



ANGELA PALMER

DEEP TIME  
UNCOVERING OUR HIDDEN PAST

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PANGOLIN LONDON





(LEFT)  
Angela Palmer with  
*Tower of Time*

## INTRODUCTION

### STONE MIRROR

Professor David Farrier  
Chair in Literature and the Environment  
University of Edinburgh

When we look upon stone, what do we see? Leonardo da Vinci remarked in his notebooks that an old wall or streaked stone may reveal fantastic or grotesque scenes, “landscapes, battles, clouds, uncommon attitudes,” or “humorous faces.” Stone can also take on the properties of water. From the perspective of very deep time, the lithic becomes liquid: “The stones flow also,” writes the Cumbrian poet Norman Nicholson, “as the fluid strata / crest the curve of time.” In certain Edinburgh streets, the coal-black fossils of Devonian fish still swim in wave-mottled paving slabs of Achanarras stone.

In *Seeing Things*, Seamus Heaney recalls watching the reflection of travelling sky and overhanging cliff in the pool of water at the base of the quarry. Rock and cloud, light and water, merge in a single question: “could you reconcile / What was diaphanous there with what was massive?” Permanence bleeds into transience; gauzy rock trembles in colossal water. The same question surrounds Angela Palmer’s work in *Deep Time*. It is, as in so many things, a matter of where you stand. Step back, and the solidity of *Tower of Time* and *Torus of Time* speak of immensity, the dense layering of ages in stone and the endless cycles of geology; but move closer, where coarse grain has been polished to a mirror sheen, and your own face swims up to meet you.

The Anthropocene, or era of the human, marks the entry of human civilisations into the ledger of planetary time, represented by a suite of chemical, geomorphological, and evolutionary changes in the Earth system. Not all humans, not all societies, share culpability; but to think of ourselves as geological agents—singly, collectively, in various kinds of political or ethical groupings—evades our senses. The vast scale of deep time dissolves. Moving between the diaphanous and solid, Palmer's sculptures capture something of this challenge to our temporal imaginations.

The Anthropocene is a hall of mirrors, giving back our own image in the distorting form of plastic, concrete, and aluminium, and in the vast pits made to extract these resources. We can see ourselves in the cloud of C14 isotopes that has settled over the planet like a fine mist following decades of nuclear testing. We are there in the burning forest and the melting permafrost. These traces will linger, time out of mind: it could take up to 100,000 years for the last particle of anthropogenic atmospheric carbon to weather away, during which time the coastlines of continents will have been remade and the conditions for life itself altered. Millions of years from now, the roots of our cities will have fossilised like those of enormous trees.

Iron is in our bodies too. "In every part of every living thing / is stuff that once was rock," writes Lorine Niedecker. We will live in stone just as minerals are part of us. Sixteen rocks from around the UK, arranged in chronological order, make the *Tower of Time*.

At its tip is a stone made of steel. It is a reminder that the Anthropocene is also the Capitalocene, a consequence of certain quirks of history rather than human nature. The Industrial Revolution developed in step with—was impossible without—the emerging science of geology. Our entry into the rock record began with our trespass into the earth in search of ores and minerals. *The Four Nations* recollects that this mastery of geology made the modern United Kingdom; that nations and their ambitions have remade the world.

(RIGHT)  
*Torus of Time*  
2023, sixteen stones  
commencing Lewisian  
Gneiss, circa 3 billion  
years, Isle of Barra  
(see reference p. 64)  
Unique  
110 x 90 x 60 cm







The Burmese Teak, stamped with the emblem of the British Crown and whose spiralling tree rings have been engraved by Palmer, bears witness to the climate emergency's roots in colonial nations' lust for natural resources. "Geology," notes Kathryn Yusoff, "is a mode of accumulation, on one hand, and of dispossession, on the other, depending on which side of the geologic colour line you end up on." But it also speaks of how the emergency is felt unevenly, manifesting most forcefully in those parts of the world which bear least responsibility.

How close are we to the cliff edge? How long before the ground disappears from beneath our feet? "Just think," writes Jen Hadfield of a crumbling precipice, "the sound as it / slid into the / sea—"

like the  
love leaving your

lover's  
face

Deep time can feel like a kind of vertigo; but thinking with deep time can also ground us. In the mirrored surfaces of Angela Palmer's sculptures, the face that appears is not just our own: the faces of generations yet to be born, who must inherit the world we make for them, also look back at us. Not all is lost; we can still choose to be better ancestors. Peering into the stone mirror can also furnish us with worlds we have yet to imagine. "Out of this confused mass of objects," Leonardo declared of the images conjured in stone, "the mind will be furnished with an abundance of designs and subjects, perfectly new." The stone mirror poses a question: which future will we choose?

