
Opening Extract from...

Atlantic

A Vast Ocean of a Million Stories

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PROLOGUE: THE BEGINNINGS OF ITS GOINGS ON

All the world's a stage
And all the men and women merely players:
They have their exits and their entrances;
And one man in his time plays many parts,
His acts being seven ages.

A big ocean – and the Atlantic is a very big ocean indeed – has the appearance of a settled permanence. Stand anywhere beside it, and stare across its swells towards the distant horizon, and you are swiftly lulled into the belief that it has been there forever. All who like the sea – and surely there can be precious few who do not – have a favoured place in which to stand and stare: for me it has long been the Faroe Islands, up in the far north Atlantic, where all is cold and wet and bleak. In its own challenging way, it is entirely beautiful.

Eighteen islands, each one a sliver of black basalt frosted with gale-blown salt grass and tilted up alarmingly from east to west, make up this Atlantic outpost of the Kingdom of Denmark. Fifty-odd thousand Faroese fishermen and sheep farmers cling

there in ancient and determined remoteness, like the Vikings from whom they descend and whose vestiges of language they still speak. Rain, wind and fog mark out these islanders' days – although from time to time, and on almost every afternoon in high summer, the mists suddenly swirl away and are replaced by a sky of a clarity and blue brilliance that seems only to be known in the world's high latitudes.

It was on just a day like this that I chose to sail, across a lumpy and capricious sea, to the westernmost member of the archipelago, the island of Mykines. It is an island much favoured by artists, who come for its wild solitude and its total subordination to the nature that so entirely surrounds it. And going there left a deep impression: in all my wanderings around the Atlantic, I can think of no place that ever gave me so great an impression of perching *on the world's edge*, no better place to absorb and begin to comprehend the awful majesty of this enormous ocean.

The westernmost of the eighteen Faroe Islands, Mykines rises abruptly from the Atlantic Ocean, buffeted by wind and waves, or else socked in by thick fogs for most of the year. Puffins, whales, and sheep – the word faroe *is Viking for sheep – support a total Faroese population of fewer than 50,000 people, all of whom are citizens of Denmark.*

The landing on Mykines was exceptionally tricky. The boat surfed in on the green breaking top of an ocean roller into the tiny harbour, its skipper tying up for just enough time to let me clamber out onto a cement quay lethal with slippery eelgrass. A staircase of rough stones rose up to the skyline, and I scrambled upwards, only too well aware of the deep chasm filled with boiling surf far below beside me. But I made it. Up on top there was a scattering of houses, a church, a shop and a tiny inn, its sitting room heavy with the smell of pipe smoke and warm wet sweater wool. A sudden furious blast of wind had driven away the morning fog, and the sun revealed a long steep slope of grass that stretched right up the island tilt, clear up to the western sky.

There was a grassy pathway leading up to this high horizon, and a skein of islanders was moving slowly up it, like a line of ants. I joined them, out of curiosity. To my great surprise most were dressed in Faroese finery – the men in dark blue and scarlet jackets, with high necks and rows of silver buttons, knee breeches and silver-buckled shoes; the women in wide-striped long skirts, blue vests fastened with an elaborate cat's cradle of chains, and fringed scarves. And though a few men had anoraks with folded felt snoods, none wore hats: the incessant wind would have whipped them away. The children, dressed just as their parents, whooped and skirled and slid on the wet grass, their elders tutting them to keep their boots clean and to be careful not to fall.

It took thirty minutes to do the climb, and none of the islanders seemed to break a sweat. They all gathered at a site by the cliff top, where the grass was flattened. There was a memorial stone here, a basalt cross incised with the names, I was told, of the fishermen who had died in the Icelandic fishing grounds off to the west. The crowd, perhaps a hundred in all, arranged themselves beside the summit marker, a cairn of basalt boulders, waiting.

After a few minutes a white-haired man of sixty or so, puffing a little from exercise, appeared at the top of the path. He was dressed in a long black surplice with a ruffled high collar that made him look as if he had stepped from the pages of a medieval chapbook. He was a Lutheran pastor, from the Faroese capital town of Thorshavn. He proceeded to lead a service, helped by two churchwardens who played accordions and one island lad with a guitar. A pair of pretty young blond children handed around some damp hymn sheets, and the villagers' high voices set to singing old Norse holy songs, the thin music instantly swept away to sea by the gale, as it was designed to be.

