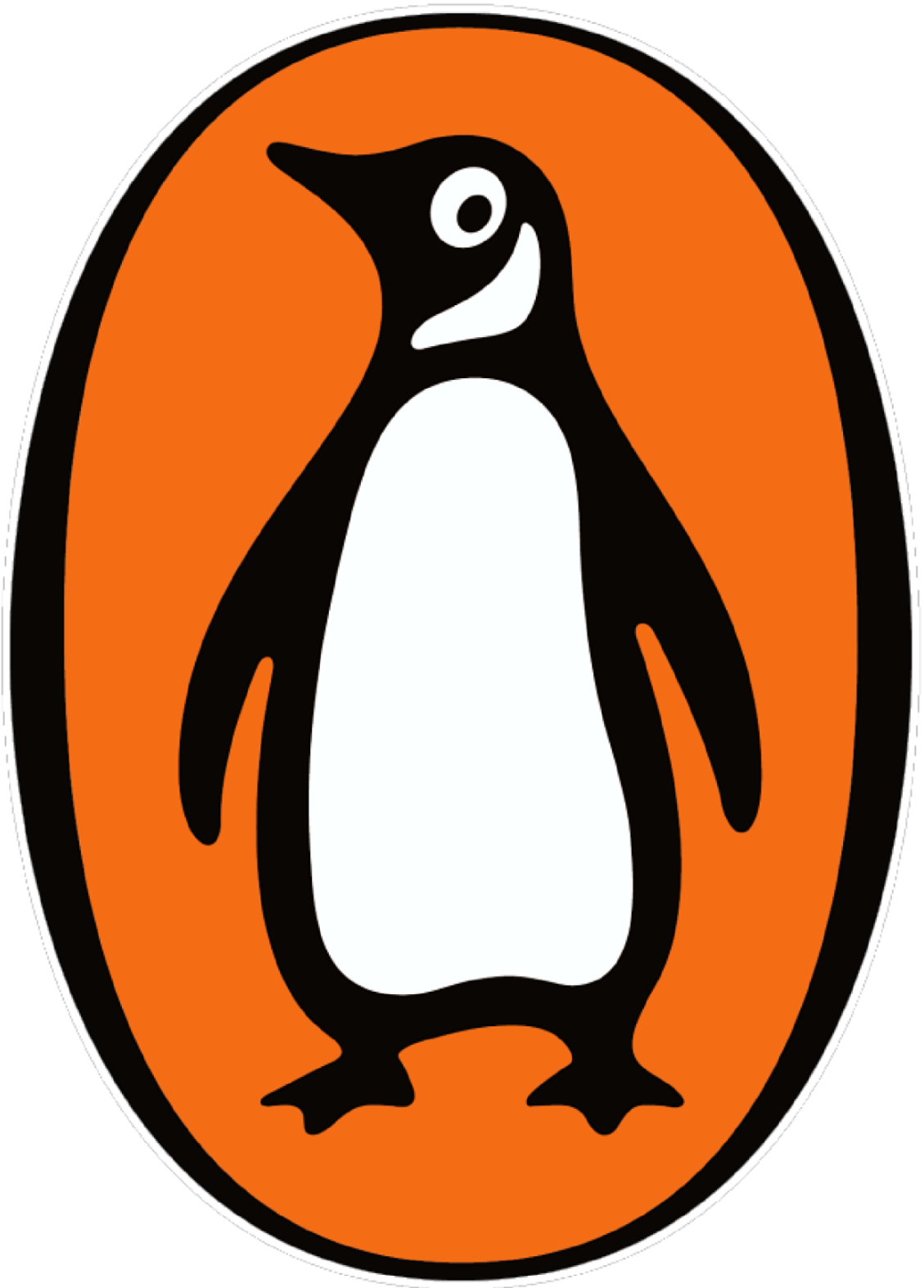

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About the Author

Robert Macfarlane is the author of *Mountains of the Mind, The Wild Places, The Old Ways, Landmarks,* and *The Lost Words*, co-created with Jackie Morris. *Mountains of the Mind* won the Guardian First Book Award and the Somerset Maugham Award and *The Wild Places* won the Boardman-Tasker Award. Both books have been adapted for television by the BBC. *The Lost Words* won the Books Are My Bag Beautiful Book Award and the Hay Festival Book of the Year. He is a Fellow of Emmanuel College, Cambridge, and writes on environmentalism, literature and travel for publications including the *Guardian*, the *Sunday Times* and *The New York Times*.

By the same author

Mountains of the Mind

The Wild Places

The Old Ways

Landmarks

The Gifts of Reading

The Lost Words (*with Jackie Morris*)

Is it dark down there
Where the grass grows through the hair?
Is it dark in the under-land of Null?[1]

Helen Adam, 'Down There in the Dark', 1952

The void migrates to the surface ...[2]

Advances in Geophysics, 2016

First Chamber

The way into the underland is through the riven trunk of an old ash tree.

Late-summer heatwave, heavy air. Bees browsing drowsy over meadow grass. Gold of standing corn, green of fresh hay-rows, black of rooks on stubble fields. Somewhere down on lower ground an unseen fire is burning, its smoke a column. A child drops stones one by one into a metal bucket, *ting*, *ting*, *ting*.

Follow a path through fields, past a hill to the east that is marked by a line of nine round burial barrows, nubbing the land like the bones of a spine. Three horses in a glinting cloud of flies, stock-still but for the swish of a tail, the twitch of a head.

Over a stile in a limestone wall and along a stream to a thicketed dip from which grows the ancient ash. Its crown flourishes skywards into weather. Its long boughs lean low around. Its roots reach far underground.

Swallows curve and dart, feathers flashing. Martins criss-cross the middle air. A swan flies high and south on creaking wings. This upper world is very beautiful.

Near the ash's base its trunk splits into a rough rift, just wide enough that a person might slip into the tree's hollow heart – and there drop into the dark space that opens below. The rift's edges are smoothed to a shine by those who have gone this way before, passing through the old ash to enter the underland.

Beneath the ash tree, a labyrinth unfurls.

Down between roots to a passage of stone that deepens steeply into the earth. Colour depletes to greys, browns, black. Cold air pushes past. Above is solid rock, utter matter. The surface is scarcely thinkable.

The passage is taken; the maze builds. Side-rifts curl off. Direction is difficult to keep. Space is behaving strangely – and so too is time. Time moves differently here in the underland. It thickens, pools, flows, rushes, slows.

The passage turns, turns again, narrows – and leads into surprising space. A chamber is entered. Sound now booms, resonates. The walls of the chamber appear bare at first, but then something extraordinary happens. Scenes from the underland start to show themselves on the stone, distant from one another in history, but joined by echoes.

In a cave within a scarp of karst, a figure inhales a mouthful of red ochre dust, places its left hand against the cave wall – fingers spread, thumb out, palm cold on the rock – and then blows the ochre hard against the hand's back. There is an explosion of dust – and when the hand is lifted its ghostly print remains, the stone around having taken the red of the ochre. The hand is shifted, more dust is blown and another pale outline is left. Calcite will run over these prints, sealing them in. The prints will survive for more than 35,000 years. Signs of what? Of joy? Of warning? Of art? Of life in the darkness?

In the shallow sandy soil of northern Europe, some 6,000 years ago, the body of a young woman – dead in childbirth along with her son – is lowered gently into a grave. Next to her is laid the white wing of a swan. Then onto the wing is placed the body of her son, so that the baby is doubly cradled in death – by the swan's feathers and his mother's arms. A round mound of earth is raised to mark their burial place: the woman, the child and the white swan's wing.

On an island in the Mediterranean 300 years before the founding of the Roman Empire, a metalworker completes the design of a silver coin. The coin's face shows a square labyrinth with a single entrance on its upper edge and a complex path to its centre. The walls of the labyrinth – like the rim of the coin – are slightly raised and polished to a sheen. Tooled into the labyrinth's centre is the figure of a creature with

the head of a bull and the legs of a man: the Minotaur, waiting in darkness for whatever comes next.

Six hundred years later, a young woman sits for a portrait painter in Egypt. She has dressed most handsomely for the sitting. She has strong dark eyebrows and wide dark eyes, almost black. Her hair is pulled back from her forehead by a metal band topped with a gold bead, and she wears a golden scarf and brooch. The painter works with hot beeswax, gold leaf and coloured pigments, layering them onto wood. He is creating the young woman's death image. When she dies it will be wrapped into the bands of cloth used to mummify her corpse such that it takes the place of her real face. As her body decays beneath its swaddling, the portrait will remain un-aged. It is well to do such things early, when one looks most glowing. Her body will be placed in a necropolis – a city of the dead built at the entrance to a sunken depression of desert, in a buried chamber lined with limestone and covered with quartzite slabs to deter grave robbers, close to vaults that hold the mummified corpses of more than a million ibises.

Beneath a plateau in southern Africa, late in the nineteenth century, miners crawl through miles of narrow tunnel – cut deeper underground here than anywhere else on Earth at this time – lugging ore from a sunken reef of gold. Some of these men, who have migrated to the area in their thousands to work, will die soon in rockfalls and accidents. More will die slowly of silicosis from breathing the rock dust down there in the killing dark, year after year. Here the human body is largely disposable in the view of the corporations that own the mine and the markets that drive it: a small, unskilled tool of extraction to be replaced when it fails or wears out. The ore the men bring up is crushed and smelted, and the wealth it yields lines the pockets of shareholders in distant countries.