(LEFT)  
*From the Depths  
of Time II (detail)*  
2023, Burmese Teak  
Unique  
47 x 46 x 22 cm



# CATALOGUE







*Mighty Voices: From the Ends of the Earth*  
2023, trio of Lewisian Gneiss, circa 3 billion years,  
Isle of Barra, Unique  
120 x 80 x 50 cm / 108 x 60 x 40 cm / 120 x 70 x 50 cm



*The Four Nations,*  
2023, Basalt (Northern Ireland), Portland Stone  
(England), Pink Granite (Scotland) and  
Anglesey Limestone (Wales)  
Unique  
35.5 x 35.5 x 35.5 cm







(LEFT)  
*Altar of Time*  
 2023, Gneiss, circa  
 1 billion years,  
 Morayshire, Scotland  
 Unique  
 27 x 55 x 27 cm

(RIGHT)  
 Angela Palmer with  
*Altar of Time* in the  
 yard Aberdeenshire,  
 Scotland





*Glimpse into Deep Time*  
2023, White Anorthosite,  
circa 2.5 billion years, Isle of Harris,  
Unique  
42.5 x 45 x 62 / 45.5 x 53 x 45 cm



*Tower of Time*  
2023, sixteen stone blocks rising from  
a base of Lewisian Gneiss, circa 3  
billion years, Isle of Barra  
topped with stainless steel  
(see reference pp. 67-9)  
Unique  
259 x 60 x 60 cm







(LEFT)

*Tower of Time* (detail)  
showing from top to  
bottom:

Silver Grey Granite,  
Cornwall, England,  
290 million years;  
Buff Yorkstone, Yorkshire,  
England, c. 320 million years;  
Mandale Limestone,  
Derbyshire, England,  
c. 330 million years;  
Lower Old Red Sandstone,  
Monmouthshire, Wales,  
c. 410 million years;  
Park Granite, Highland,  
Scotland,  
c. 425 million years.

*The Ring and the Tower are stunning and are the most rewarding sculpture pieces I have seen for a long time. The colour is so unexpected and makes the work so fresh which at first seem at odds with the idea and the age. The fact of the age and the freshness make them deeply “present”.*

David Nash, sculptor

(RIGHT)

*Tower of Time* (detail)  
showing from top to  
bottom:

Avochie Granite,  
Aberdeenshire, Scotland,  
470 million years;  
Gneiss, Morayshire,  
Scotland, 1 billion years;  
Green Schist, Argyll and  
Bute, 1 billion years;  
Torridonian Sandstone,  
Highland, Scotland,  
1 billion years.







*Time Flows Deep*  
2023, Lewisian Gneiss,  
circa 3 billion years, Isle of Barra  
Unique  
35 x 30 x 36 cm / 30 x 40 x 35 cm

*Written in Stone: Journey from the South Pole (xi)*  
(wall-mounted)  
2023, Lewisian Gneiss, circa 3 billion years and  
White Anorthosite, circa 2.5 billion years,  
Isle of Harris  
Unique  
63.5 x 66.5 x 11 cm







*Bands of Time*  
2023, White Anorthosite,  
circa 2.5 billion years,  
Isle of Harris  
Unique  
50.5 x 71.5 x 39 cm

*Column of Time (i-iv)*

2023, sixteen stone blocks commencing  
Lewisian Gneiss, circa 3 billion years,  
South Uist, Scotland topped with  
stainless steel  
Series of 4  
143 x 34 x 34 cm

Stones date from circa 3 billion years  
commencing:

Lewisian Gneiss, Scotland  
Torridonian sandstone, Scotland  
Green Schist, Scotland  
Gneiss, Morayshire, Scotland  
Avochie Granite, Scotland  
Park Granite, Scotland  
Lower Old Red Sandstone, Wales  
Mandale Limestone, England  
Buff Yorkstone, England  
Silver Grey Granite, England  
Aeolian Sandstone, Scotland  
Blue Lias, England  
Purbeck, England  
Basalt, Northern Ireland  
Mourne Granite, Northern Ireland  
Glacial Boulder, deposited Inverness-shire, Scotland  
Stainless Steel