The islanders said the small religious ceremony was quite without precedent: in the past it had always been a visiting pastor from Denmark, a thousand miles south, who would come here to bless the islands' long-drowned sailors; but today made history, it was explained, because for the first time ever the minister was Faroese. In its own gentle and respectful way the dedication service, with its prayers offered in the local tongue, offered an indication of just how these remote mid-ocean islands had drawn themselves steadily away from the benign invigilation of their European motherland. They had gone their own way at last: an *island* way, remarked one of the congregants. *An Atlantic way.*

After the service was finally over, I strolled behind the dispersing crowd – and without warning suddenly and terrifyingly reached the cliff edge. The grass cut off as with a blade, and in its place there was just a huge hollow emptiness of wind and space, the black wet walls of a hurtling precipice of basalt cliffs with, crawling almost half a mile below, the tides and currents and spume of the open sea. Hundreds of puffins stood in nooks in the cliff edge, some no more than an arm's length away, and all quite careless of my presence. They looked like ridiculous, stubby creatures, with that mask-face, chubby cheeks, and a coloured

bill that was usually crammed full with a clutch of tiny fish. But every so often one took to the air and soared off into the sky with an easy and contented grace, ridiculous no more.

I must have sat at the edge for a long, long time, staring, gazing, mesmerised. The gale had finally stopped its roaring, and the sun had come out and was edging its way into the afternoon. I was sitting on the cliff edge, my legs dangling over half a mile of emptiness. I was facing due west. Just below me were clouds of seabirds, the gannets and fulmars, kittiwakes and storm petrels, and beside me were the chattering congregations of puffins. Ahead of me there was just nothing – just an endless crawling sea, hammered like copper in the warm sunshine and stretching far, fifty miles, a hundred – from up this high I felt I could have been looking out on five hundred miles and more. There was an endless vacancy that at this latitude, 62 degrees north or so, I knew would be interrupted only by the basalt cliffs of Greenland, more than a thousand miles away. There were no ships' wakes on the sea, no aircraft trails on the sky – just the cool incessant wind, the cries of the birds, and the imagined edge of the known world set down somewhere, far beyond my range of sight.

And it is very much the same on any Atlantic headland, whether in Africa or the Americas, in the Arctic or from the dozens of other oceanic islands like these, places from where the views are limitless, the horizons finely curved with distance. The view is enough to give the viewer pause: it is just so stupefying, so haunting, the impressions welling up, one after another.

How eternal the ocean appears, and how immense. It is anything but trite to keep reminding oneself how incalculably large the Atlantic happens to be. The big seas are so big that after just a little contemplation of this ocean you understand why it was once perfectly fitting of someone – in this case Arthur C. Clarke, who

knew a thing or two about immensity – to remark on *how inappropriate it is to call this planet Earth, when clearly it is Sea.*

Then again, above all the dominant colour of this ocean is grey. It is grey, and it is slow-moving, and it is heavy with a steady heaving. The Atlantic is in most places not at all like the Pacific or the Indian oceans – it is not dominated by the colour blue, nor is it overwhelmingly fringed with leaning palm trees and coral reefs. It is a grey and heaving sea, not infrequently storm-bound, ponderous with swells, a sea that in the mind's eye is thick with trawlers lurching, bows up, then crashing down through great white curtains of spume, tankers wallowing across the swells, its weather so often on the verge of gales, and all the while its waters moving with an air of settled purpose, simultaneously displaying incalculable power, and inspiring by this display perpetual admiration, respect, caution, and fear.

The Atlantic is the classic ocean of our imaginings, an industrial ocean of cold and iron and salt, a purposeful ocean of sealanes and docksides and fisheries, an ocean alive with squadrons of steadily moving ships above, with unimaginable volumes of mysterious marine abundance below. It is also an entity that seems to be somehow *interminable.* Year in and year out, night and day, warm and cold, century after century, the ocean is always there, an eternal presence in the collective minds of those who live beside it. Derek Walcott, the Nobel laureate poet, wrote in his famous epic work *Omeros* of his fisherman-hero Achilles walking finally and wearily up the shingled slope of an Atlantic beach. He has turned his back on the sea at last, but he knows that even without him seeing it, it is behind him all the while and simply, ponderously, magnificently, ominously, continuing to be the sea. The Ocean is, quite simply, "still going on".