In a cave in the foothills of the Indian Himalayas not long after Partition, a young woman meditates sixteen hours a day, for seventy-five days. She sits stone-still while meditating, save for her mouth, which moves as she murmurs mantras. She emerges most often at night; when it is cloudless the Milky Way can be seen spilling across the sky above the peaks. She lives on water drunk with cupped hands from a sacred river, and on foraged wild berries and fruits. The mantras, the solitude and the darkness bring perceptions that are new to her, and she experiences a profound change in her vision. When at last she completes her retreat she feels vast as the skies, old as the mountains, formless as starlight.

Thirty years ago a boy and his father use the claw of a hammer to prise up a floorboard in a house they are soon to leave. They have made a jam-jar time capsule. Into the jar the boy has placed objects and messages. The die-cast metal model of a bomber aeroplane. The outline of his left hand traced in red ink on plain paper. A self-description for whoever finds the jar – *Quite tall for my age, very blonde hair, almost white. Biggest fear, nuclear war* – written in pencil on a notebook page. A stopped watch with luminous hands and dial, around which he likes to cup his hands to see the numbers glow. He pours a handful of rice into the jar to absorb moisture, screws the jar's brass lid tightly shut, puts it in its hiding place and nails the floorboard back down.

Deep in an extinct volcano a tunnel network has been bored above a crustal fault known as Ghost Dance. Access drifts incline through tilted strata to level out in a repository zone, organized into emplacement corridors. The intent is to inter high-level nuclear waste in these corridors: radioactive uranium pellets encased in iron, then encased in copper, then buried above the Ghost Dance fault to pulse out their half-lives for millions of years to come. The timescale of the hazard is such that those responsible for entombing this waste must now face the question of how to

communicate its danger to the distant future. This is a risk that will outlast not only the life of its makers but perhaps also the species of its makers. How to mark this site? How to tell whatever beings will come to this desert place that what is kept in this rock sarcophagus is desperately harmful, is *not* of value, *must never be disturbed*?

And on a muddy ledge, two and a half miles into the cave system of a mountain in which they have become trapped by flood waters, twelve boys and their football coach sit in utter blackness, conserving the batteries of their phones, waiting day after day to see if the waters will rise or fall – or if by miracle someone will come to rescue them. With each passing hour the oxygen in their chamber is reduced by their breathing, and carbon dioxide levels increase. Above the mountain the monsoon clouds build, threatening more rain. Outside the mountain thousands of rescuers from six countries gather. At first they do not know if the boys are alive. Then they find handprints in mud on the walls of a chamber two miles into the system. Hope is given. Divers push further and further along the flooded passageways. Nine days after entering the mountain, the boys hear sounds coming from the river that flows past their ledge. Then they see lights glowing in the water. Bubbles seethe up. The lights rise. A man breaks the surface. The boys and their coach blink in the beam of his head-torch. One of the boys raises a hand in greeting, and the diver raises his in reply. 'How many of you?' asks the diver. 'Thirteen,' one replies. 'Many people are coming,' says the diver.

So these scenes from the underland unfold along the walls of this impossible chamber, down in the labyrinth beneath the riven ash. The same three tasks recur across cultures and epochs: to shelter what is precious, to yield what is valuable, and to dispose of what is harmful.

Shelter (memories, precious matter, messages, fragile lives).

Yield (information, wealth, metaphors, minerals, visions).

Dispose (waste, trauma, poison, secrets).

Into the underland we have long placed that which we fear and wish to lose, and that which we love and wish to save.

1
Descending

We know so little of the worlds beneath our feet. Look up on a cloudless night and you might see the light from a star thousands of trillions of miles away, or pick out the craters left by asteroid strikes on the moon's face. Look down and your sight stops at topsoil, tarmac, toe. I have rarely felt as far from the human realm as when only ten yards below it, caught in the shining jaws of a limestone bedding plane first formed on the floor of an ancient sea.

The underland keeps its secrets well. Only in the last twenty years have ecologists succeeded in tracing the fungal networks that lace woodland soil, joining individual trees into intercommunicating forests – as fungi have been doing for hundreds of millions of years. In China's Chongqing province, a cave network explored in 2013 was found to possess its own weather system: ladders of stacked mist that build in a huge central hall, cold fog that drifts in giant cloud chambers far from the reach of the sun. A thousand feet underground in northern Italy, I abseiled into an immense rotunda of stone, cut by a buried river and filled with dunes of black sand. Traversing those dunes on foot was like trudging through a windless desert on a lightless planet.

Why go low? It is a counter-intuitive action, running against the grain of sense and the gradient of the spirit. Deliberately to place something in the underland is almost always a strategy to shield it from easy view. Actively to retrieve something from the underland almost always requires effortful work. The underland's difficulty of access has long made it a means of symbolizing what cannot openly be said or seen: loss, grief, the mind's obscured depths, and what Elaine Scarry calls the 'deep subterranean fact' of physical pain.[1]

A long cultural history of abhorrence exists around underground spaces, associating them with 'the awful darkness inside the world', in Cormac McCarthy's phrase.[2] Fear and disgust are the usual responses to such environments; dirt, mortality and brutal labour the dominant connotations. Claustrophobia is surely the sharpest of all common phobias. I have often noticed how claustrophobia – much more so than vertigo – retains its disturbing power even when being experienced indirectly as narrative or description. Hearing stories of confinement below ground, people shift uneasily, step away, look to the light – as if words alone could wall them in.

I still remember as a ten-year-old reading the account, in Alan Garner's novel *The Weirdstone of Brisingamen*, of two children escaping danger by descending the mining tunnels that riddle the sandstone outcrop of Alderley Edge in Cheshire. Deep inside the Edge, the embrace of the stone becomes so tight that it threatens to trap them:

> They lay full length, walls, floor and roof fitting them like a second skin. Their heads were turned to one side, for in any other position the roof pressed their mouths into the sand and they could not breathe. The only way to advance was to pull with the fingertips and to push with the toes, since it was impossible to flex their legs at all, and any bending of the elbows threatened to jam the arms helplessly under the body. [Then Colin's] heels jammed against the roof: he could move neither up nor down and the rock lip dug into his shins until he cried out with the pain. But he could not move ...[3]

Those passages took cold grip of my heart, emptied my lungs of air. Rereading them now, I feel the same sensations. But the situation also exerted a powerful narrative traction upon me – and still does. Colin could not move and I could not stop reading.

An aversion to the underland is buried in language. In many of the metaphors we live by, height is celebrated but depth is despised. To be 'uplifted' is preferable to being

'depressed' or 'pulled down'. 'Catastrophe' literally means a 'downwards turn', 'cataclysm' a 'downwards violence'. A bias against depth also runs through mainstream conventions of observation and representation. In his book *Vertical*, Stephen Graham describes the dominance of what he calls the 'flat tradition' of geography and cartography, and the 'largely horizontal worldview' that has resulted. We find it hard to escape the 'resolutely flat perspectives' to which we have become habituated, Graham argues – and he finds this to be a political failure as well as a perceptual one, for it disinclines us to attend to the sunken networks of extraction, exploitation and disposal that support the surface world.[4]

Yes, for many reasons we tend to turn away from what lies beneath. But now more than ever we need to understand the underland. 'Force yourself to see more flatly,' orders Georges Perec in *Species of Spaces*.[5] 'Force yourself to see more deeply,' I would counter. The underland is vital to the material structures of contemporary existence, as well as to our memories, myths and metaphors. It is a terrain with which we daily reckon and by which we are daily shaped. Yet we are disinclined to recognize the underland's presence in our lives, or to admit its disturbing forms to our imaginations. Our 'flat perspectives' feel increasingly inadequate to the deep worlds we inhabit, and to the deep time legacies we are leaving.

We are presently living through the Anthropocene, an epoch of immense and often frightening change at a planetary scale, in which 'crisis' exists not as an ever-deferred future apocalypse but rather as an ongoing occurrence experienced most severely by the most vulnerable. Time is profoundly out of joint – and so is place. Things that should have stayed buried are rising up unbidden. When confronted by such surfacings it can be hard to look away, seized by the obscenity of the intrusion.

