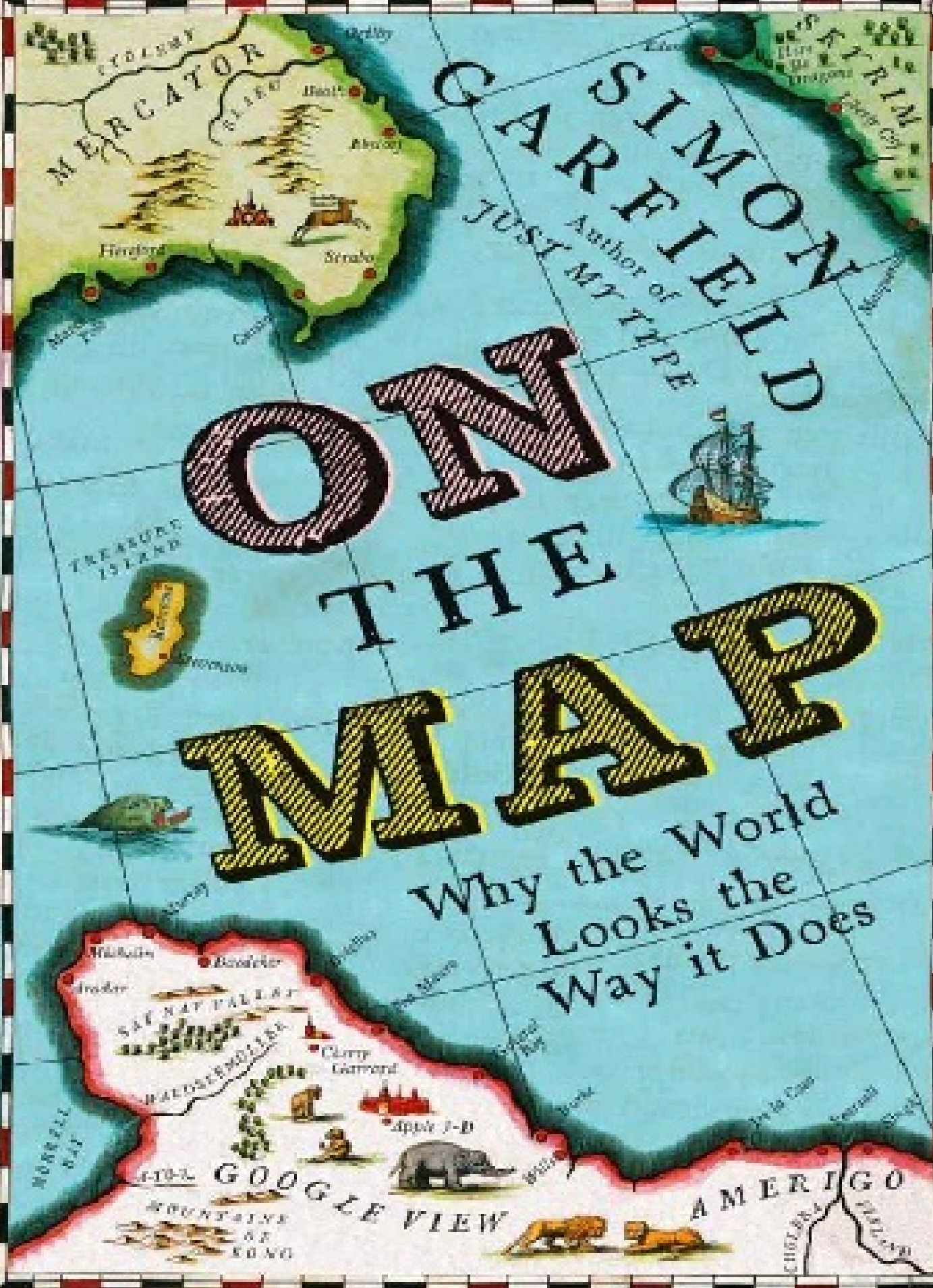


CAR SIMON & FIELD
Author of
JUST MY TYPE

ON THE MAP

Why the World
Looks the
Way it Does



Why the world looks the way it does

Simon Garfield



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Simon Garfield has chosen an apt double entendre as the title for his delightful paean to maps: *To be On the Map* is to have arrived. To discourse *On the Map* is to ponder cartography's course through history and throughout the cultural milieu. With pleasure, I accept the invitation he offers any reader of this book – to lose oneself in map perusal.

I love maps. I do not collect them, unless you count the ones in the box under my desk, which I've saved as souvenirs from the cities they walked me through or cross-country trips they guided. The maps I covet – early renderings of the known world before the New World came to light, mariner's portolans bearing wind roses and sea monsters – are all beyond my means, anyway. They belong where they are, in museums and libraries, and not confined to the walls (or condemned to the humidity) of my house.

I think about maps a lot. When working on a book project, I must keep a map of the territory at hand, to help the characters find their roots. Even at odd moments, say while clearing spam from the junk folders of my email accounts, it occurs to me that 'spam' is 'maps' spelled backward, and how maps, the true opposite of spam, do not arrive unbidden, but only beckon.

A map will lead you to the brink of Terra Incognita, and leave you there, or communicate the comfort of knowing, 'You are here.'

Maps look down, as I do, watching my step. Their downward perspective seems so obvious, so familiar as to make one forget how much looking-up they entail. Ptolemy's rules of cartography, written out in the second century, descended from his prior study of astronomy. He called down the moon and stars to help him align the world's eight thousand known locations. Thus he drew the tropic lines and equator through the places where the planets passed directly overhead, making his best guess of east–west distances by the light of a lunar eclipse. And it was Ptolemy who set North at the top of the map, where the pole pointed to a lone star that held still through the night.

Like everyone else these days, I rely on quick computer-generated maps for driving directions, and often find my way on foot or public transportation via the maps app on my smart phone. But for serious travel preparation I need a plat. Only a map can give me a sense of where I'm going. If I fail to see, before setting off, whether the destination is shaped like a boot or a fish tail or an animal hide, I will never gain a sense of the place once I'm there. Seeing ahead of time that streets obey a grid layout – or they circle around a hub, or follow no discernible plan – already tells me something of what wandering them will be like.