*Witness of Time*  
2023, White Anorthosite, circa 2.5 billion years old,  
Isle of Harris; with a Findhorn Granite base,  
circa 430 million years old, Highland  
Unique  
91 x 78 x 37.5 cm






(LEFT)  
*Written in Stone: Journey  
 from the South Pole (iv)*  
 2023, White Anorthosite,  
 circa 2.5 billion years,  
 Isle of Harris  
 Unique  
 23 x 21 x 21 cm



(RIGHT)  
*Written in Stone: Journey  
 from the South Pole (iii)*  
 2023, White Anorthosite,  
 circa 2.5 billion years,  
 Isle of Harris  
 Unique  
 42 x 23 x 13 cm





*The falling water  
Hangs steady as stone;  
But the solid rock  
Is a whirlpool of commotion,  
As the fluid strata  
Crest the curl of time...*

Extract from *The Beck*  
by Norman Nicholson





## IN CONVERSATION

Angela Palmer & Polly Bielecka, May 2023

**PB:** This exhibition explores the concept of *Deep Time*. When did you first become aware of the concept and what gave you the idea for the exhibition?

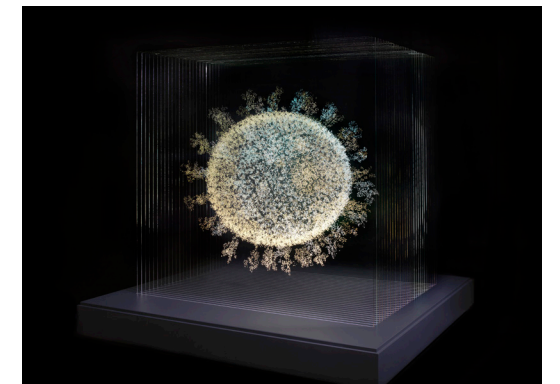
I have always been drawn to what lies beneath the surface, and the natural beauty of what exists hidden from our vision. Through my art I try to explore new perspectives, peeling back the layers and reimagining what is unseen or unnoticed. My subject matter is usually the natural world, such as the internal form of humans and animals. During Covid I became fascinated by the notion of this tiny living thing terrorising us all and collaborated with some brilliant scientists to recreate the coronavirus particle sphere at 8 million times its size as a three-dimensional engraved 'drawing', floating in a glass chamber. An object of horror turned out to have a strange and fragile beauty reimagined in this way.

As to *Deep Time*, it has, fittingly, been a long time in gestation. Since childhood, I've wandered hillsides and shorelines, captivated by the textures, colours and markings on stones and rocks. Gradually this led me to explore geology and a natural connection formed with mapping the unseen, which has always lain at the core of my work.

(LEFT)  
Angela Palmer with  
*Torus of Time*

(RIGHT)  
Angela Palmer  
sketching *Tower of  
Time*

(FAR RIGHT)  
*The Sphere that  
Changed the World*,  
2021. On view at  
The Science Museum,  
London