In the Arctic, ancient methane deposits are leaking through 'windows' in the earth opened by melting permafrost. Anthrax spores are being released from reindeer corpses buried in once-frozen soil, now exposed by erosion and warmth.[6] In the forests of Eastern Siberia a crater is yawning in the softening ground, swallowing tens of thousands of trees and revealing 200,000-year-old strata: local Yakutian people refer to it as a 'doorway to the underworld'.[7] Retreating Alpine and Himalayan glaciers are yielding the bodies of those engulfed by their ice decades before. Across Britain, recent heatwaves have caused the imprints of ancient structures – Roman watchtowers, Neolithic enclosures – to shimmer into view as crop-marks visible from above: aridity as X-ray, the land's submerged past rising up in parched visitation. Where the River Elbe flows through the Czech Republic, summer water levels have recently dropped so far that 'hunger stones' have been uncovered – carved boulders used for centuries to commemorate droughts and warn of their consequences. One of the hunger stones bears the inscription '*Wenn du mich siehst, dann weine*': 'If you see me, weep.'[8] In north-west Greenland an American Cold War missile base, sealed under the ice cap fifty years ago and containing hundreds of thousands of gallons of chemical contaminants, has begun to move towards the light. 'The problem,' writes the archaeologist Þóra Pétursdóttir, 'is not that things become buried deep in strata – but that they endure, outlive us, and come back at us with a force we didn't realise they had ... a dark force of "sleeping giants"', roused from their deep time slumber.[9]

'Deep time' is the chronology of the underland.[10] Deep time is the dizzying expanses of Earth history that stretch away from the present moment. Deep time is measured in units that humble the human instant: epochs and aeons, instead of minutes and years. Deep time is kept by stone, ice, stalactites, seabed sediments and the drift of tectonic plates. Deep time opens into the future as well as the past. The Earth will fall dark

when the sun exhausts its fuel in around 5 billion years. We stand with our toes, as well as our heels, on a brink.

There is dangerous comfort to be drawn from deep time. An ethical lotus-eating beckons. What does our behaviour matter, when *Homo sapiens* will have disappeared from the Earth in the blink of a geological eye? Viewed from the perspective of a desert or an ocean, human morality looks absurd – crushed to irrelevance. Assertions of value seem futile. A flat ontology entices: all life is equally insignificant in the face of eventual ruin. The extinction of a species or an ecosystem scarcely matters in the context of the planet's cycles of erosion and repair.

We should resist such inertial thinking; indeed, we should urge its opposite – deep time as a radical perspective, provoking us to action not apathy. For to think in deep time can be a means not of escaping our troubled present, but rather of re-imagining it; countermanding its quick greeds and furies with older, slower stories of making and unmaking. At its best, a deep time awareness might help us see ourselves as part of a web of gift, inheritance and legacy stretching over millions of years past and millions to come, bringing us to consider what we are leaving behind for the epochs and beings that will follow us.

When viewed in deep time, things come alive that seemed inert. New responsibilities declare themselves. A conviviality of being leaps to mind and eye. The world becomes eerily various and vibrant again. Ice breathes. Rock has tides. Mountains ebb and flow. Stone pulses. We live on a restless Earth.

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The oldest of underland stories concerns a hazardous descent into darkness in order to reach someone or something consigned to the realm of the dead. A variant to the *Epic of Gilgamesh* – written around 2100 BC in Sumeria – tells of such a descent, made by Gilgamesh's servant Enki to the 'netherworld' on behalf of his master to retrieve a lost object. Enki sails through storms of hailstones that strike him like 'hammers', his boat trembles from the impact of waves that attack it like 'butting turtles' and 'lions', but still he reaches the netherworld. There, however, he is promptly imprisoned – only to be freed when the young warrior Utu opens a hole to the surface and carries Enki back out on a lofting breeze. Up in the sunlight Enki and Gilgamesh embrace, kiss, and talk for hours. Enki has not retrieved the lost object, but he has brought back precious news of vanished people. 'Did you see my little stillborn children who never knew existence?' asks Gilgamesh desperately. 'I saw them,' answers Enki.[11]

Similar stories recur throughout world myth. Classical literature records numerous instances of what in Greek were known as the *katabasis* (a descent to the underland) and the *nekyia* (a questioning of ghosts, gods or the dead about the earthly future), among them Orpheus' attempt to retrieve his beloved Eurydice from Hades, and Aeneas' voyage – led by the Sibyl, protected by the Golden Bough – to seek counsel with the shade of his father. The recent rescue of the Thai footballers from their lonely chamber far inside a mountain was a modern *katabasis*: the story seized global attention in part because it possessed the power of myth.

What these narratives all suggest is something seemingly paradoxical: that darkness might be a medium of vision, and that descent may be a movement towards revelation rather than deprivation. Our common verb 'to understand' itself bears an old sense of passing beneath something in order fully to comprehend it. 'To discover' is 'to reveal by excavation', 'to descend and bring to the light', 'to fetch up from depth'. These are ancient associations. The earliest-known works of cave art in Europe – taking the form

of painted ladders, dots and hand stencils on the walls of Spanish caves – have been dated to around 65,000 years ago, some 20,000 years before *Homo sapiens* are believed to have first arrived in Europe from Africa. Neanderthal artists left these images. Long before anatomically modern humans reached what is now Spain, writes one of the archaeologists responsible for the dating of this art, 'People were making journeys into the darkness.'[12]

Underland is a story of journeys into darkness, and of descents made in search of knowledge. It moves over its course from the dark matter formed at the universe's birth to the nuclear futures of an Anthropocene-to-come. During the deep time voyage undertaken between those two remote points, the line about which the telling folds is the ever-moving present. Across its chapters, in keeping with its subject, extends a subsurface network of echoes, patterns and connections.

For more than fifteen years now I have been writing about the relationships between landscape and the human heart. What began as a wish to solve a personal mystery – why I was so drawn to mountains as a young man that I was, at times, ready to die for love of them – has unfolded into a project of deep-mapping carried out over five books and around 2,000 pages. From the icy summits of the world's highest peaks, I have followed a downwards trajectory to what must surely be a terminus, exploring the storeys of place that lie beneath the surface. 'The descent beckons / as the ascent beckoned,' wrote William Carlos Williams in a late poem.[13] It has taken me until the second half of my life to understand something of what Williams meant. In the underland I have seen things I hope I will never forget – and things I wish I had never witnessed. What I thought would be my least human book has become, to my surprise, my most communal. If the image at the centre of much that I have written before is that of the walker's placed and lifted foot, the image at the heart of these pages is that of the opened hand, extended in greeting, compassion or the making of a mark.

I have for some time now been haunted by the Saami vision of the underland as a perfect inversion of the human realm, with the ground always the mirror-line, such that 'the feet of the dead, who must walk upside down, touch those of the living, who stand upright'.[14] The intimacy of that posture is moving to me – the dead and the living standing sole to sole. Seeing photographs of the early hand-marks left on the cave walls of Maltravieso, Lascaux or Sulawesi, I imagine laying my own palm precisely against the outline left by those unknown makers. I imagine, too, feeling a warm hand pressing through from within the cold rock, meeting mine fingertip to fingertip in open-handed encounter across time.

~

Shortly before beginning the journeys recounted here, I was given two objects. Each came with a request, and it was a condition of the gift of these objects that I agreed to fulfil those requests.

The first of the objects is a double-cast bronze casket the size of a swan's egg, which sits heavy in the hand. It is a kist and what it contains is toxic. Its maker wrote his demons down on a sheet of paper: his hatreds, fears and losses, the pain he had inflicted on others and the pain others had inflicted on him – all that was worst in his mind. Then he burned the paper and sealed the ashes inside the casket. Then he double-cast the casket, giving it a second layer of bronze to increase the strength of the containment. That outer layer of bronze became pitted and encrusted in the process of its casting, such that it seemed to resemble either the surface of a planet or the weather above it. Then he drove four iron nails through the casket's centre, cutting

off their ends and filing them flush. It is an exceptionally powerful object, which possesses a ritual intensity of creation. It could have been fashioned at any point in the past 2,500 years, but it was made only recently.

I was given the casket on the condition that I disposed of it in the deepest or most secure underland site that I reached – a place from which it could never return.

The second of the objects is an owl cut from a slice of whalebone. It is a talisman and what it connotes is magic. The minke whale from which the owl was taken had washed up dead on the shoreline of a Hebridean island. One of its rib bones was smoothed into cross-sections, each less than half an inch thick and six inches high. One of those cross-sections was then cut into the form of an owl with four bold strokes of a blade: two strokes for the eyes, and two for the wing lines. It is an exceptionally beautiful object, which possesses an Ice Age simplicity of making. It could have been fashioned at any point in the past 20,000 years, but it was made only recently.

I was given the owl on the condition that I carried it with me at all times in the underland, to help me see in the dark.[15]

Part One

SEEING (BRITAIN)

2

Burial

(Mendips, Somerset)

The bones of a child lie in darkness on a ledge of limestone. Sunlight has not seen this child for over 10,000 years. In that time, calcite has flowed like silver varnish from the rock around, chrysalizing the body.

A January day in 1797 and two young men are out rabbit-catching in the Mendip Hills of Somerset. They flush out a rabbit on the slope of a ravine. The rabbit runs and finds refuge in a jumble of boulders. The men are hungry; they want the rabbit. So they pull away some of the rocks – and are 'surprised with the appearance of a subterraneous passage'. They enter the passage, which leads them steeply into the limestone of the scarp and then opens into a 'large and lofty cavern, the roof and sides of which are most curiously fretted and embossed'.

Winter sun follows them down the passage and lights up the chamber. It is, they see, a charnel house. On the floor and ledges to their left are scattered bones and complete skeletons, 'lying promiscuously, almost converted into stone'.[1] The relics shine with calcite, and dusting some of the bones is red ochre powder. A single large stalactite hangs from the chamber's ceiling which, when struck, rings like a bell, its peal echoing in the cave-space. The stalactite has reached down and begun to absorb one of the skeletons; embedded in it are a skull, a thigh bone and two teeth with the enamel still intact.