If I'm not really going anywhere, then travel by map of course provides the only possible route – to everywhere, to nowhere in particular, to the folds of the human genome, the summit of Everest, the paths of future transits of Venus for the next three thousand years. Even buried treasure, lost continents and phantom islands are all accessible by map.

What difference does it make if I never reach my map-dream destinations, when even the most admired map-makers of old stayed home? I think of Fra Mauro, immured in his Venetian monastery, spinning the thin yarns of untrustworthy travellers into his own gorgeous geography.

I revel in the visual luxury of maps. The so-called four-colour map conjecture, which defines the minimum number of pigments required for constructing a world map, sets no upper bounds on artistic licence.

The language of maps sounds no less colourful to my ear. Words like 'latitude' and 'graticule' rattle out of the mouth to cast a net around the world. And 'cartouche', the map's decorative title

block or legend, whooshes off the tongue with a breeze. Some names of places yodel; others click or sing. Gladly would I go from Grand-Bassam to Tabou along the coast of the Côte d'Ivoire, if only to say so out loud.

Maps are guilty of distortion, it's true, but I forgive them for it. How could one wrestle the round world down to a flattened image on the page without sacrificing some proportion? The various methods of map projection, from the eponymous Mercator to the orthographic, gnomonic or azimuthal, all cause one continent or another to morph. Just because I grew up seeing Greenland the equal of Africa in land mass doesn't mean I believed them to be that way, any more than I fretted over the misnomer of Greenland, a place white with ice, near Iceland, green with flora. Maps are only human, after all.

Every map tells a story. The picturesque antique ones speak of quest and conquest, of discovery, claim and glory, not to mention the horror tales about exploitation of native populations. Story lines may blur in modern maps, under a welter of natural and manmade features, yet up-to-date maps make great templates for new stories: swept clean of their topographical details, and with various data superimposed, they can make a statement about the voting patterns in the latest election, say, or the spread of disease at epidemic's first threat.

The only thing better than a map is an atlas. Atlas himself, the Titan who once held the heavens on his shoulders, has lent his name to a family of rockets as well as to book-length compendia of maps. I own several of these worthy Atlas namesakes, all requiring strong arms to bear them from shelf to table.

I could enthuse about globes, too, especially the bygone ones built and sold in pairs, one orb for earth and one for sky (also depicted from above, with the geometry of all constellations reversed). A globe, though, is merely an inflated, reincarnated map. It starts out flat, as a series of painted or printed gores, and these need to be fitted around and pasted on a ball to make the ends of the earth meet. If maps be the fuel of wanderlust, read on.

Introduction

The Map That Wrote Itself

In December 2010, Facebook released a new map of the world that was as astonishing as it was beautiful. It was both instantly recognisable – the standard projection produced by Gerard Mercator in the sixteenth century – and yet curiously unfamiliar. It was a luminescent blue, with gauzy lines spread over the map like silk webs. What was odd about it? China and Asia were hardly there, while East Africa seemed to be submerged. And some countries weren't quite in the right place. For this wasn't a map of the world with Facebook membership overlaid, but a map generated by Facebook connections. It was a map of the world made by 500 million cartographers all at once.

Using the company's central data on its members, an intern called Paul Butler had taken their latitudinal and longitudinal coordinates and linked these to the coordinates of the places where they had connections. 'Each line might represent a friendship made while travelling, a family member abroad, or an old college friend pulled away by the various forces of life,' Butler explained on his blog. Facebook had about 500 million members at that time, so he anticipated a bit of a mess, a crowded mesh of wires (like the back of those early computers) that would culminate in a central blob. Instead, Butler recalled, 'after a few minutes of rendering, the new plot appeared, and I was a bit taken aback. The blob had turned into a detailed map of the world. Not only were continents visible, certain international borders were apparent as well. What really struck me, though, was knowing that the lines didn't represent coasts or rivers or political borders, but real human relationships.'



It was the perfect embodiment of something Facebook's founder Mark Zuckerberg had told me when I interviewed him the year before Butler created that map. 'The idea isn't that Facebook is one new community,' he had said, 'but it's mapping out all the different communities that exist in the world already.'

The digital revolution – so neatly encapsulated by that Facebook map – has transformed mapping more than all the other innovations of cartography's centuries. With our phone maps in our hands and Google Earth on our computers, it is increasingly difficult to recall how we managed without them. I seem to recall we used to buy maps that folded, or maps that once folded when they were new and then never again. Or that we used to pull down shoulder-dislocating atlases from shelves and thumb

through their index, and perhaps wonder at how many Springfields there were in the United States.

That these simple pleasures are becoming distant memories is no small change. For physical maps have been a vital part of our world since we first began finding our way to food and shelter on the African plains as hunter-gatherers. Indeed, Richard Dawkins speculates that the very first maps came about when a tracker, accustomed to following trails, laid out a map in the dust; and a recent finding by Spanish archeologists identified a map of sorts scratched on a stone by cave dwellers around fourteen thousand years ago. Dawkins goes on to speculate as to whether the creation of maps – with their concepts of scale and space – may even have kick-started the expansion and development of the human brain.

In other words, maps hold a clue to what makes us human. Certainly, they relate and realign our history. They reflect our best and worst attributes – discovery and curiosity, conflict and destruction and they chart our transitions of power. Even as individuals, we seem to have a need to plot a path and track our progress, to imagine possibilities of exploration and escape. The language of maps is integral to our lives, too. We have achieved something if we have put ourselves (or our town) on the map. The organised among us have things neatly mapped out. We need compass points or we lose our bearings. We orient ourselves (for on old maps east was at the top). We give someone a degree of latitude to roam.

Maps fascinate us because they tell stories. The ones in this book tell how maps came about, who drew them, what they were thinking, and how we use them. Like any map, of course, the selection is highly selective, for a book about maps is effectively a book about the progress of the world: sturdier ships in the fifteenth century, triangulation in the late-sixteenth century, the fixing of longitude in the eighteenth, flights and aerial observation in the twentieth century. And then, in this century, the Internet, GPS and sat nav – and perhaps, through them, a second reshaping of our own spatial abilities.