Three thousand years ago Homer introduced the poetic idea of *Oceanus* — the son of Uranus and of Gaia, the husband of Tethys and father of a score of river gods. The word itself signified a vast globe-encircling river, which the ancients imagined to be rimmed by both the Elysian fields and by Hades. To Homer the ocean was a river that rose far away where the sun sets. It was something totally daunting for Mediterranean sailors who spied its great greyness crashing and storming outside the Pillars of Hercules, at the Strait of Gibraltar. It was known as the Great Outer Sea, and it was a thing hugely to be feared, a world of crashing waters inhabited by terror-inspiring monsters like Gorgons and Hecatonchires, or by bizarrely unfamiliar humans like Cimmerians, Ethiopians, and pygmies. And forever, *always going on.*

This poetic notion of the sea's ceaseless activity is one that manages to be at once familiar, comforting, and mildly unsettling. One has a sense that the sea, whatever else it may be, however grey or immense or distempered or powerful, is a permanent presence in the world, whether it is rumbling or calm, storming or drowning. We think of it as an immutable living being, ceaselessly occupied in its unfinishable business of washing and waiting.

Yet strictly speaking, this is hardly true at all. Oceans have their beginnings and their endings, too. Not in the human imagination, perhaps, but in a physical sense, most certainly. Oceans are born, and oceans die. And the Atlantic, the once much-feared Great Outer Sea, the most carefully studied and considered of them all, was not always there, and it will not remain either where it is, or what it is.

For an ocean to begin, a planet must have two elemental essentials. One is water. The other is land. The enormous tonnage

of water* that presently exists has not always been there, of course – but recent research suggests that it came into existence fairly soon after the earth was first coalesced out of clouds of space-borne planetesimals, almost five billion years ago. Studies of zircon crystals found near an iron ore mine in Western Australia indicate that liquid water was on earth just a few hundred million years after the planet was formed. It was extremely hot water, and it had all manner of noxious and corrosive dissolved gases in it; but it was liquid, it sloshed about, it could (and did) erode things that it poured over, and most important of all, it was the undeniable aqueous ancestor material of all of our present seas.

The ocean I gazed down on from the puffin cliffs of Mykines is in essence the selfsame water that was created all those years ago; the principal difference is that while the Hadean sea was hot and acid and incapable of supporting anything but the most primitive of thermophilic cyanobacteria, the Faroese Sea was cold and clean, had been purified and well salted by millions of years of evaporation and condensation and recycling, was rich in chemical ions from all over, and was vibrant with life of great complexity and beauty. In all other respects the frigid waters off the North Atlantic islands and the steaming acid waters of our early and territorially undifferentiated planet of long ago were more or less the same.

Territorially undifferentiated though that early planet may have been, it would not remain so for long. Solid, habitable earth was being manufactured in the cooling planet at about the same time, too.

At first this land was represented by little more than the ap-

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* The water weighs 1.3 billion billion tonnes, give or take – on a planet that is calculated to weigh 6,000 billion billion tonnes in total.

pearance of countless huge supervolcanoes, each separated from the other so that their clusterings might have looked from the air like the chimneys of a planet-sized industrial complex, giant marine mountains that belched out choking clouds of smoke and spewed thousand-mile-long puddles of thick black lava. Eventually these isolated volcanoes managed to vomit out so much new rock that they started to coalesce, and some of these coagulating masses became more or less stable, such that they could be thought of in aggregate as *landmasses.* Some long while later, these landmasses formed into even larger bodies of land that could fairly be described as *protocontinents.* And thus did the defining present-day characteristic of our planet – an entity formed of continents and seas – have its beginnings, although the process of reaching a configuration that looked anything like today's world was infinitely slow and involved a fantastic complexity. The making and unmaking of a multidimensional topography is only now beginning to be understood.