Also present in the cave are animal remains: the teeth of a brown bear, a barbed spear-point made from a red deer antler, and the bones of lynx, fox, wildcat and wolf. Votive objects have been interred here, too: sixteen periwinkle shells pierced so that they will hang spiral-outwards when worn against the body as a necklace; and a nest of seven pieces of fossil ammonite, the ends of their arcs rubbed smooth.

The human bodies, it will later be established, are more than ten millennia old, and among them are children and infants as well as adults. All show signs of chronic malnutrition. The adults stood little more than five feet tall. The children's molars were scarcely worn. Slowly, it becomes clear to those who study this mysterious place – now known as Aveline's Hole – that, far back in the Mesolithic, the cave was used as a cemetery over a period of around a century. Much of the world's water was then still locked up by glaciation. Sea levels were much lower. What we now call the Bristol Channel and much of the North Sea did not exist; one could walk north from the Mendips to Wales on dry land, or eastwards over Doggerland to France and the Netherlands.

The evidence from Aveline's suggests a shifting group of hunter-gatherers taking that area of the Mendips as their home range over two or three generations, and using the chamber as their mausoleum. These people – whose lives were short and unthinkably hard, who suffered from paucities of food and energy – made the effort and took the care to carry the bodies of their dead to this difficult hillside site, to place them within the chamber, to leave significant objects and the bones of creatures with them, and to open and then reseal the entrance with each new burial.

These wandering, hungry people wished for a secure location in which to entomb their dead – a place to which they could return over time. No comparable cemetery is known to have been established in Britain for another 4,000 years.

We are often more tender to the dead than to the living, though it is the living who need our tenderness most.

~

‘Mendip is mining country,’ says Sean. ‘It’s also caving country. But above all it’s burial country. There are hundreds of Bronze Age funeral barrows spread across this landscape, some joined with monuments and henges into large-scale ritual complexes. In one of the barrows an antiquarian called Skinner found an amber bead with a bee trapped inside it, preserved right down to the hairs on its legs.’

Late afternoon, early autumn, unseasonable heat. Air shimmering in the sun, car doors scalding to touch. But it is cool as a pantry in Sean and Jane Borodale’s house, set down in the shadows of a quiet side-arm of Nettlebridge Valley. Board games are piled in teetering stacks in the porch. Mint, thyme and rosemary flourish in pots by the porch. A large ammonite is embedded in the front doorstep, polished by decades of footfall. And in the garden, hanging from the outstretched wings of a towering wooden totem pole, are the flayed skins of two men.

‘Those are our caving suits,’ says Sean, waving towards the skins. ‘Strictly speaking, they’re chemical hazmat suits. I sourced them from eastern Europe. They’re ideal for our needs. You’ll see.’

Sean, Jane and their two boys have lived in this fairy-tale cottage for several years. The former owner held seances here, believing she could speak through the veil to the dead. To the west of the house a wrinkled field rises up the scarp before disappearing into ash woods on the ridge line. A stream gurgles off the scarp and past the house.

I have come to the Mendips to learn how to see in the dark. Sean knows the Mendips profoundly well, above ground and below. He is a bee-keeper, a caver, a walker and a remarkable poet. He has curling black hair and is very gentle. For several years he has been working on a long series of poems or voicings that emerge from – and in some cases are written within – the underland of the Mendips: their lead mines, iron workings and limestone quarries, their many burial sites, their Cold War bunkers and the countless miles of natural cave and tunnel that honeycomb their bedrock. Sean is compelled by the great descent stories of underworld mythology – Dante and Virgil, Persephone and Demeter, Eurydice, Orpheus and Aristaeus (the keeper of bees) – and by the associated visionary powers of darkness and blindness. The poems he writes about the underland feel to me both unearthed and unearthly. In them deep time is given utterance, earth is stirred, stone speaks. In them, too, the dead are quickened briefly back to life by the poet’s attention.

The Mendips rise south of Bristol and west of Bath. From their southern edge on a clear day, Glastonbury Tor can be seen across the water-bearing flatlands of the Somerset Levels. From west to east they stretch almost thirty miles, tapering down towards the sea at the Bristol Channel. Their geology is elaborate, but predominantly they are a limestone range – and limestone land, wrote Arthur Conan Doyle, ‘is hollow ... land; could you strike it with some gigantic hammer, it would boom like a drum, or possibly cave in altogether and expose some huge subterranean sea.’[2]

The first fact of limestone is its solubility in water. Rain absorbs carbon dioxide from the air, creating a mild carbonic acid – just sharp enough to etch and fret limestone, given time. This fretwork deepens into limestone’s surface perforations of gryke and clint, and also its hidden labyrinths of rift and chamber. Streams shape stone with their energy. Thermal waters rise from within the earth, biting rock into form. Limestone landscapes are rich with clandestine places. They have the unexpected volumes of a lung’s interior. Portals give access to their extensive underland: pots and sinkholes, swallets where streams vanish into their own beds. The great writer and cartographer of the west of Ireland, Tim Robinson, knows the deceptions of limestone

better than almost anyone. After living on and mapping limestone for more than forty years, he concludes: 'I do not trust space an inch.'[3]

'Let me show you the garden,' says Sean.

The cottage's land drops down to the valley's main stream. We stop at its bank. The water is so clear it can hardly be seen. Small trout fin in the current.

'It's a petrifying stream,' Sean says. 'There's so much calcium carbonate dissolved in it that any twigs or leaves snagged there soon pick up a white crust of stone.'

Green-black damselflies dance on the current. Horseflies cruise for blood.

'Look at this,' Sean says, pointing upwards. Where the lowest bough of an old alder meets its trunk, one end of a curved metal blade protrudes. The rest of the object is lost below the bark.

'It's a scythe. Someone hooked it up on here many decades ago and forgot about it. So the tree absorbed the blade, growing around it while the handle rotted away.'

In the vegetable garden, tucked into the lee of a blackthorn hedge, are two beehives the colour of red ochre. Sloped landing boards lead up to the dark hive mouths. Bees alight on the boards, crawl into the hives, whirr out again.

Everywhere I look there is evidence of burial and excavation. Badger setts, molehills, bee tunnels, the engulfed scythe, the hives, the entrances to mine adits. Even the house, set back into the dolomite slope, is part cave.

'I didn't understand the Mendips until I began to explore them from below,' Sean says. 'Almost everything here involves the underworld somehow: quarrying, mining, caving. Bronze Age lead mining. Coal mining by the Romans. Quarries for limestone grit, so big they have a spiral ramp cut to a narrow core, in order that the lorries can get up and down, like an industrial version of Dante's descent in *The Inferno*. And basalt quarries to supply hardcore for top-dressing roads.'

A dragonfly rustles past.

'Then there are the burial sites – Bronze Age bowl barrows mostly, but Neolithic long barrows too, and of course, at Aveline's, the Mesolithic chamber. Medieval and early modern graveyards, and then our own still-growing cemeteries. This has been a funerary landscape for over 10,000 years. It's a terrain into which we have long entrusted things, as well as from which we have long extracted things.'

~

'To be human means above all to bury,' declares Robert Pogue Harrison in his study of burial practices, *The Dominion of the Dead*, boldly drawing on Vico's suggestion that *humanitas* in Latin comes first and properly from *humando*, meaning 'burying, burial', itself from *humus*, meaning 'earth' or 'soil'.[4]

We are, certainly, a burying species as well as a building species – and our predecessors were buriers too. In a cave system called Rising Star in the limestone of South Africa a team of palaeoarchaeologists led by six women has discovered fossilized bone fragments thought to belong to a previously unknown early human relative, a species now named as *Homo naledi*. The disposition of this dark matter in two deep-set chambers suggests, remarkably, that *Homo naledi* was already interring its dead underground some 300,000 years ago.[5]

In burial, the human body becomes a component of the earth, returned as dust to dust – inhumed, restored to humility, rendered humble. Just as the living need places to inhabit, so it is often in the nature of our memory-making to wish to be able to address our dead at particular sites on the Earth's surface. The burial chamber, the gravestone, the hillside on which ashes have been scattered, the cairn: these are places

to which the living can return and where loss might be laid to rest. The grief of those who have been unable to locate the bodies of their loved ones can be especially corrosive – acid and unhealing.