For the Internet has effected an extraordinary and significant change. Before astronomers faced the gallows for suggesting otherwise, our earth stood firmly at the centre of the cosmos; not so long ago, we placed Jerusalem at the centre of our maps; or if we lived in China, Youzhou. Later, it might be Britain or France, at the heart of their empires. But now we each stand, individually, at the centre of our own map worlds. On our computers, phones and cars, we plot a route not from A to B but from ourselves (‘Allow current location’) to anywhere of our choosing; every distance is measured from where we stand, and as we travel we are ourselves mapped, voluntarily or otherwise.

Earlier this year, a friend of mine noticed an odd thing on his Blackberry. He was walking in the Italian Alps and wanted to check out contours and elevations. When he turned on his phone his Transport for London bicycle app was open: a handy tool where you put in a London location and it tells you how many bikes are available at each docking station. It was less use in Italy, or so he thought. But, in fact, the app was still working and the map over which Transport for London had overlaid its bicycle info actually covered the entire world. The bikes were only the start of it. It could plot a route to Ravello, Cape Town or Auckland. Wherever he went, my friend was the map, the pivot around which the world diligently spun. And the app was no doubt tracking him, too, so that someone knew which Italian mountain he was on, as well as who was riding the bike he had docked the day before.

How on earth did we get to this point? This book is intended as an answer to that question, but it could also be viewed as a journey around an exhibition. It is by necessity an imaginary show, for it contains things that would be impossible to gather in one place: long-lost impressions of the world from Ancient Greece, famous treasures from the world’s universities, some jaw-dropping pieces from the British Library and the Library of Congress, rare items from Germany, Venice and California. There will be manuscripts, sea charts, atlases, screen grabs and phone apps. Some exhibit

are more important than others, and some are just displayed for amusement. The range will be extensive: ~~poverty and wealth maps, film maps and treasure maps, maps with a penchant for~~ octopuses, maps of Africa, Antarctica and places that never were. Some of the maps will explain the shape of the world, while others will focus on a street or on the path of a plane as it flies to Casablanca.

We'll need a lot of space for our guides: boastful dealers, finicky surveyors, guesswork philosophers, profligate collectors, unreliable navigators, whistling ramblers, inexperienced globe-makers, nervous curators, hot neuroscientists and lusting conquistadors. Some of them will be familiar names – Claudius Ptolemy, Marco Polo, Winston Churchill, Indiana Jones – and some will be less well known: a Venetian monk, a New York dealer, a London brain mapper, a Dutch entrepreneur, an African tribal leader.

You hold in your hand the catalogue to this show, and it begins in a library on the coast of Egypt.

Chapter 1

What Great Minds Knew

Maps began as a challenge of the imagination and they still perform that role. So imagine yourself in your bedroom. How good would you be at mapping it? Given a pencil and pad, could you draw the room well enough so that someone who's never been there would get a fair picture? Would the size of the bed be in proportion to the door and the bedside table? Would the scale be right in relation to the height of the ceiling? Would your kitchen be harder or easier to map than the bedroom?

This shouldn't be too hard really, because these are places you know well. But what about the living room of a friend? That would be partly a test of memory – would you get it right or would you be struggling? But what about your first school: would you remember where your classroom was in relation to others? Or the world? Could you draw that? Could you correlate the relative size – and geographic relationship – of Mongolia and Switzerland? Would you get the oceans even half right in the southern hemisphere? And what if you'd never seen another map before, or a globe, and you'd never been to any of these places yourself? Could you construct a map of the world based purely on what people had told you, and what people had written down? And if you did manage this, would you be happy for it still to be used as the principal map of the world some 1350 years after you had drawn it?

Only, I imagine, if your name was Claudius Ptolemy.

Considering his impact on the world, and beyond the fact that we should regard the P in his surname as silent, we know curiously little about Ptolemy. But we do know where he worked – at one of the greatest buildings in ancient Egypt, lying just a little way inland on a small cloak-shaped port on the banks of the Mediterranean.

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The story of the vanished Great Library of Alexandria is one of the most romantic of the ancient world, and it appeals partly because we are unable to imagine a modern equivalent. Today's British Library is a library of record, receiving a copy of each new work in the English language, but it has no ambitions to house a complete collection of the world's manuscripts, nor to contain the sum of human knowledge. The same with the Bodleian in Oxford, and the New York Public Library. But the Great Library of Alexandria did aspire to such ambitions, and it existed at a time when such a thing was broadly achievable.

From its inception in around 330 BC, the Library was intended as a place where every scrap of useful information found a home. Other private libraries were commandeered for the common good; manuscripts arriving in the city by sea would be transcribed or translated, and only some were returned; often the ships would sail away again with the originals replaced by copies. At the same time, Alexandria became Europe's principal supplier of papyrus, from which the majority of its Library scrolls were made. And suddenly the supply of papyrus for export dried up: some claimed that all the papyrus was required to supply the Great Library, though others detected a plot designed to inhibit the growth of rival collections – an elitism, passion and quest that all obsessive book and map collectors will recognise.

The Great Library was the legacy – like the city itself – of Alexander the Great. During a journey along the western reaches of the Nile Delta, Alexander had come across a site that, according to the

Roman historian Arrian, he predicted would be 'the very best in which to found a city.' Its subsequent foundation signalled the shift of governmental and cultural power from Athens.

Alexander had been tutored by Aristotle in the ways of morality, poetry, biology, drama, logic and aesthetics, and it was through Aristotle that he became devoted to Homer, taking the Iliad into battle and living by its teachings. His conquest of the Persian Empire was followed by the destruction of Tyre and the rapid capitulation of Egypt, and it was here that he became afflicted with immortal ambitions: he wanted his legacy to be a symbol of learning rather than destruction, a place from where the Hellenistic worldview would be spread through the empire and beyond. And so he laid plans for a city marked by a devotion to scholarship, high ideals and good governance, and its vast Library was to be its pantheon.