The earth in its early days may have been both water and land, but it was a scalding and wretched place. It spun on its axis much more rapidly than today: once every five hours the sun would rise, though had any inhabitants been around they would probably not have seen it through the vast clouds of ash and smoke and fire and noxious gas. If the skies ever cleared, the planet below would have been scourged by unfiltered pulses of ultraviolet radiation and gamma rays, making the surface hostile to almost everything. And the newly made moon was still so close that each time it swept around in orbit, it raised great acid tides that would inundate and further corrode such continents as existed.

But some continents most certainly did exist. Today's geological record contains the relicts of half a dozen or so identifiable former bodies mighty enough to be continents. Their remains have been dispersed by billions of years of planetary restlessness:

no longer is any one of these early bodies intact. All that is left is a collection of stratal shards and sunderings that can be dated from at least three billion years ago, and which are now scattered to places as otherwise unconnected as present-day Australia (where parts of this earliest of continents are to be found) and Madagascar, Sri Lanka, South Africa, Antarctica, and India.

The detective work needed to piece together the original continents is prodigiously difficult. Yet it has become possible, by looking carefully at the ages and structures of such rocks, to come up with at least an approximate sequence of events that led to the formation of today's Atlantic Ocean and the continents that now border it.

It is a sequence featuring the dozen or so continents and seas that have come into existence, briefly or for aeons, over the planet's life. The lineage commences with the arrival of the world's first continental body: a mighty, two-thousand-mile long landmass shaped much like the silhouette of a monstrous albatross, which formed itself and hoisted itself above the boiling seas some three billion years ago. Today's geological community has given it a suitably sonorous and memorable name: it is known, in honour of the Chaldean birthplace of Abraham, as the supercontinent of Ur.

The remains of other ancient continents have been discovered since the finding of Ur, and they have been given names reflecting either the national pride of those living where they lie, the classical education of the explorers who discovered them, or the realities of modern global politics. They are names mostly unfamiliar beyond the sodalities of geology: Vaalbara, Kenorland, Arctica, Nena, Baltica, Rodinia, Pannotia, Laurentia. They are names that define bodies either as small as present-day Greenland, or as immense as present-day Asia. They were bodies constantly in motion, constantly changing their shape, topography, and position.

Over immense stretches of time, during periods of scourg-

ing heat and colossal physical forces, they all shifted themselves slowly and in stately fashion around the surface skin of the planet. Sometime they collided with one another, creating what are now ancient and much-flattened mountain chains. More often than not, they broke apart in a series of slow-motion explosions, events that took millions of years to play out. The shards of their ruin then banged and ricocheted their way around the earth, reordering themselves and occasionally recombining with one another, as though the planet's surface were covered with the pieces of some enormous jigsaw puzzle that was being operated by an unseen and none-too-bright giant. And all the while, the spaces between the continental bodies were filled with the seas – being constantly shape-shifted and divided up and redivided and configured into bodies of water that were each recognisable, from about one billion years ago, as true and proper oceans.

By Cambrian times, some 540 million years ago, one of these oceans was starting to have a familiar look to it. When it first appeared, its shape was inconsequential – it was merely very big. But during the Ordovician period, it started to become fairly narrow, vaguely sinuous, no more than a thousand miles wide, like a great river coursing across the world from north-east to south-west. That is to say – *it was in appearance not altogether unlike the North-Atlantic-to-be.*

And because it washed the shores of what would in time become the east of North America and the northwest of Europe, so this supposed Ordovician sea was given the name that it should by rights bear. It was called Iapetus, for the mythical figure known by the ancient Greeks as the father of Atlas. The Iapetus Ocean, long since dry, and now seen at its spectacular best in the sandstones and deepwater grey limestones in northern Newfoundland that memorialise its existence, was the precursor, the father or mother, of the true and eventual Atlantic Ocean.