We give bodies and their residues to the earth in part as a means of safekeeping. Burial often aspires to preservation – of memory, of matter – for time behaves differently in the underland, where it might be slowed or stayed. Early in his profound meditation on inhumation and history, *Urne-Buriall* (1658), Thomas Browne describes the discovery – in the sandy soil of a field near Walsingham in the 1650s – of 'between fourty and fifty Urnes ... not a yard deep, nor farre from each other'. Each of the urns contained up to two pounds of human bones and ash, as well as offerings: 'peeces of small boxes, or combes handsomely wrought, handles of small brasse instruments, brazen nippers, and in one some kind of *Opale*'. Browne refers to the dark interiors of these buried urns as 'conservatories' – that is, spaces of conservation, insulated from what he calls 'the piercing Atomes of ayre' that corrupt the upper world. He represents each urn as a bright chamber of memory, secured in the 'nether part of the Earth'.[6]

Limestone, in particular, has long been a geology of burial – in part because it is so common globally, in part because its erosive tendencies create so many natural crypts into which bodies may be laid, and in part because limestone is itself, geologically speaking, a cemetery. Limestone is usually formed of the compressed bodies of marine organisms – crinoids and coccolithophores, ammonites, belemnites and foraminifera – that died in waters of ancient seas and then settled in their trillions on those seabeds. These creatures once built their skeletons and shells out of calcium carbonate, metabolizing the mineral content of the water in which they lived to create intricate architectures. In this way limestone can be seen as merely one phase in a dynamic earth cycle, whereby mineral becomes animal becomes rock; rock that will in time – in deep time – eventually supply the calcium carbonate out of which new organisms will build their bodies, thereby re-nourishing the same cycle into being again.

This dance of death and life that goes into limestone's creation is what makes it without doubt the liveliest, queerest rock I know – and the human burials it holds have sometimes echoed these vibrancies, and the multi-species makings that have brought limestone into being.

Around 27,000 years ago, on a limestone hillside overlooking what is now the Austrian Danube, two babies, dead at birth, were placed side by side in a freshly dug round hole. Their remains were wrapped in animal hide, and the space around them was packed with red ochre, into which were mixed yellow beads of ivory. A shelter was then constructed to protect them from the crushing embrace of the earth: a scapula from a woolly mammoth, propped up as a bone shroud on pieces of tusk.

Twelve thousand years ago in a limestone cave above the Hilazon River in what is now northern Israel, a grave was prepared for a woman in her forties. An oval hole was dug in the cave floor, and its sides were walled with limestone slabs. Her body was placed in the grave, curled against the northern side of the oval. Two stone martens, their brown and cream fur sleek in the low light, were draped over her: one across her upper body, one across her lower. The foreleg of a wild boar was laid on her shoulder. A human foot was placed between her feet. The blackened shells of eighty-six tortoises were scattered over her. The tail of an aurochs was put near the base of her spine. The wing of a golden eagle was opened over her. She had become a wondrous hybrid – a being of many beings. At last, a single large plate of limestone was pulled over the hole, closing this compound creature inside her chamber.[7]

On a limestone outcrop near the Somerset village of Stoney Littleton, around 5,500 years ago, a chambered tomb was constructed. It remains present in the landscape: low-slung and turf-roofed on a slope of the hill, the beckoning mouth of its main entrance marked by a vast lintel stone and two flanking door jambs of single upright slabs. Set into the western jamb is the cast of an ammonite almost a foot in diameter.

And across ten millennia – since those first hunter-gatherer bodies were placed in the chamber discovered by the rabbit-catching boys – humans have buried their dead in the limestone uplands of the Mendips. There are some 400 Bronze Age round barrows in the Mendips, dating from around 2500 BC to around 750 BC. Most are clustered together, and most contained – until they were plundered or ploughed out – a single inhumation and the grave goods that were left with it. The bodies were typically placed in a stone-lined kist or collared urn under the dome of earth. The accompanying grave goods included pottery cups, barbed flint arrowheads, a bronze dagger, amber-headed pins, and beads of jet and shale. Their inclusion in the barrows speaks of a belief, widespread among cultures, that burial is a form of onwards journey to an afterlife where earthly items will be needed.

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Sean and I walk back up to the cottage, step over the ammonite set into the door sill and enter the white-walled kitchen. It's a relief to be back in the cool of the house after the garden's heat. Jane smiles in welcome.

'You're here on a good day for the cottage,' she says. 'In summer, it's a dream. But in the other three seasons of the year, when the north wind blows straight down that valley, in one gable and out the other, it's impossible to keep warm. We lose the light so fast too. By early afternoon in full winter we're in deep shadow, cold shadow.'

That afternoon we sit, talk, drink tea. On the table is a blue-and-white china plate, Russian in its decorative style, showing a steam train emerging from a tunnel into winter fields. Two peasant figures walk by the trackside, carrying bundles of sticks on their backs, and the train trails a rooster-plume of steam that rises up into the blue dusk sky before bending back into the tunnel mouth.

Jane and Sean's two boys, Louis and Orlando, are playing Minecraft on a computer in a corner of the room. I go over to join them. They are mining hard, pickaxing down towards bedrock in search of precious minerals.

'We don't want redstone, we need obsidian,' says Louis.

'We want to fight the Ender Dragon!' says Orlando.

'We're building a portal to the Nether!' says Louis.

'Let's go caving,' says Sean.

~

Evening light now, thick as amber, pouring east across the land.

Over a stile, through a field thronged with yellow ragwort to where the grass sinks into a collapsed cone, sixty feet or so at its widest point. Horses in halos of flies.

The sinkhole's sloped sides are lush with rosebay willowherb. Its belly is scrubbed with elder. Two wood pigeons clatter away at our approach. In the lowest point of the dip is an entrance to the Mendip underland.

A small blockhouse protects a dark mouth in the limestone. Though I have been into cave systems before, I find swallowing is suddenly difficult, as if I have a pebble in my gullet. My scalp swarms with bees. Sean is calm, eager to get under.

The entry is awkward – a body-bending downwards wriggle before a drop into a pot that feels locked, a closed cylinder of space. Our pupils widen to well-shafts in the darkness, until we pop on our beams. Sean leads and is off, lies down, moves head first into a small gap in shadow at the pot's base. I watch his twitching legs slowly disappear, and when his feet have gone I drop to join him. Face forced into wet gravel, moving along by squirm, a sense of the rock as a hand pressing down first on the skull, then the back, then the whole of the body, a moment spent briefly in its grip – and then I am out and with Sean at the top of a twelve-foot notch where a waterfall has run for thousands of years, cutting this narrow channel to the rift below. We down-climb the notch, facing inwards, feet slipping on the wet rock, me going first then spotting Sean as he descends. The rift turns, turns again – and then opens dramatically out.

We are in an awesome space. We track our beams along its roof and walls, scoring out its dimensions. The portal through which we squeezed has become a gorge, hollowed by the work of water over immensities of time. The sides of the gorge are great curves of grey limestone, cross-struck with calcite streaks like lightning flashes.

We move on down. Car-sized blocks of stone have fallen from the roof into the torrent bed and must be clambered around. The slope steepens. The ceiling gleams with star points: stalactite blebs, catching and condensing our torchlight. And then suddenly from either side of the gorge fall two avalanches of stone, waves of boulders and rock fragments crashing down upon us – but somehow frozen in mid-sweep, cantilevered out over our heads. I see that the fragments are all glued together by calcite. Time is starting to play tricks. Movements that have been stilled for thousands of years seem as if they might recommence without warning. My nerves tingle as I pass between the hanging waves of stone. The actions of my body feel jerky, triggering.

Up on the surface, horses flick at flies, caterpillars seethe on ragwort, the sun lowers to dusk. People drive home from work, radios on, windows down.

Beneath all of this, Sean and I pass under two further stone arches. The gorge's floor is slicker now. An awareness grows in us of a big drop somewhere ahead. I feel pulled on like water, as if I might flow down that slope and over the unseen edge. The acoustics change; echoes grow. Warned, we stop just short of a brink. At our feet the gorge floor falls away in a cliff, the base of which we cannot see.

'This feels like the Nether to me, Sean,' I say.

'Let's take a few minutes here,' says Sean.

We sit on boulders, flick off our head-torches. Afterlives of light at first, ghost-patterns on the retina: ferns and leaves. Then the darkness settles and trues, so that when I hold my hand an inch from my eyes I know its presence only from the sound and heat of breath on palm. A heavy black curtain has fallen between Sean and me, then hardened into a wall of stone, such that we are soon in different underlands altogether.

We tend to imagine stone as inert matter, obdurate in its fixity. But here in the rift it feels instead like a liquid briefly paused in its flow. Seen in deep time, stone folds as strata, gouts as lava, floats as plates, shifts as shingle. Over aeons, rock absorbs, transforms, levitates from seabed to summit. Down here, too, the boundaries between life and not-life are less clear. I think of the discovery of the bones in Aveline's, shining with calcite, *lying promiscuously, almost converted into stone* ... I slip out the whalebone owl, feel the Braille of its back, the arcs of its wings, thinking of how it had taken flight from a whale's beached ribs. We are part mineral beings too – our teeth are reefs, our bones are stones – and there is a geology of the body as well as of the land. It is

mineralization – the ability to convert calcium into bone – that allows us to walk upright, to be vertebrate, to fashion the skulls that shield our brains.

Sean flicks his light back on. Glare and blink. There is the cliff again at our feet, water streaming down its face. It is possible that we will find our way to the base of the waterfall later in the journey, so we decide to fix a rope down it now, in case we need to ascend it from below. We find a boulder and loop the centre of the rope around its back, then Sean hammers a chockstone into place with the heel of his hand to prevent the rope riding up and over the boulder when weight comes onto it. I lap-coil the rest of the rope, tie off the two ends, and after two warm-up swings – one, two, *three!* – hurl the coils over the edge.