The Library, completed several decades after Alexander's death in 323 BC, was in effect the world's first university, a place of research and colloquy, whose scholars included the mathematician Archimedes and the poet Apollonius. They discussed scientific and medical principles as well as philosophy, literature and political administration. And they were responsible for drawing up the first accomplished maps of the world: a role for which, living in a port city at the heart of both western and eastern trade routes, and with first-hand testimonies from travellers and sailors, they were ideally placed.

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If we stumbled across a map of ancient Alexandria today, we would see an orderly place, a grid system of boulevards and thoroughfares. A heavily populated Jewish Quarter lies to the east, while the Library and Museum stand in the Royal Quarter in the centre. The city is surrounded by water, with the Great Harbour (home of the royal palaces) on small islands in the north. At the city's northern harbour rises the Pharos lighthouse, one of the Seven Wonders of the World, more than a hundred metres tall, with a flame at its top reflected by a mirror and visible some thirty miles out to sea. It would be difficult to miss the metaphor: Alexandria was a beacon city, a landmark both liberated and liberating in a city pulsing with illuminated thinking.

But the world beyond Alexandria – how did that look at the beginning of the third century BC?

Despite the Great Library's accomplishments in science and mathematics, the study of geography was still in its infancy. Its first scholars constructed an important proto-map of the world, based largely on the writings of the Greek historian Herodotus. His nine-volume *Researches* had been completed a century and a half earlier but his description of the rise and fall of the Persian empire and the Greco-Persian wars remained the most detailed source on the known world. Homer, too, was regarded as an important source for geographical knowledge, not least through the travels depicted in the *Odyssey*.

It is thought that this Alexandrian map depicted the world as round, or at least roundish, which by the fourth century BC was commonly accepted. It is possible that Herodotus shared this view, though he may have seen it as a flat disc floating on water. Homer, certainly, was a flat-earthier, back in the eighth century BC, believing the earth was a place where if you continued sailing you would eventually fall off the end. But by the fifth century BC, Pythagoras had argued persuasively that the earth was a sphere. (The myth that the earth was still considered flat until the time of Columbus is an oddly enduring one. Why should this be? A combination of general ignorance and our love of a good story: the image of Columbus returning home with the news that his fleet did not in fact topple into a great abyss is madly appealing.)

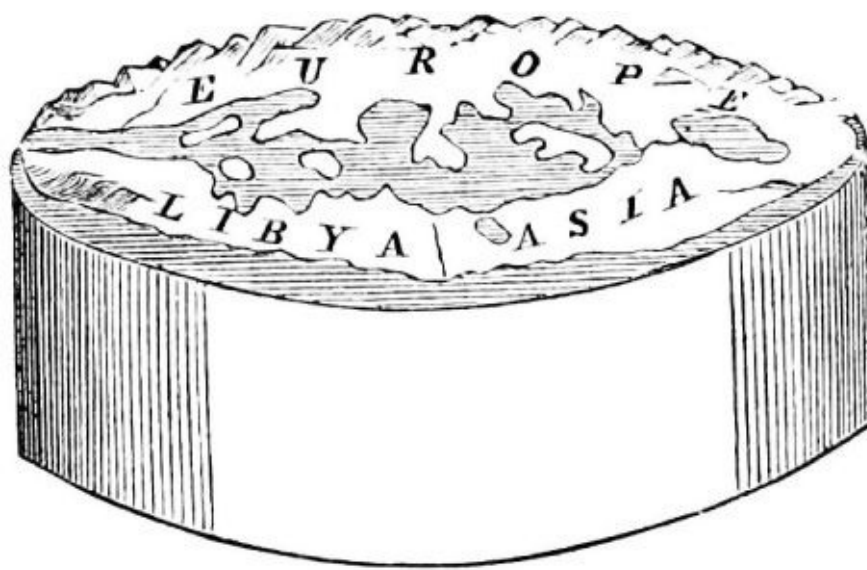
Herodotus upheld the common wisdom that the world was divided into three sections – Europa,

Asia and Libya (Africa) – but argued against a widespread belief that they were the same size and made up the whole of the earth. Neither Britain nor Scandinavia featured in his accounts, and the Nile ran throughout Africa to Morocco's Atlas Mountains. Only a small section of Asia was examined, and it was dominated by India. Herodotus admitted to uncertainty over whether Europe was surrounded wholly by water, but he suggested Africa might be. He also saw the Caspian Sea – accurately – as a vast inlet, unlike many of his successors.

As the Great Library developed its collections, the variety and reliability of its sources yielded a vast collection of fragmentary information about the world – and the possibilities of creating maps to reflect this. Eratosthenes of Cyrene (in modern-day Libya) was one of the first scholars able to marshal the city's new geographical knowledge into the art of cartography. Born in 276 BC, he studied mathematics and astronomy in Athens, combining the disciplines to form the first primitive armillary sphere (or astrolabe), a series of metal rings arranged as a globe that showed celestial positions with the earth at its centre.

At the age of forty, Eratosthenes became the third Librarian at Alexandria and began his great treatise *Geographica* shortly afterwards. There was no study of geography comparable to that of medicine or philosophy (indeed, Eratosthenes is believed to have coined the word 'geography' from the Greek words *Geo*/Earth and *graphien*/writing) but at the Great Library he would have encountered an abstract map created in the sixth century BC by Anaximander of Miletus for his treatise *On Nature*. This map, long extinct, showed the world as a flat disc with named parts for the Mediterranean, Italy and Sicily. He may also have benefitted from an inventory of countries and tribes – a 'Circuit of the Earth', but in truth more a circuit around the Mediterranean – provided in the same period by Hecataeus of Miletus. (Miletus, in modern-day Turkey, was something of a Classical geographical hothouse. In the fifth century BC it was also home to Hippodamus, a forefather of urban planning responsible for some of the earliest civic maps).