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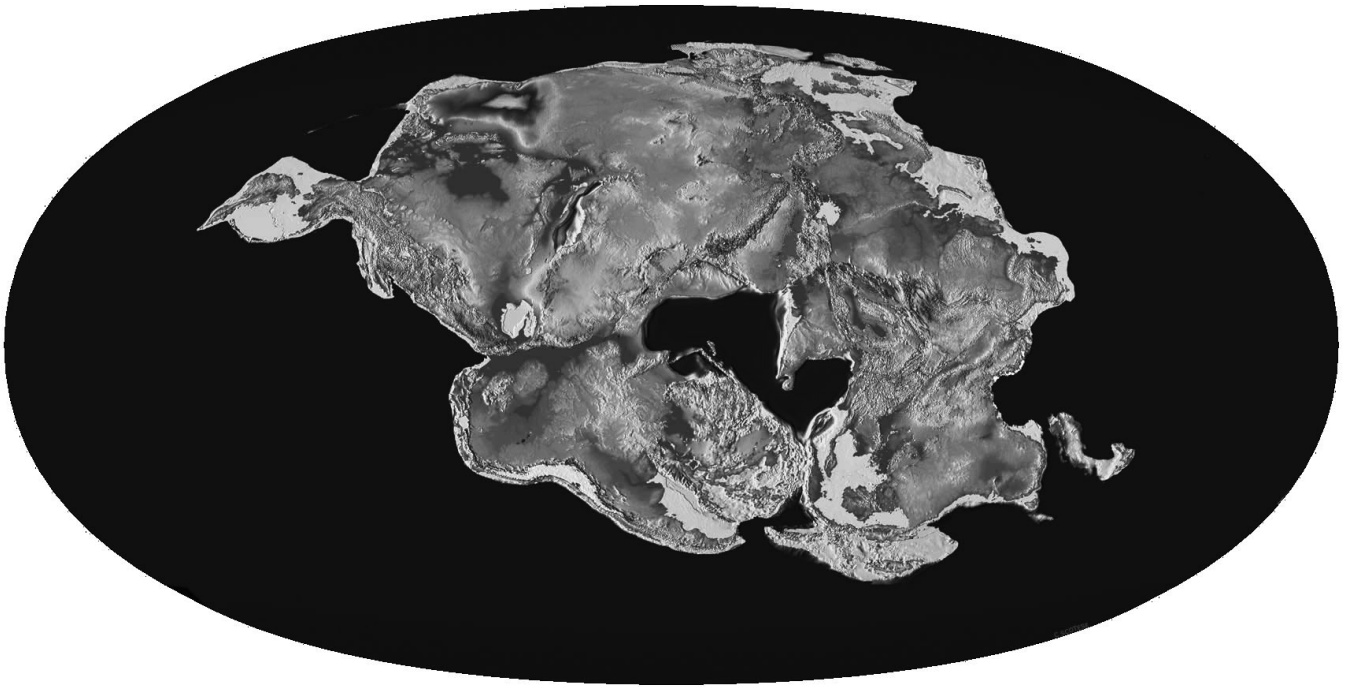
The modern and recognisable world began to come about some 250 million years later – 250 million years ago, indeed – during the end of the Permian and the beginning of the Triassic eras. It was a process that got under way when four of the original protocontinental jigsaw pieces collided and formed themselves into the one supercontinent that has since managed to achieve wide familiarity: the great body known as Pangaea. This vast entity contained every piece of Permian real estate that then existed on the globe. Its name alone says this was one land that comprised all of the world's land, and it was surrounded by one sea – Panthalassa – that was all of the world's sea.

Out of these two bodies – one water, the other land – today's Atlantic Ocean would be made. The process began with a long era of spectacular volcanic violence, one of the planet's most violent episodes in its entire recent history. Soon thereafter there was a mass extinction of life forms, both at sea and on the land; and then finally Pangaea started to break apart, and the new ocean started to form. The extent to which these three events were connected has been debated at length – especially over whether the vigorous volcanic activity caused both the extinction and the breakup – but these events did occur, and within relatively short order.

The volcanic period was so comprehensively and terrifyingly violent, so generous in its extent and so profound in its consequences that it must have felt as though the entire world were ripping itself apart. A gigantic series of explosions started to cannonade around the central core of Pangaea. Thousands of mighty volcanoes, first thousands of Heclas, and then in time thousands of Krakatoas, or Etnas or Strombolis or Popocatepetls, pushed themselves up and out of the countryside and started to spew fire and magma thousands of feet into the air. A ceaseless round of unbearably huge earthquakes began to shake



Some 195 million years ago Pangaea began to break up and the first tongue-like extension of the Panthalassan Ocean began (centre) to seep into the narrow but widening gap between America and Europe, and in time between Africa and South America too. The Atlantic was being born: it would exist for 440 million more years.

and shatter the planet, trending along a roughly delineated line that ran for hundreds of miles northwards and southwards, and splintering and smashing the earth for scores of miles downwards into the crust.