Hiss, thrum, shiver of snakes in the torchlight, whip-slap as falling rope cracks tight against stone.

'Now,' Sean says, 'we just need to find the way down and round. There's a side passage somewhere up to our left, according to the maps I've seen, but it's a case of choosing the right one.'

We climb back up the belly of the gorge, away from the lip, moving upstream through the ghost-torrent, probing the left-hand side of the gorge with our torch-beams. There are three visible side passages. We try each in turn.

One spins us around in its twists before curving back at last to end in a wide window overlooking the waterfall, with an unclimbable drop below. The second is a rift entered by a squeeze that we have to repeat when the passage deads out. The third takes us far from the main chamber, and we have to count the turns in our minds, muttering them to ourselves (*first left, first right, second right*) so that the sequence can be reversed if we have to return – which we do.

There is one possibility left: a small entrance near the roof of the chamber, which can be reached only by the traverse of a cascade of damp flowstone, itself set high above the gorge bed. We clamber up to the cascade's edge, and consider the traverse. It is an intimidating crossing. We can rope up, but there is nothing to secure the belayer: one slip and we'll both go.

The cascade is a baroque structure. Flowstone is the name given to the calcite deposits that precipitate out of minerally saturated water as it runs over the slopes of limestone caves. You might imagine flowstone as a kind of white candle wax, gradually hardening as it runs, though it is built up over spans of time rather than by brief incandescence. Because of the gradual nature of its formation, flowstone sets into elaborate ruches and folds – elephant-skin gathers of texture, wrinkled stockings. Flowstone is very beautiful to look at and very hard to grip.

People don't often die caving, but it can be a hell of a job to get someone with a broken leg back up from deep in a rift. The fall from the cascade isn't necessarily a death fall, but it is definitely a double-leg-breaker. Twenty-five feet, perhaps. We know it's the right route, though, because Sean's head-torch has picked out a line of marks traversing near its high point, where earlier boots have cracked the calcite to the consistency of mint cake.

Little demons of worry bite at my stomach as we start out over the cascade. Steady steps, testing the take of each foot, like trying to walk across a slope of wet stone ropes, leaning down to touch the bosses with fingertips for balance, *slowly*, *slowly, slowly* ... and then Sean is over and I am over and we are into the entrance near the roof of the chamber, laughing with relief – and a new region of the labyrinth is open to us.

We let gravity lead us through it, taking always the downwards path where the tunnel splits, until the echoes tell us that our passage is approaching broad space – and

others endanger themselves trying to retrieve it.

Eric wished for a burial of a kind, however. So he sought permission from the coroner to have Moss's body sealed in the fissure that had killed him. Cement powder from the local works was carried into the cave, mixed with water from the thigh-deep lake, and then poured down the pot, entombing Moss in perpetuity. This section of Peak Cavern is now known as Moss Chamber.[8]

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It is full dark by the time Sean and I get back to the cottage. We hose down and then hang up our hazmat suits in the cool air of the garden, one on each wing of the totem pole. I whistle a song from *Rubber Soul* by the Beatles while we work.

Sean tells me about how he once climbed a wooded slope in Burrington Combe, opposite Aveline's, and found an entrance to a chamber, the aperture big enough for him to put his head into but too tight to admit his body.

'I called out into it,' says Sean, 'and the chamber answered, singing a different note back to me.'

I am sleeping in the attic room. It runs the length of the house. Head-height beams of crooked elm brace the space, tunnelled by boring beetles into galleries I cannot see. Each gable end has a small oak-framed window set into it, through which cool night air moves. Books stand in tall piles on the floor because the whitewashed plaster walls are too sloped for shelves. Before sleep I read Harrison's *The Dominion of the Dead*. I copy out a few sentences from early in the book:

> For the first time in millennia, most of us don't know where we will be buried, assuming we will be buried at all. The likelihood that it will be among our progenitors becomes increasingly remote. From a historical or sociological point of view this is astounding. Uncertainty as to one's posthumous abode would have been unthinkable to the vast majority of people a few generations ago.[9]

Tawny owl cries float into the room from the woods around. That night I dream of being slowly absorbed by calcite, a varnish creeping over me, setting me in my place.

I am woken by cries from the garden. Dawn light. Through the gable window I can hear Louis running in the garden. I look out. He is barefoot and in his pyjamas, standing at the chicken coop.

'Mum! How many eggs do we need for breakfast?!'

The newspaper that morning reports that geologists have discovered buried seas of water in the Earth's mantle. Four times as much water might be locked up there in a mineral called ringwoodite as is currently held in all the world's oceans, rivers, lakes and ice put together.

~

Over the days that follow, Sean and I move from place to place in the Mendips. Sean is teaching me undersight – how to see the underland's subtle entrances, its disguised extents. The heat persists, building but not breaking. The earth longs for rain but we do not, for rain will rush through the cave systems, making them too dangerous to enter.

Up on wooded ground, where the bracken grows above head height and an old pine plantation has run into what feels like wildwood, we follow deer paths to a small escarpment, at the base of which a cave mouth beckons us under the stone. Ferns mark

the entrance, hooped with bramble. Ivy climbs the cliff. A red admiral basks where light falls, slowly opening and closing its wings. Scrambling under the escarpment, we enter an alarming space. A scree-slope tilts to a flat lower chamber. Big blocks of rock hang from the rift's fractured roof. We descend to the chamber, and crouch there.

This is clearly a strong place – and it has drawn humans to it for thousands of years. Ritual depositions have happened here: the bodies of humans and animals were thrown or placed into the rift, probably during the Neolithic. Bronze Age relics have also been found, and at some point in the sixteenth or seventeenth century the stone near the entrance was marked with red painted figures. They are thought to be protection marks – apotropaic inscriptions made to avert evil. Are they designed to stop evil from entering this underland space, I wonder down there in the rift, or to stop it getting out?

Another day, near the highest point of the Mendip plateau, Sean and I walk what is known as 'gruffy ground'. 'Gruffy' means 'rough', 'rugged', and gruffy ground is the relic landscape of lead-mining activities dating back more than 2,000 years. Small-scale Roman mining left behind hundreds of small heaps of tailings; in the eighteenth century these were reheated to melt out any residual lead ore. This double working of the landscape has left the ground humped with small hills of toxic slag, over which grass has thickly grown, shunned by grazing animals which sense its contamination.

We walk that lush and poisonous little valley to a viewpoint. The air is lightly hazed. Sean picks out the landmarks: the Bristol Channel, the rise of Dartmoor to the south-west, Hinkley Point nuclear power station squat on the coast, and below us the spreading flatlands of the Somerset Levels, where we know – through the startling precision of tree-ring dating – that in 3807 BC Neolithic people cut and split oak into planks, bound them together, supported them with cross-poles, and laid them as a trackway over marshland, joining high ground to high ground.

Kites turn above us, and above the kites turn buzzards. A telecoms mast relays signals through the air, through our bodies. Down in the Levels a fire is burning from within a stand of willows, and its smoke plume rises straight up in the still air. The sun beats on us. I close my eyes, see red and gold tendrils.

'It's way too hot above ground,' says Sean. 'Let's go somewhere cooler.'

So we do. It will be one of the most unnerving spaces I have ever entered.

~

Over field and down into bower of elder and old ash, moss plushing rock to soft gold-green. Follow the stream bed through gorse and bracken, setting fieldfares flaring to the west with chatter and crackle. Swallows skimming meadows on the fly, blowy warmth in a north-east wind. On and into the deep-set hollow, a last nod to the sun – to the light falling through leaves in nets, to the buzzard drifting over – and then we are down a hole in the stone-cold soil, worn to a swallet by the run of a stream, into the earth's gullet, into the black bite of a polished stone-vice set carelessly and wondrously with the spirals of ammonites and the bullets of belemnites, and down into trouble.

Sean leads, lowering into a six-foot shaft. I follow, drop into darkness, and find him on his knees. There is just space for the two of us hunched together here. Ahead of us is the shoulder-wide entrance to the ruckle.

'This is a space granted by collapse,' says Sean quietly, admiringly.

A ruckle is a group of boulders that have caved against one another, blocking a section of passage, but through the gaps of which a path might just be traced. Ruckles are delicate, unpredictable structures. Without disturbance, a ruckle might hold its

position for tens of thousands of years. But an earth tremor might shake it into a new order in an instant. Or a human touch might cause a boulder to move, shifting the whole stack, trapping foot or hand – or just, terribly, locking one in.

Crouched in that bare space, my heart hammers warning in my ears. I reach out and place a hand on the black rock of the first boulder, and the cold volts into me like a current, surging up my arm, petrifying me.

The stone of the ruckle is beautiful, I think – a dark limestone, glittering in the torchlight like ice – and then I see that even the air in the spaces between the boulders seems somehow to shine, so that it is, really, impossible not to move on into the ruckle.

And there is a hint as to how to navigate the maze – for hanging from the first boulder is a line of white nylon cord. This is an 'Ariadne's thread', left by earlier cavers and named after the ball of wool that Theseus was given by Ariadne to unravel behind him, laying a track back to safety as he twisted down the dark passageways of the Minotaur's lair.