But Eratosthenes' own geographic study was to be on an altogether grander scale, making fullest use of the Library scrolls, the accounts of those who had swept through Europe and Persia in the previous century, and the pertaining views of the leading contemporary historians and astronomers. His world map was drawn in about 194 BC. No contemporary version exists, but the cartographer's descriptions were interpreted for a Victorian audience, and this remains the generally accepted and widely used reproduction. It peculiarly resembles a dinosaur skull. There are three recognisable continents – Europe to the north-east, Africa (described as Libya and Arabia) beneath it, and Asia occupying the eastern half of the map. The huge northern section of Asia is called Scythia, an area we would now regard as encompassing eastern Europe, the Ukraine and southern Russia.



Three continents in a fountain: Anaximander imagines a disc-like earth surrounded by water in sixth century BC.

The map is sparse but sophisticated, and noteworthy for its early use of parallels and meridians in a grid system. Eratosthenes drew a main parallel running east-west through Rhodes, and a main meridian running north-south, again with Rhodes at its centre. His map was then divided into unequal rectangles and squares, which appear to the modern eye as locational grids but served the Greek geographer more as an aid to achieving accurate proportions. They affirmed the common belief that the earth's length from west to east was more than double its breadth from north to south.

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Eratosthenes viewed the earth in the contemporary way: as a sphere at the centre of the universe with the heavenly bodies in full rotation every twenty-four hours. In his view, there were two distinct ways of interpolating and depicting the world: the whole planetary earth as it hung in space, and the known world as it existed to scholars, navigators and the beneficiaries of trade. The inhabited world (something the Romans would later call 'the civilised world') was believed to occupy about one-third of the northern hemisphere and was wholly contained within it. The northernmost point, represented by the island of Thule (which may have been Shetland or Iceland), was the last outpost before the world became unbearably cold; the most southerly tip, labelled enticingly as Cinnamon Country (Ethiopia/Somaliland) was the point beyond which the heat would burn your flesh.

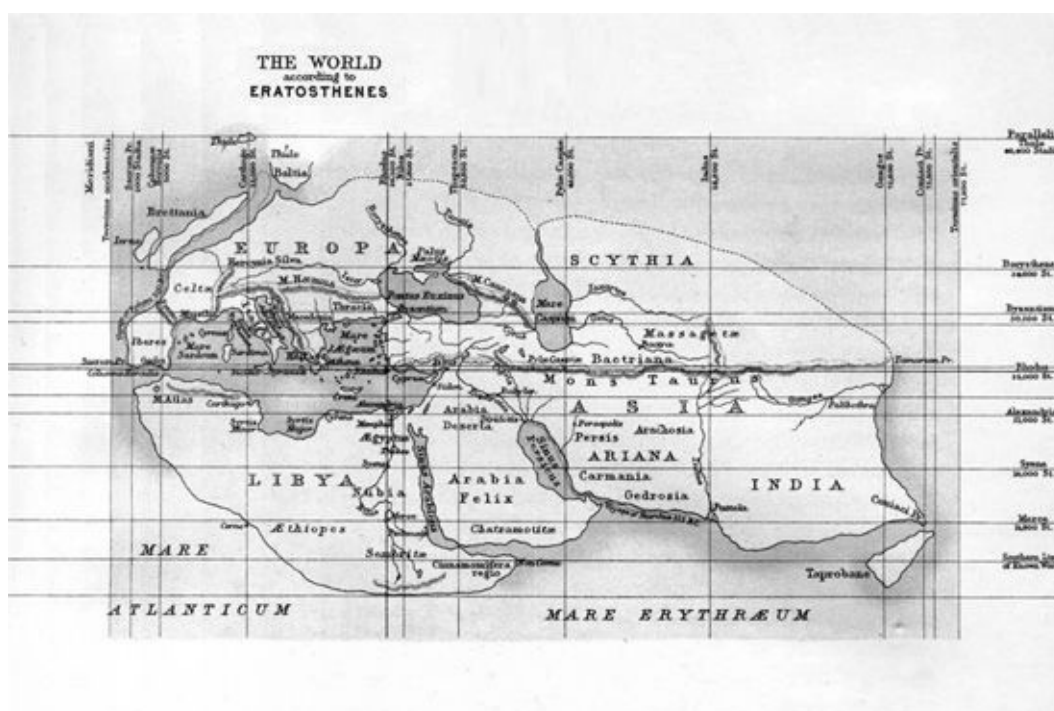
In Eratosthenes' map the oceans are interconnected, the Northern Ocean covering the top of Europe and Scythia, the Atlantic propping up the coasts of Libya, Arabia, the Persian empire and a square-shaped India. There are giant inlets of the Caspian Sea and the Persian Gulf, both of which erroneously flow into the oceans. Brettania, vaguely accurate in shape but excessive in scale, is sited to the far north-west, sitting in good proportion to both Ireland and Europe. All three give the impression of being loosely connected, separated only by navigable inland waters or mountain ranges. And they appear purposely huddled together, as if the huge encroaching oceans and the vast areas of the unknown world are joining forces against them. There is no New World, of course, no China, and only a small section of Russia.

Nonetheless, in its reliance on scientific principles, the map made great methodological strides over its predecessors. And although Eratosthenes consciously elongated the continents to fit his workings, he set the template for a new goal – the formulation of a precise and consistent map of the world.

If it were just for his descriptive map, Eratosthenes would now be regarded as a minor character in the story of ancient cartography (indeed his colleagues referred to him as a ‘Beta’ talent, compared to the ‘Alpha’ virtues of Aristotle or Archimedes). But this judgement should be revised, for he did one great thing which goes beyond mapping: he made ground-breaking calculations as to the earth’s measurements, and his working principles, based on the large Babylonian pole known as a gnomon (a forerunner to the classical vertical sundial), are rightly considered a timeless and fool-proof technique, if rather a clumsy one.