Even if the immense universal continent of Pangaea had not yet broken up, it certainly had started to weaken and groan with the weight and weariness of its own long existence. The world was witnessing the beginnings of a brief and yet merciless series of spasms of tectonic mayhem that started tearing the world's one stretch of land into pieces, from end to end.

And water began to seep into the growing gap between the two halves of Pangaea that were beginning to form. The tiny weasel-tongue of water that laid down sediments that are found in today's Greece turned into an almighty spigot: trillions upon trillions of tonnes of seawater started to rush inward from it and from the feeder-waters of the surrounding Panthalassan Ocean. In doing so – by beginning the process of prising apart, levering open, wielding a tectonic crowbar – this potent combination of volcanoes, earthquakes, and lots and lots of water started the making of a brand new ocean. It only opened up a crack, like a door cautiously ajar: but it was a process that would continue, and then accelerate and proceed without let-up, for scores of millions of years, right up to the present day. The resulting ocean had been paternally prefigured by the Iapetus two hundred million years before. This tiny filigree of seawater that was fast rising between the newly made volcanic cliffs of what are now Nova Scotia and Morocco was the first small-scale indication of the coming birth of the Atlantic.

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The volcanoes lasted for only a few-score thousand years (though some say as much as two million) but their pulses were so violent and the amount of magma they disgorged was so prodigious that

the cliffs and mountain ranges that today stand as memorial are awesomely impressive.

I took a family holiday in 1975 on the Canadian island of Grand Manan in New Brunswick, a short distance from where Roosevelt took his summer's ease on Campobello. We spent happy afternoons investigating the tide pools at Southwest Head, a high cape from where only the Atlantic could be seen, misty and cold, endlessly stretching to the south. Afterwards we walked home to watch the huge Fundy tides at Seal Cove, and on the way passed by a curious assortment of pure white boulders that sat incongruously at the top of a cliff composed of sheer columns of a dark brown rock. The boulders, deposited by glaciers, were called the Flock of Sheep. But it was the brown rock below them, a columnar basalt, that has most intrigued geologists – ever since, in the late 1980s, it was realised that they were quite similar in appearance and probable age to another huge pile of basalts, in a mountain range in Morocco.

I went to these mountains, the High Atlas, when I was researching a different aspect of this book. I had no idea then of their connection with the Grand Manan rocks, nor did I know until I started to ask around. For although Morocco is known for its Palaeozoic as well as its Jurassic and Cretaceous fossils, the Atlas mountains have large outcrops of basalt, too – layers of volcanic rocks sandwiched between the sedimentary rocks, which, it was realised by researchers in 1988, were of exactly the same age as the rocks in places like Grand Manan, in eastern Canada. This discovery, which I was told about while sitting sunning myself in a rooftop bar in the coastal town of Essaouira, led geologists on a huge Easter egg hunt around other Atlantic coastal countries for more basalts of the same antiquity. A series of expeditions in the 1990s found scores of outcrops – sills, dykes, flood basalt sequences – all in enormous abundance, which

showed almost certainly just what had been going on a little over two hundred million years ago.

The outcrops were all over – four million square miles of lavas, covering parts of what in time would become four continents: in North America they ranged along the Appalachians from Alabama to Maine, and then well beyond up into Canada and along the shores of the Bay of Fundy; in South America they were found in Guyana, Surinam, French Guiana, and, most impressively, throughout the Amazon basin of Brazil; in southern Europe they were detected in France; and in Africa there were swarms of sills and dykes found not only in Morocco but in Algeria, Mauritania, Guinea, and Liberia. And all these puzzle pieces had alignments and ages and proximities that positively shouted their intimate geological connections and their probable common origin.

The average age of their deposition eventually came in with some accuracy: most of the basalts had been laid down or extruded or blown into the sky 201.27 million years ago, a figure computed with an error either way of only perhaps three hundred thousand years. Some discrepancy exists between the age of the basalts on what would be the eastern side of the region – in North Africa, especially – and those in what would become North America: the American basalts seem older. This discrepancy has led to an impassioned debate over whether the volcanoes led to the extinction of so much of the flora and fauna, since that massive wiping-out – when huge numbers of amphibian species vanished, leaving environmental niches perfectly suited for the arrival of scores of Jurassic dinosaur types – occurred around 199.6 million years ago. Would volcanoes, however almighty, have their principal biological effect almost *two million years* later? It seems a little improbable – but some laboratories are still trying to link the two events, not least because it makes for a more dramatic, and anthropomorphically comprehensible, story.