'After you,' whispers Sean to me, gesturing with a wave of his hands towards the cord, and giving as much of a bow as he can muster from that cramped position.

'No, please, really, after you,' I whisper in reply, bowing back.

Sean rolls his eyes and leads off, easing head first through an opening little more than twenty inches wide. His feet vanish. I follow.

On and in and down, sliding through each black mouth of each new turn in the ruckle, following the white thread, bending body to fit space, curling against the cold stone, trying to push as little as possible against any boulder, trying somehow to *evaporate* myself such that I become a gas that can flow through this place without touching a surface. But instead I am aware of my clumsy bag of bones and blood, of the need to lever myself onwards with elbow and knee, to push off with foot and pull on with fingers, and each touch of rock feels a risk, a tap that might spring the trap of the ruckle – until at last Sean eases through a gap and I hear him sigh in space, and I slide through to join him in a chamber big enough almost to stand in, and the roof above us is solid once more.

'Hell,' I say, breathing hard.

'Yes,' says Sean.

To our left is a passageway cinching to a shoulder-width black circle. Ahead of us, drawing my eye and tightening my throat, two leaning ten-foot slabs of black rock, more marble than limestone, run off into shadow, angling towards one another.

This is a bedding plane, formed when the rock was being laid down as sediment on a seabed. Strata movement has prised the sides of the plane apart millions of years later, water has worked to burnish an absence between them, and our onwards route is into this deep time space, this deep time vice.

We enter the bedding plane with trepidation, leaning back on the lower angle of stone, and sliding ourselves onwards into the darkness, the upper plane tilting out and over us. There is no danger of collapse here but the sense of confinement is severe. We *submit* ourselves to the bedding plane, until at last it tightens to a silted-up sump that is not the end of the passage for water, but is surely the final affordance for our stubborn, unshrinkable human bodies.

In that vanishing point, neither of us speaks. Language is crushed. We are anyway too busily engaged building structures within ourselves that might house our spirits, for the pressure here is immense, a weight of rock and time bearing down upon us from every direction with an intensity I have never experienced before, turning us fast to stone. It is a fascinating and terrible place, and not one that can be borne for long.

We return to the edge of the ruckle, knowing we must pass back through it – and there lies the end of our thread, our white clue. Without it we could hardly retrace our route through the boulder labyrinth. It would be like memorizing a fifty-word tongue-twister on the way down and then reciting it in reverse on the way back up.

I lie down to lead, I follow the thread, and each tiny room in the ruckle opens onto the next as it should, in turn, in order. I pass through the last of the gaps, and as I lift myself into the entry shaft I feel the snap of the black stone's jaws at the empty air below my toes, and then I am out of the swallet and into the hollow, and warm air is rolling around me, and my bones grow again in the storm of light and ferns furl their green over and into me and moss thrives on my skin and leaves teem in my eyes, and Sean and I sit laughing, knowing for those few moments that to understand light you need first to have been buried in the deep-down dark.

We emerge from the hollow, step clear of the elder and the ash. The sunshine is so thick I want to lie belly up in it, floating as if in a salt-rich sea. After the bedding plane, our sight lines are huge. Silhouetted on the horizon above us are two round grassed domes.

Sean points up at them. 'Those are some of the Priddy Nine Barrows,' he says.

These are hay-making days in the Mendips, and there is the ripe reek of cut grass in the air. Where hay has been lifted and black-wrapped as bales, aftermath already shows as green shoots in the gold stubble. Sean and I walk together uphill towards the barrows from the cave of the ruckle, along a holloway with sides fifteen feet high from bed to hedge top.

A charm of goldfinches flitters away, the birds' high song glittering around us. I am moved by the generosity of colour and space in this ordinary land. Here in the Mendips I have seen how thin the border is between the upper and lower worlds, and how hard it can be to pass in either direction.

The holloway leads to a gap in a stone wall, then out onto a meadow over which a warm westerly blows. The burial barrows lie in a line along the slope. Sean and I cross the meadow, happy in each other's silence and glad of each other's company. We reach the first barrow and lie there in the long grass, backs to the hill's back, sun hot on skin.

Meadowsweet, knapweed, scabious. Everything is shiveringly strange. Flies on the grass blades are exotic as tigers – eyes of a thousand ruby hexagons, wings of the finest filigree. We lie so still that a grasshopper lands inches away, and I watch its drumsticks quiver as it drags leg over wing case, stridulations streaming out. I think of the makers of these barrows, choosing this high place as their site of burial. The construction of the kists, the casting of the collared urns, the burning of the bodies, the building of the barrows.

Eight of the nine barrows were excavated in a single week by the Reverend John Skinner and his men in 1815, the exhumation motivated by a combination of antiquarian interest and grave robbery. All were found to contain at least one cremation. One of the barrows held the wealthiest burial found anywhere in the Mendips: a woman who had been pregnant, missing her pelvis but buried with beads of amber and faience, a copper awl and an elaborate dress fastening. Twenty-four years after he plundered the Priddy Nine Barrows, Skinner would shoot himself in the face. It is thought that his friends succeeded in concealing his suicide, thus allowing his body to be buried in the consecrated ground of his Somerset parish at Camerton. *We are often more tender to the dead than to the living, though it is the living who need our tenderness most …*

Sean tells me a story. Modern archaeologists excavating a Bronze Age barrow in a Mendips wood find the remains of a woman placed in a funerary urn. The barrow had already been ruptured by deep ploughing when the cemetery was planted with trees early in the twentieth century, but the urn somehow survived. The archaeologists disinter the urn, and study the remains of the woman that it holds. Once their work is done, one evening while white moths flit in the shadows of trees, they rebury the woman's remains in a replica urn. As they do so one of them speaks a blessing at the graveside – a reburial ritual performed across the space of several thousand years, spoken out of respect and also, perhaps, out of apology.

Sean and I stand up in the warm wind and we follow the barrows, walking past each mound in turn until we have reached the end of the line, the last of the nine. From there we return to the first of the barrows, and we lie again on its slope, talking and not-talking. Beneath us is the earth and the kists it holds, and below that is the limestone and the rifts it holds.

We lie on the barrow's turf for so long that, when we leave, I look back and see that we have pressed imprints of our own bodies into the grass of that burial site, leaving outlines of what is to come.

entity such as a galaxy. But just as Zwicky's galaxies rotated too fast, so light also bends too greatly to be due only to the visible components of a given galaxy. There must again, therefore, be more mass than that which can be seen. This imperceptible, space-curving, light-lensing massive presence that surrounds a visible galaxy is known to astrophysicists as a 'dark-matter halo'.

What these observations and others like them suggest is that only around 5 per cent of the universe's mass is made of the matter we can touch with our hands and witness with our eyes and instruments. This is the matter of stone, water, bone, metal and brain, the matter of which the ammoniacal storms of Jupiter and the rubble rings of Saturn are made. Astronomers call this 'baryonic matter', because the overwhelming share of its mass is due to protons and neutrons, known to physicists as 'baryons'. A little over 68 per cent of the universe's mass is presumed to be made of 'dark energy', an enigmatic force that seems to be accelerating the ongoing expansion of the cosmos. And the remaining missing 27 per cent of the universe's mass is thought to be made up of dark matter – the particles of which almost wholly refuse to interact with baryonic matter.

Dark matter is fundamental to everything in the universe; it anchors all structures together. Without dark matter, super-clusters, galaxies, planets, humans, fleas and bacilli would not exist. To prove and decipher the existence of dark matter, writes Kent Meyers, would be to approach 'the revelation of a new order, a new universe, in which even light will be known differently, and darkness as well'.[2]

Dark-matter physicists work at the boundary of the measurable and the imaginable. They seek the traces that dark matter leaves in the perceptible world. Theirs is hard, philosophical work, requiring patience and something like faith: 'As if' – in the analogy of the poet and dark-matter physicist Rebecca Elson – 'all there were, were fireflies / And from them you could infer the meadow'.[3]

Presently, the particle thought most likely to be the constituent of dark matter is known wryly as a WIMP – a weakly interacting massive particle. What we know of WIMPs suggests that they are heavy (up to more than a thousand times the weight of a proton), and that they were created in sufficiently vast quantities in the seconds after the birth of the universe to account for the missing mass.

WIMPs – like neutrinos, nicknamed 'ghost particles' – have scant regard for the world of baryonic matter. WIMPs traverse our livers, skulls and guts in their trillions each second. Neutrinos fly through the Earth's crust, mantle and solid iron-nickel core without touching a single atom as they go. To these subatomic particles, we are the ghosts and ours the shadow-world, made at most of a diaphanous webwork. The great challenge faced by physicists has been how to compel such elusive particles to interact with experiments; how to weave a net that might catch these quick fish. One of the solutions has been to go underground. Subterranean laboratories have been established around the world, dedicated to the detection of evidence that a WIMP or a neutrino has briefly interacted with baryonic matter. The experiments under way in these deep-sunk laboratories are all forms of ghost hunting, and they are located far underground because the surrounding rock shields the experiments from what physicists call 'noise'.