His eureka moment, reported subsequently by the Greek scientist Cleomedes, has now taken on the mythical weight of a Newtonian apple, but it may be true. Eratosthenes had observed that on midsummer’s day the sun shone directly overhead at the Nile settlement at Syene, a fact demonstrated by its reflection in a deep well at noon. He knew, by the time it took to journey between the two towns by camel, that Syene (modern Aswan) lay roughly 5,000 stades (about 500 miles) due south of Alexandria (on the main meridian on which he had plotted Rhodes). By measuring the angle of the sun’s elevation from the Great Library at the same moment (7°) he could plot a circumference of the earth. Assuming the earth to be spherical and made up of 360° , his 7° difference between 500 miles worked out at 1/50th of the whole sphere. Eratosthenes thus declared that the earth had a circumference of 250,000 stades (roughly 25,000 miles), a calculation he increased to 252,000 to fit his desire for a pleasing symmetrical division by 60.

Eratosthenes came remarkably close to the true figure. We now accept the earth’s circumference 24,901.55 miles (40,075.16 km). By some estimates his figure was only two per cent over, although much depends on the definition of the stadion, his unit of measurement, which has both an Attic definition and an Egyptian one. But given that Eratosthenes was operating with such primitive estimates (Syene was not precisely due south, the earth is not perfectly spherical but bulges slightly at the Equator), we may marvel not only at his accuracy, but also at what the great distances said about the size of the unexplored world around him. Was there ever a greater invitation to explorers and geographers to map what was yet unknown?



A skull-like vision of the world from Eratosthenes, with the equator through Rhodes, and Cinnamon Country spicing up the southern

The destruction of the Great Library by fire in 48 BC (conceivably an accident caused when Julius Caesar's troops set ablaze their own ships in an attempt to thwart the invading force of Cleopatra's brother Ptolemy XIV) was only the first to afflict it. It was destroyed or ransacked at least three times more, though each time succeeded in re-establishing itself, either on the same site or to the south-west of the city. Mark Antony replenished the library's stocks in 37 BC by raiding the library of Pergamum and donating some 200,000 volumes as a wedding present to Cleopatra.

Several years after the first firestorm, something remarkable happened to our understanding of the world: the emergence, in seventeen volumes, of the *Geographica*, the most comprehensive account of the world yet written. Its author, the historian and philosopher Strabo, was born in 63 BC in Amasia by the Black Sea, and survived long enough to straddle the Common Era.

Strabo was almost sixty before his first volume emerged about 7 BC; the last appeared a year before his death at the age of eighty-five. He was one of the world's first great travellers and much of the value of his geography lay in the descriptive passages of areas he himself had seen. He was not modest about these travels: in his second volume he boasts of a journey westwards from Armenia to Sardinia and to the south from the Euxine Sea to the borders of Ethiopia. 'Perhaps there is not one among those who have written geographies who has visited more places than I have between these limits.'

All but one of the volumes of Strabo's *Geographica* survive. Their stated purpose was to show how knowledge of the inhabited world had developed in line with the expansion of the Roman and Parthian empires, and the volumes (divided into geographical regions) are invaluable in our understanding not only of cartography, but also of how the civilised world saw itself at the time of Julius Caesar and the birth of Christ. No physical map survives but it seems likely that Strabo was writing with a large manuscript map in front of him, or perhaps a selection of maps from which he drew a mental composite.

Intriguingly, Strabo's world is smaller than that described by Eratosthenes, his predecessor by two centuries. The earth's width is reduced to 30,000 stades (compared with Eratosthenes' 38,000), while its length is 70,000 stades compared to Eratosthenes' 78,000. Or that at least is his inhabited world, which he describes as 'an island' floating in a sea in the northern hemisphere. He believed that the world he knew and described took up about a quarter of the earth.

Strabo was no mathematician, and he distrusted the scientific advances in measurements and map projection made by Eratosthenes. Accordingly, he described his world in the most literal of ways, akin to the conceits of astrology. Taken as a whole, the inhabited world resembled a chlamys, a short tapering cloak worn by Greek soldiers and hunters. Britain and Sicily were triangular, while India was a rhomboid. He compared the northern part of Asia to a kitchen knife; Iberia to an ox-hide; the Peloponnese to a leaf on a plane tree; while Mesopotamia had the profile of a boat with the Euphrates as its keel and the Tigris the deck.

We read Strabo's *Geographica* now with a mix of awe and bemusement: awe at the scale of the enterprise, bemusement at some of its assumptions. Britain is thought not worth conquering, described as wretched and uninhabitable on account of its climate (Strabo notes that the sun hardly shines in Britain, particularly not in the region we now call Scotland). Ireland is full of cannibals. Ceylon, an island seven days' sailing from India, has an unusual crop: 'It produces elephants.'

Although Strabo is a geographer rather than mapmaker, he acknowledged the limitations of his

descriptions, instructing that his prose should be visualised on a flat surface. For this he suggests a simplified grid of parallels and meridians on a parchment seven foot long and three foot wide. But he also envisaged a far better method of representing his research: a globe.

He mentions a sphere constructed by the philosopher Crates of Mallus in the previous century that was ten feet in diameter and showed the world divided into four clear regions, all islands, all of roughly equal size, two above the 'torrid zone' dividing the northern and southern hemispheres and two below.* Only one of these islands – his own – was definitely inhabited, but Crates, drawing on a combination of Eratosthenes and Homer for much of his information, believed that the other three might also be temperate and populated, with at least one other region below the equatorial ocean cultivated by 'Ethiopians' who had no connection with other Ethiopians in Cinnamon Country.

Strabo suggested that his own globe should also be at least ten feet in diameter in order to capture sufficient detail. But he appreciated that most of his readers would find the construction of such a thing beyond them.

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The Great Library of Alexandria had one more defining contribution to make to the history of cartography, and although it built on the gains of Eratosthenes and Strabo it was such a momentous piece of individual scholarship that it set the tone and look of map-making in the European and Arab worlds for hundreds of years. This wasn't a map itself, but a descriptive atlas, and its originator could be said to be the world's first modern cartographer. It was a book of instructions, in Greek, that changed the way we looked at the world so fundamentally that – almost 1,350 years later – it was, in modified form, one of the main navigational tools Columbus carried with him when he departed for Japan in 1492.