The great continent unzipped, though not like a fly on a pair of trousers. It was an inelegant, jerky process, rather like watching a camel getting to its feet, with one part of the ocean opening, then another far away, then a portion of the middle, then another section in the distance, and then back to the middle again. The first waves of water washed the shores of eastern Canada and northwest Africa as they pushed apart from each other, almost at the very beginning of the Jurassic, 195 million years ago. This was the first true moment of the Atlantic Ocean's life.

Twenty million years on, the process of sea-floor spreading got under way in earnest, in the middle of the sea – like two unrolling carpets, or two unspooling conveyor belts running away from each other from a vague submarine midpoint. The bottom of the sea started to split open, and its two halves began to diverge, the continents on either side shifting steadily apart. West Africa shifted itself about three hundred miles away from South Carolina; Mali moved a couple of hundred miles off Florida; there was a large stretch of wide-open ocean around where the Windward Islands would eventually be, and then a gap of almost a thousand miles opened between Liberia and Venezuela. In this midsection a body of seawater as large as today's Mediterranean was created, and yet unlike the rather stable-sized Mediterranean, this body only continued to get bigger.

By 150 million years ago, continuing a Canaveral-style countdown, Greenland* had begun to pull away from Norway, and Iceland began to be built up from deep down in the sea. (The

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* In 1965 I was part of an expedition to determine, by measuring fossil magnetism in basalts collected from nunataks high on the East Greenland icecap, how much the island had drifted in the fifty million years since the rocks had been laid down. We found that Greenland had drifted about 15 degrees westward – an impeccable example of the kind of movement confirming the tectonic plate theory just then being advanced.

spectacular eruption that began in the spring of 2010 from Eyjafjoll, an Icelandic volcano that had been quiet for the previous two centuries, and which disrupted air traffic across northern Europe with its immense swathes of high-altitude volcanic dust, is part of the process of building up. Surtsey, an entirely new island born just a few miles away in 1963, may have provided somewhat clearer evidence of the steady swelling of Iceland, but Eyjafjoll produced much more lava, even if most of it was blasted high into the sky.)

At the same time the shallow waters off the northern parts of the British Isles had deepened, and serious wave-tossed oceanic expanses now separated Ireland from Labrador. By ten million years later, Guinea, the Gambia, Senegal, and Sierra Leone had pulled relentlessly away from the coastlines of the putative Guyana, Surinam, and French Guiana, which would occupy a similar dependent position in South America. Hitherto they had been in the same place: five hundred miles of ocean now separated them.

By the early Cretaceous, 120 million years back in time, the conveyor-belt-unrolling-carpet mechanism that was now evidently driving the entire process – for there was to be no further dramatic volcanism to complicate matters – had an apparent source: the Mid-Atlantic Ridge had been formed. This linear bulge in the seabed, its centre fissured and faulted and alive with submarine volcanoes, would play a vital role for the rest of the ocean's history. It was the place where new crustal material would be belched out of the inner earth, where the ocean floor to the east and the west of it would spread out and away, and where islands – a long string of them, the Azores, the Canaries, St. Helena, Fernando do Noronha, Tristan da Cunha, a jagged line stretching from Jan Mayen in the far north to Bouvet Island, 9,200 sea miles

away to the south* – occasionally poked their peaks above water level, only to be pushed away in their turn to end up, remote and mostly unpeopled, in the new ocean's farther reaches.

And still the opening went on. Fifty million years more, and the north and middle portions now began to create and separate the southern coasts of Africa and South America. There was at first another sudden outbreak of volcanic activity – flood plains of basalt poured from numberless vents. But then separation began down here, too, though it is still not clear if this was connected with the volcanic spasm. And here the process did indeed look like the unzipping of a fly, and it was accomplished with similar speed. It was an opening up that rippled southwards, one coastline following hard on another. Nigeria stripped itself away from Brazil. The valleys that would one day house the Congo on one side and the Amazon on the other snapped apart. The flood basalts of the southern edge of Pangaea separated into two: on one side the enormous Etendeka Traps, which would come to lie in southern Africa – and over the edge of which the Victoria Falls now cascade – and on the other the Paraná basalts of Argentina, currently home to the sprawling spray curtains of the falls the Guarani called *big waters,* the Iguazu.