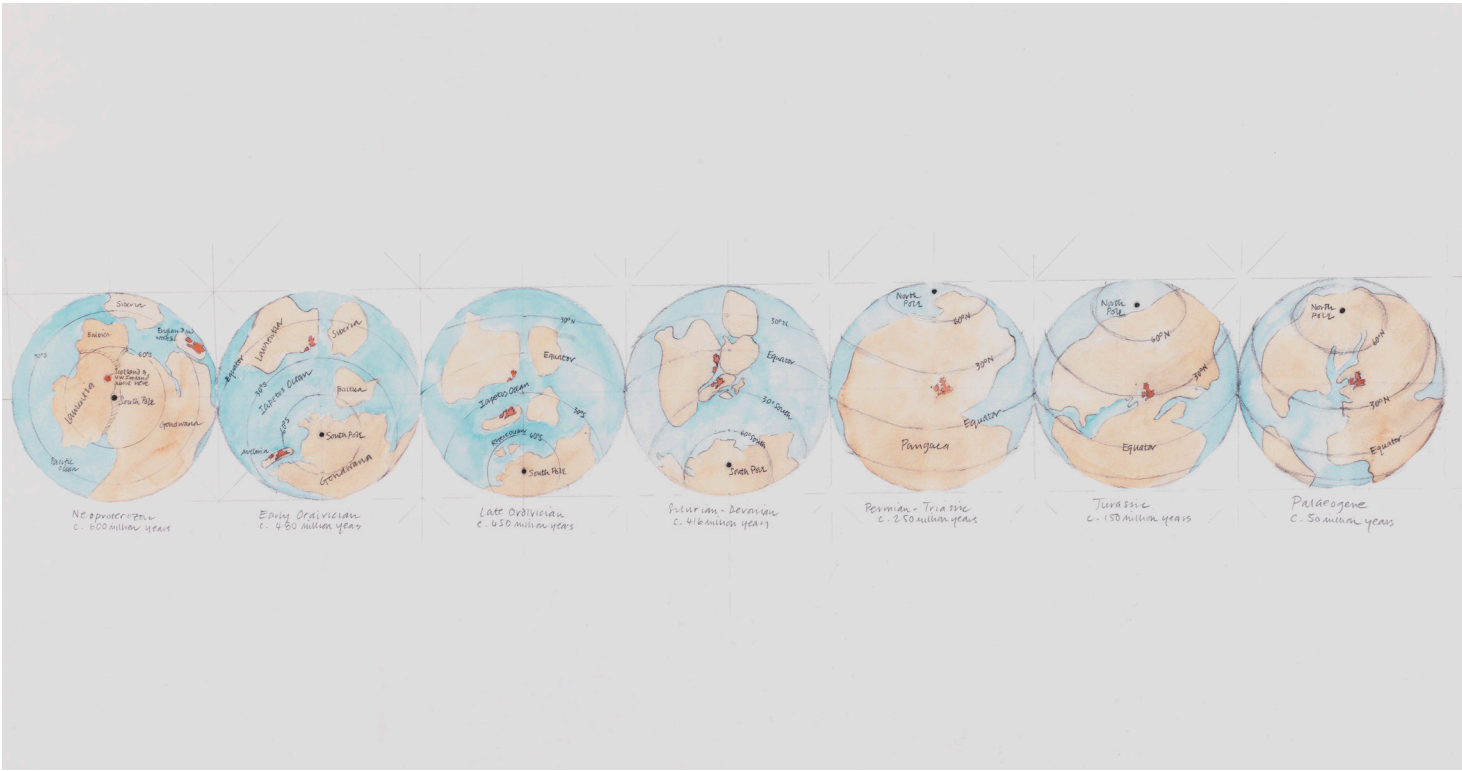
In retrospect, perhaps the key moment was discovering the 1815 Geological Map of Great Britain by William Smith, the country's first geological map. It is as much a beautiful work of art as it is a scientifically significant exploration of the connection between geology and time. From there the pieces all started to fall into place as I learnt about the unique geological composition of the UK, how our nations came together, and how our nation has been on a three-billion-year journey, literally through time and space, from the far reaches of the South Pole. It was not clear how to realise this concept until it suddenly became obvious: to allow the rocks, beneath our feet, to tell their own story.

**What was the most unexpected aspect of your research?**

It was a revelation to learn that our nation boasts some of the most ancient rocks in the world - the Lewisian Gneiss from the Outer Hebrides in Scotland in this exhibition is two-thirds the age of the Earth itself. It is the oldest material object you are ever likely to hold in your hand. I found that very powerful.

I was also astonished to learn that the land on which we stand, and which Britons know as home, was originally located in the Southern Hemisphere, near the South Pole. And that for billions of years, Scotland and Northern Ireland enjoyed an entirely separate existence on a different continent to England and Wales. Their continents were separated by the 7000km wide Iapetus Ocean. It was only when the tectonic plates shifted and their respective continents collided that England and Scotland were physically united, just south of the Equator, around 400m to 425m years ago. We were 'stitched' together as a united country at roughly the same location as today's Anglo-Scottish border. It was a gentle collision - known as a 'soft-docking' - so there are no dramatic mountain ranges to mark the 'Iapetus Suture.' My brother said it must have been the last gentlemanly exchange between the two countries. I hope visitors to the exhibition will unlock their imaginations and allow themselves to be propelled to the Antarctic Circle where the most ancient of these rocks in this exhibition began their journey - a silent world with little oxygen, with no trees, nor fish, nor birds, nor beasts.