The atlas was the work of Claudius Ptolemy, who lived between 90 and 170 AD, studied at Alexandria for the majority (if not all) of his life, and had earlier produced a highly influential treatise on Greek astronomy called the *Almagest*. This contained detailed star charts and a multilayered model of the earth's position in the cosmos, with the earth, stable in the centre, playing host to the daily revolution – in order of proximity – of Moon, Mercury, Venus, Sun, Mars, Jupiter and Saturn, and a sphere of fixed stars sparkling on the outer edge. Ptolemy also wrote a scientific investigation into optics, examining the process of seeing and the role of light and colour.

But the work we are interested in is Ptolemy's *Geographia*. This was a two-part interpretation of the world, the first consisting of his methodology, the second of a huge list of names of cities and other locations, each with a coordinate. If the maps in a modern-day atlas were described rather than drawn they would look something like Ptolemy's work, a laborious and exhausting undertaking, but one based on what we would now regard as a blindingly simple grid system. In the seventh section of *Geographia* (there were eight in all), Ptolemy provided detailed descriptions for the construction of not just a world map, but twenty-six smaller areas. No original copies have survived, and the closest we can get to it is a tenth-century Arab description of a coloured map – though whether that was an original or merely inspired by his text is unknown, and at any rate, it no longer exists.



The modern winds of change: Ptolemy's classic map of the world, beautifully rendered in 1482 by the German engraver, Johannes Schnitzer of Armsheim.

As one would expect, Ptolemy had a skewed vision of the world. But while the distortion of Africa and India are extreme, and the Mediterranean is too vast, the placement of cities and countries within the Greco-Roman empire is far more accurate. Ptolemy offered his readers two possible cylindrical projections – the attempt to project the information from a three-dimensional sphere onto a two-dimensional plane – one 'inferior and easier' and one 'superior and more troublesome'. He gives due credit to a key source, Marinus of Tyre, who had advanced the gazetteer listings system a few decades earlier, assigning his locations not merely a latitude and longitude, but also an estimated distance between them. (Marinus had another claim, too: his map data was the first to include both China and the Antarctic.)

Ptolemy boasted that he had greatly increased the list of cities available to the cartographer (there were about 8,000), and also disparaged the accuracy of Marinus's measurements. But he had his own flaws. Indeed, the map historian R. V. Tooley suggests that Ptolemy stood apart from his predecessors not just in his brilliance but in his disregard for science. Where earlier cartographers were willing to leave blanks on the map where their knowledge failed, Ptolemy could not resist filling such empty spaces with theoretical conceptions. 'This would not have mattered so much in a lesser man,' Tooley contends, but so great was his reputation 'that his theories assumed an equal validity with his

undoubted facts.’ As we shall see, this had the uncanny ability to send ambitious sailors, Columbus among them, to places they had no intention of seeing.

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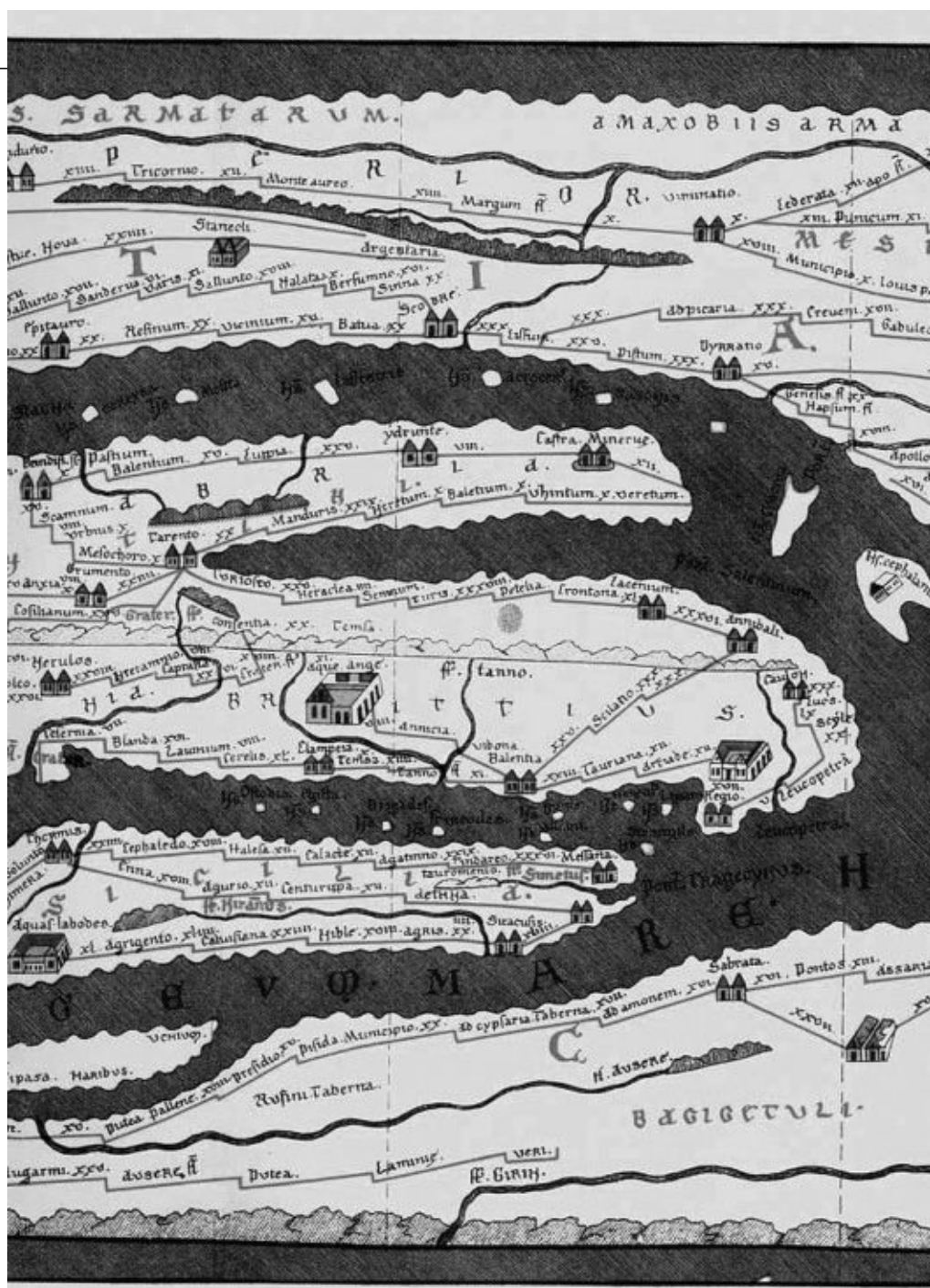
There were maps of the world before these Alexandrian advances – a clay tablet here, a papyrus shroud there – but they were unique and random objects.* By contrast, the maps by Eratosthenes, Strabo and Ptolemy spawned at the Great Library were logical and disciplined. The reputation of the library as the most important the world has seen has some grounding here – and it is a legend made more romantic by the various destructions that befell it over the centuries.