Noise is the trundle of everyday particles through the air, the din of the ordinary atomic world going about its business. Radioactivity is deafening noise. Cosmic-ray muons are noise. If you wish to listen for sounds so faint they may not exist at all, you can't have someone playing the drums in your ear. To hear the breath of the birth of

the universe, you must come below ground to what are, experimentally speaking, among the quietest places in the universe.

Half a mile underground in an abandoned mine in Japan, set in a chamber of 250-million-year-old gneiss, a stainless-steel tank holds 50,000 tons of ultra-pure water. Watching the water are 13,000 photomultiplier tubes, forming a compound eye. The eye is looking for tiny flashes of blue light. These flashes are Cherenkov radiation, produced when an electron moves faster than the speed of light in water. Electrons reach such speeds when an atom is – occasionally – struck by a neutrino, the impact scattering the atom's electrons at velocities in excess of the speed of light. These scattered electrons are called 'annihilation products', and if those electrons are scattered in water then they briefly create a luminous blue cone around them as they move. The compound eye of the photomultiplier tubes therefore watches for trebly displaced evidence of the 'ghost particles': not the neutrino itself, or the atom it has struck, or the electrons it has dispersed, but the blue aura left by that ghost-struck atom – annihilation's afterglow. This buried chamber of gneiss is called an 'observatory', for although it is deep underground it is in fact scrying the stars: among its many other tasks is keeping watch for supernovae in the Milky Way.

Deep in a worked-out open-cut gold mine in South Dakota, super-cooled xenon is held in a six-foot-tall vacuum vessel, surrounded by 71,600 gallons of deionized water contained in a welded steel tank and watched by photomultiplier tubes for the displacement of a single photon and a single electron brought about by the strike of a WIMP. Xenon, a noble gas, has large atoms. When xenon is very cold it is very dense; those large atoms huddle together, thus presenting a greater cross-section to incoming particles and optimizing the chances of WIMP strikes. In a landscape where the earth was once raked and gouged in search of a highly valued rare metal, the search is now ongoing for a substance that is plentiful beyond imagination and of no worth at all.

And near the little village of Boulby on the Yorkshire coast, in a salt cavern far below the headworks of a potash and rock-salt mine that commenced operation in 1973, a dark-matter detection experiment is presently under way that is known by the acronym DRIFT: directional recoil identification from tracks.

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Neil Rowley unrolls his map of the underland on his desk, and places four chunks of rock on its corners to keep it flat, naming each as he puts it down: sylvite, halite, polyhalite, boracite. He smooths the map out with his hands, working from the centre to the edges. Neil is a mine-safety specialist. He has worked in coal; now he works in potash. He likes W. H. Auden, he likes maps and he loves mining.

Neil's map records the roadways and refuge chambers of the Boulby mine. At first glance, it looks to me like the wings of a dragonfly, intricately veined and structured. Slowly my eyes key into its codes.

The north-east coastline of England is present as a faint grey line running across the map from north-west to south-east: a surface irrelevance, shown chiefly for purposes of orientation. At Boulby itself, two circles signify the two shafts that plunge into the bedrock, giving access to the tunnel network. From that centre point the tunnels fan out to the north-east and the south-west, forming the wings of the dragonfly. To the south-west, they spread under moor and dale, deep into North Yorkshire. To the north-east they spread under the North Sea, running out beyond the shipping lane and into open ocean.

This network of tunnels and roadways is collectively known as 'drift'. There are more than 600 miles of existing drift burrowed into the soft bands of halite (salt) and sylvite (potash) that stretch below sea and land, out to the mining faces where – every hour of every year – men and machines claw tons of potash from the seams, duct the potash onto hoppers and start the journey of this buried residue of a Permian sea up to the world's crop fields, where it will be spread as a fertilizer in both of the Earth's annual two springs, returning vital potassium to the growing cycle.

As the land below the Mendips holds a water-made labyrinth, so the land below Boulby holds a human-made maze. I have come from rift to drift.

On Neil's map, red lines signify drift cut through salt, black lines signify drift through potash. Yellow squares mark refuge chambers, dug into the side walls of the tunnels and armoured against heat by polyfoam outer walls. In the case of collapse or fire at depth, these are the fall-back sites.

At the tips of the wings – far under the sea and far under the moors respectively – thin green threads lick out. These are the lateral boreholes being drilled by mine geologists to test the lie and integrity of the deposits ahead of the workface. The information they return will determine the future directions of the mining, the future spread of the wings.

'You need to understand that the tunnel network is on a tilt,' says Neil, drawing his finger across the map, from one end of the dragonfly's wing to the other. 'The drift tilts because the deposit tilts. The tunnels follow the potash, and the potash strata are inclined.'

Inland the potash deposit runs deeper, reaching a maximum depth of around 4,500 feet at the outermost limit under the moors. Seawards, it rises to a minimum depth of around 2,600 feet at the outermost point beyond the shipping channel. A temperature gradient follows the depth gradient. At 2,600 feet the air temperature is 35°C. At 4,500 feet it's 45°C. In both places the geothermal heat is so intense, and the moisture content of the air so low, that sweat evaporates before it can even be seen. Dehydration is rapid. For the miners it is like labouring in the Sahara at noon, in darkness.

'The men all carry cool-boxes with four litres of chilled water per shift,' Neil says. 'They have rehydration timetables throughout their shifts. Got to keep drinking. Much safer.

'Come on – let's see if we can catch a lift down there, find some dark matter, then we'll make the long drive out to the mining face under the sea.'

Ear defenders on. Respirator hooked at the belt. Numbered bronze triangle in pocket as proof of entrance: *Don't lose it now, you won't be allowed out ...* Yellow cage door clangs shut, cage starts its drop, steady but still stranding the stomach. Roar of the fan-house fading away, cage speeding up. Halfway down a shudder and blast as the other cage crosses on its way up, squeezing air between cages with a *crash-whoosh* like two trains passing in opposite directions. Slow, slow, slow, bump, stop, cage door clangs open – and voices are yelling, 'Ears off, lights on! Ears off, lights on!'

Rock dust swirls in the air, thick enough to taste, salty on the tongue.

Black mouths of drift lead away under the ocean, into the Permian.

An airlock in a wall opens into a laboratory.

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The young physicist sits at his computer, watching for signals from Cygnus. His name is Christopher, and his white lab coat is too big for him. Christopher speaks with calm

clarity. His manner is modest, gracefully gentle, and I wonder if this comes in some way from spending your days thinking through time so deep it stretches to the birth of the universe.

Along the walls of the laboratory, at intervals of every fifteen feet or so, black-and-yellow warning tape marks the outlines of what look like potential doorways, rising only to thigh level. Above each taped outline, a long-handled axe with a splitter blade is held in two hooks.

Salt has very low gamma radiation. Salt is a good insulator. Salt is radio-pure. Salt is an excellent substance in which to encase yourself if you want to study weakly interacting massive particles. But salt is also highly plastic. Salt *flows* over time. It creeps around. It sags. If you cut a chamber out of a seam of halite with 3,000 feet of bedrock above it, that chamber will slowly distort. The ceiling will dip, the sides will bulge. Gravity wants that space back. So the scientists working in the Boulby laboratory know they are operating in a temporary zone, with limited years of safe life. Deep time must be studied fast.

'Those are your emergency exits in case of a sudden slump in the halite,' says Christopher, mimicking the hand gestures of a flight attendant explaining the safety protocols, and pointing to the doorways marked with warning tape, 'here, here ... and here. If the lab begins to collapse, you grab an axe, hack your way through the lab wall, then hack your way out through the salt to safety.'

He pauses, smiles. 'Well, that's the theory, at least.'

Several different kinds of underground experiment are presently taking place in the laboratory. One assays rock samples in order to research techniques for the long-term burial of radioactive waste. Another investigates a technology known as 'muon tomography', which makes use of highly penetrating charged particles (muons) produced by cosmic rays from space. Because of their ability to pass deep into rock, muons allow sunken structures such as the interiors of volcanoes and the hollow hearts of pyramids to be perceived. Muons offer a way of seeing through stone. These are all remarkable experiments. But the jewel in the experimental crown of the Boulby laboratory is DRIFT.

Christopher walks me towards a large object located at one side of the laboratory. 'This is my underground crystal ball,' he says – flourishing his hands like a magician revealing a trick – 'also known as the Time Projection Chamber.'

From the outside, the magnificently named Time Projection Chamber is disappointing to look at. Black bin liners are taped scruffily around a large metal-clad box.

'I see that bin bags make up the vital outer layer of your crystal ball,' I say.

'You mock,' replies Christopher, 'but duct tape and bin bags have proved crucial to more scientific breakthroughs than you'd imagine.'

He explains the experiment to me. 'We know dark matter is massy. Massively massy. So its particles, even though they're invisible to us, have mass, and if they have mass then they must at least occasionally collide with particles we can see. These collisions send nuclei scattering. Our first goal with DRIFT is to detect these collisions, and follow the nuclei as they scatter.'

He pauses. I wait. Trillions of neutrinos pass through our bodies and on through the Earth's bedrock, its mantle, its liquid innards, its solid core.

'Imagine watching a game of billiards in which the red balls are visible but the white isn't. Suddenly you see the red ball – an electron – move across the baize. By plotting the red ball's path, you might be able to backtrack, as it were, the path of the invisible