*"I was also astonished to learn that the land on which we stand, and which Britons know as home, was originally located in the Southern Hemisphere, near the South Pole."*



*Journey from the South Pole:  
Our Four Nations on the  
Move  
2023, Photographic Print  
Edition of 30  
56 x 76 cm*

Information courtesy of the  
British Geological Survey

*"And that for billions of years Scotland and Northern Ireland  
enjoyed an entirely separate existence on a different continent to  
England and Wales."*





You’ve travelled the length and breadth of the country visiting quarries from the Hebrides to Portland in your quest to build an accurate geological history of the UK. It sounds like it’s been an adventure. Which was the most challenging stone to find and why?

Without question the most challenging stone was the 2.5 billion year old White Anorthosite from the Isle of Harris in the Outer Hebrides. It is the same type of rock that was found on the moon and recovered by astronauts on the Apollo 15 mission in 1971; it became known as the Genesis Rock and to this day remains a precious specimen held under high security at NASA’s Johnson Space Centre in Houston, Texas.

White Anorthosite is a rare stone in the UK and it was quite an adventure to firstly locate the disused quarry and then track down its owner. After years of trails going cold, I eventually found a breakthrough lead and we finally met on a remote, windswept lay-by on Harris. Several other rock types I had sourced for the *Torus of Time*, the *Tower of Time* and the *Column of Time* sculptures had to be

(LEFT)  
Angela Palmer on a research trip on the Isle of Harris

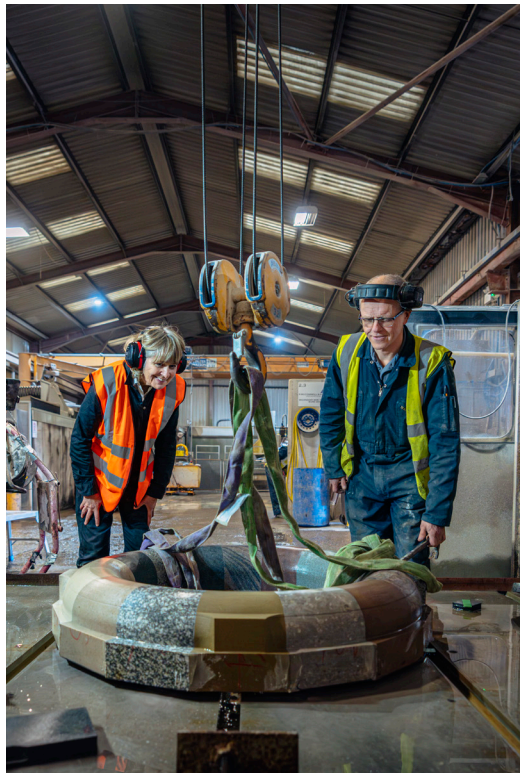
(RIGHT)  
*Written in Stone: Journey from the South Pole (viii)*  
2023,  
White Anorthosite,  
circa 2.5 billion years old,  
Isle of Harris  
Unique  
26 x 26 x 26 cm





abandoned because of fracturing. This is because many quarries in the UK are blasted with dynamite to create aggregate for gravel, road making *et al* rather than for building. It is a sad indictment that it is largely cheaper to import stone in blocks from China and India than use our native stone.

As some of the rocks crumbled under the saw, it was a scramble against time to source replacement stones from all over the UK which represented the same geological period. The *Torus* and the towers were all being constructed in Northern Ireland and delays were compounded by hold ups at customs imposed by Brexit (three hauliers I approached refused to even transport the substitute stones between the mainland and Northern Ireland due to Brexit issues).



(LEFT)  
Angela Palmer with  
Glyn Lucas and  
*Torus of Time* at  
S McConnell, Kilkeel,  
Northern Ireland



(RIGHT)  
Angela Palmer on the  
Isle of Harris

**Has the challenge felt similar to the days when you tracked down a story as a journalist?**

I love the thrill of the chase. My journalist background trained me in seeking out and asking the help of professionals who excel in their fields. For this project, I was fortunate to be guided by the stone guru Michael Heap of CED who introduced me to leading geologists and helped me source the stones. I then spent many hours at quarries, knee deep in mud dwarfed by humungous JCBs, discussing my vision with obliging but often bemused quarrymen. Michael was also key in introducing me to the most talented stonemasons, S McConnell & Sons, based at Kilkeel in County Down, Northern Ireland, whose team, led by Glyn Lucas, masterminded the construction of *Torus*, the *Tower of Time*, the *Columns of Time* and *The Four Nations*.