The Library’s ultimate destruction occurred nearly half a millenium after Ptolemy’s death, in 641 when Alexandria fell to the Arabs. At the time, the Library had again been replenished, and although was not the powerhouse of learning it once was, it still contained many hundreds of thousands of volumes. But its new captor apparently had no use for books. When asked about the fate of the Library, the Caliph Omar is said to have replied: ‘If the contents of the books are in accordance with the book of Allah, we may do without them, for in that case the book of Allah more than suffices. If, on the other hand, they contain matter not in accordance with the book of Allah, there can be no need to preserve them. Proceed, then, and destroy them.’

But there is one more improbable thing. We have seen that Ptolemy’s *Geographia* appeared in about AD 150, and we could logically have anticipated a steady stream of carto-graphic progress. The coordinates and projection that he employed were a universal system, something to be employed and expanded as our knowledge of the world itself grew over the centuries. It was like an enormous net, able to catch new information and spread out accordingly. But it didn’t happen. The steady cartographic advance one might have anticipated failed to materialise. Where was the Ptolemy of the fourth or fifth century? Why do we not know what Harold thought of the shape of the world when he trotted out to Hastings in 1066? Or how Saladin saw the Middle East? Because there are no maps to show us.

Neither the Romans nor the Byzantines progressed Ptolemy’s work. There were some fine localised beauties – the Peutinger Table from the fifth century (a long, schematic roadmap showing the key settlements of the Roman Empire), and the sixth-century Madaba map (a mosaic of the Holy Land, preserved in a church in Jordan, that includes street plans of Jerusalem and other cities). But they show little curiosity about the world beyond, and neither of them advances the science of mapmaking.

Instead of progress, the world appeared to fall into the cartographic dark ages for about a thousand years. Did our ambitions towards exploration, conquest and the pursuit of wealth suddenly disappear like so much candle smoke? And what about globes? They too spun backwards. The concepts of latitude and longitude, the emergence of the graticule and the prime meridian – all these were put back in the box, only really to emerge into the sun again in teeming Venice and Nuremberg in about 1450.



The long and winding empire: a detail from the Peutinger Table, a fifth-century Roman roadmap stretching from the Dalmatian Coast to the African Med.

And what was it that did actually emerge at the height of the Renaissance? Some great new pictures of the world? The discovery of new continents? Something to do with America? No, what emerged was the translation from Greek into Latin of a volume that had been thought lost since the glory days of Alexandria. It was Ptolemy's 'atlas', and its rediscovery – matched with the boom in European printing – heralded the birth of the modern world.

But let's stay awhile in the dark ages. Or, more precisely, Hereford in the winter of 1988.

On Wednesday 16 November 1988, the Dean of Hereford, the Very Reverend Peter Haynes, and Lord Gowrie, a former Arts Minister who was now Chairman of Sotheby's, stood outside Hereford Cathedral in suits and posed for photographs beside a framed facsimile of a large brown map. The map, almost as tall as the pair holding it, was due to be auctioned the following June, and Sotheby's had agreed a reserve price of £3.5m, which would make it the most valuable map in the world. Later that day it would be described by Dr Christopher de Hamel, Sotheby's expert on medieval manuscripts, as 'without parallel the most important and most celebrated medieval map in any form.'

Lord Gowrie regretted that such an important object might soon be leaving the country to the highest bidder, but said that all attempts to save it for the nation had failed. He had been trying for almost a year to keep the map in the UK, but now needs must. The Dean explained that his eleventh-century cathedral, one of the most impressive Norman constructions in England, was in need of £7m to prevent it from crumbling to the tiled floor, and disposing of the map was the only way forward. After their announcement, the two men handed the frame to the cathedral staff, and departed, Gowrie back to London, the Dean back to his troubled place of worship.

Mass unhappiness ensued.

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The map in question was Hereford's Mappa Mundi, c.1290, and it wasn't a beautiful thing to look at. A large shank of tough hide – measuring 163 cm by 137 cm – it has a murky rendition of the world that, at first sight, is hard to fathom with its faded colours and indistinct lettering. It is also a map that if you had been transported from the Great Library at the time of Ptolemy, would have come as quite a surprise. Gone is the careful science of coordinates and gridlines, longitude and latitude. And in their place is, essentially, a morality painting, a map of the world that reveals the fears and obsessions of the age. Jerusalem stands at its centre, Paradise and Purgatory at its extremes, and legendary creatures and monsters populate the faraway climes.

And this is very much its conception. The mappa (the word meant cloth or napkin rather than map in medieval times) had a lofty ambition of metaphysical meaning: a map-guide, for a largely illiterate public, to a Christian life. It has no reservation in mixing the geography of the earthly world with the ideology of the next. Its apex displays a graphic representation of the end of the world, with a Last Judgement showing, on one side, Christ and his angels beckoning towards Paradise, and on the other the devil and dragon summoning to another place.

But it seems likely that those who saw it first at the end of the thirteenth century would have done what we do now and looked for the 'You Are Here' spot. If so, they would have found themselves in the south-west region of the giant circle, with Hereford one of the few places mentioned in England, and England itself a fairly insignificant part of the global story. Around them is a world crowded with cities, rivers and countries teeming with human activity and strange beasts. Ancient and brilliant cartographic theories have been replaced by something else: the map as story, the map as life.

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