And then in a final protracted frenzy of tearing, all of eastern Patagonia wrenched itself away from Angola, and the flatlands that were then off Cape Horn freed themselves from their geological embrace of what is now Namibia and the South African cape, and swept away to become the foothills of the southern Andes.

This was all accomplished at a remarkable speed, for though

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* Both islands are Norwegian possessions, giving Norway a unique perspective on the ridge from its ownership of both ends. Jan Mayen, fogbound and miserable, has an airstrip and a manned weather station; Bouvet, a jumble of cliffs and Southern Ocean ice, had its weather station destroyed by an avalanche, is uninhabited, and is classed as the most remote island in the world.

in the north matters unfolded in a somewhat leisurely fashion, down south they raced almost breathlessly. The Atlantic coastlines that had once been welded together between the bulge of Brazil and the armpit of Africa – the apparently natural fit that led nineteenth century figures like Alfred Wegener to think out loud that continents might once have moved apart, thoughts that condemned him to live in near-universal and near-perpetual ridicule – had managed in a scant forty million years to spring five thousand miles apart from one another. The sea in these parts must have opened up at rather more than four inches a year – infinitely more rapidly than the separation that took place up in the brisk waters of the North Atlantic, and more than three times the rate at which the ocean continues to spread wider today.

And that movement has never ended. The outline of the Atlantic Ocean that we know today was fixed perhaps ten million years ago, and though to us and our cartographers it appears to have retained its boundaries, its coastlines, and its "look" ever since the days of Columbus and Vespucci and the great German map of Martin Waldseemüller that first defined it, it has been changing, subtly and slightly, all the time. Coastlines in the east continue to advance, those in the west to retreat. *Things fall apart: the centre cannot hold.* The Mid-Atlantic Ridge continues to disgorge untold tonnages of new ocean floor; some of it appears above the water's surface and creates new islands and reefs. And the islands that do exist continue to move, slowly and slightly, away from the sea's centre.

By ten million years ago the great split was done, and the Atlantic was fully born. At some time in the distant future – but not the unknown future, as we shall see – the rocks that opened will close and the sea will be forced to go elsewhere, and it will find another home. The vast earth-ocean, with its essentially and

eternally constant volume of seawater, will be obliged by continental movement to reconfigure itself, and in time other shapes and sizes of its constituent water bodies will appear. The Atlantic that was born will in due course also die.

But that will not be for a very long while. In the meantime, the Atlantic Ocean, *Mare Atlanticus,* the Great West Sea, is like an enormous stage set. It was ten million years ago just as it is today: a sinuous snakelike river of an ocean, stretching thousands of miles from the Stygian fogs of the north to the Roaring Forties in the south, riven with deeps in its western chasms, dangerous with shallows in eastern plains, a place of cod and flying fish, of basking sharks and blue-finned tuna, of gyres of Sargasso weed and gyres of unborn hurricanes, a place of icebergs and tides, whirlpools and sandbanks, submarine canyons and deep-sea black smokers and ridges and seamounts, of capes and rises and fracture zones, of currents hot, cold, torrential, and languorous, of underwater volcanoes and earthquakes, of stromatolites and cyanobacteria and horseshoe crabs, of seabird colonies, of penguins and polar bears and manta rays, of giant squid and jellyfish and their slow-and-steady southern majesties, the great and glorious wandering albatrosses.

The stage, now so amply furnished with all this magic and mystery, has been prepared for a very long while. The supporting cast of players, all the beasts and plants, have now mostly made their entrances. The Atlantic Ocean is open wide, its physical condition fully set, and all is ready for the appearance on stage of the creature that will give full force to the human idea of the great sea.

For what promises or threatens to be in relative time just the briefest moment only, the central character is set to step into the light. Mankind is finally about to confront the grey-heaving reality of all these mighty waters. To see, at last, just what is going on.