**As well as being beautiful objects aesthetically, on a much deeper level the works in this exhibition can be seen as an exploration of the history of the nation. You have even included a work titled *The Four Nations*. Would you agree and was it a conscious decision?**

*The Four Nations* is an interlocking cube of four separate rocks consisting of black basalt for Northern Ireland, Portland stone for England, pink Morayshire granite for Scotland and Anglesey limestone for Wales.

It is a simple yet complex cube which is mightily difficult to take apart and well nigh impossible to reassemble. As a sculpture, it is not intended to signify what divides us but what makes each of our four nations different, what gives it its own character and personality. Our identity is imbued in our homes and institutions, built over generations from the rocks beneath us. In a way, *The Four Nations* is a portrait of the UK. Each country represented dominates the cube depending on your angle and standpoint.



**You have also addressed our current age of the Anthropocene. Tell us more.**

As modern humans, we have occupied less than 0.01% of the Earth's existence, and in that infinitesimally short period we have done untold damage to the planet. Mother Nature is our benign landlady, whom we take for granted at our peril. To represent the Anthropocene - the hand of man - I incorporated a highly polished stainless steel element in the towers. In the 2.6m *Tower of Time*, it is placed atop the column of ancient stones, reflecting the observer as they look up. In the four *Column of Time* sculptures, the stainless steel cube is the final block which, like the steel element in the *Tower of Time*, mirrors the onlooker, prompting, I hope, reflection on our place in the world. Besides its reflective role, the steel symbolises the Industrial Revolution, which many believe is the starting point of the Anthropocene. In addition, steel is derived from iron, a component found within rocks and of course an essential mineral in our bodies.

I received a message recently from an astro-biologist at NASA in the US, Sanjoy Som, who wrote: 'I'm glad your work includes iron. It's the one element that connects us all to our biological cousins, the Earth itself, and ultimately, to the stars where all the iron and indeed all the silica that forms the rocks you exhibit, came from.'

**You have purposefully left elements of each rock rough but highlighted others by polishing - tell us about why you've done this?**

In the *Tower of Time*, I wanted to preserve the raw, rugged outer layer as we would experience the rocks in the wild, and so three sides are rough. On one side, I have peeled back the outer layer of the rock and polished it, to expose the internal beauty of the stone.

Angela Palmer  
with *Tower of Time*







*Mighty Voices: From the  
Ends of the Earth (detail  
one of three)  
2023, Trio of Lewisian  
Gneiss, circa 3 billion  
years, Isle of Barra  
Unique  
120 x 80 x 50 cm /  
108 x 60 x 40 cm /  
120 x 70 x 50 cm*

The three boulders of 3 billion-year old Lewisian Gneiss (exhibited outside the gallery) have been gently carved and polished to follow their natural contours, and are otherwise left as they were found, wild and rugged. You will see, inscribed on their faces, the tumultuous journey they have made from their original location in South Pole, with dramatic, swirling bands of energy and movement. I wanted them to tell that story, and expose their raw beauty accreted over three billion years. To me, they stand as mighty voices. I was much influenced by the philosophy of the Japanese Gutai art movement which declared: 'Keeping the life of the material alive also means bringing the spirit alive...'

**When I visited one of the stone masons up in Aberdeenshire with you in February I was struck by the intractability of the stones you are using and how much of a process it has been to create these works. It seems a distinct contrast to the delicate hand engraved glass you have become known for. What do you think has driven this development?**

The material I use is entirely driven by the concept of what I am trying to achieve. I've used all manner of materials in my art works over the years, from water-filled pigs' intestines to liver-fed 'royal' dust mites and reclaimed shotgun cartridges. When Covid intervened, I was collecting thousands of fallen twigs from British native trees in collaboration with The National Trust to create a series of monumental wall-hanging tapestries. When we were physically trapped as a nation, I had to abandon that, and my focus turned to the virus particle itself which was threatening us all. I created it in glass and you can see it at The Science Museum in London.

When I was working with the teak in this exhibition, I was drawn to the delicate tree rings which emerged after polishing, and reached for my drill to engrave their fine lines on fragile glass sheets. As to the intractability of the stones, the Lewisian Gneiss and White Anorthosite are very hard to work: even the gentlest mark-making on its surface destroyed the titanium blades on my best chisels. But in a way that just underlines the point - their mass and durability are their essence, accreted over billions of years. I learned to respect that and I tried to work with the ancient material, rather than imposing my will upon it.



You've built an incredible network of contacts through all your projects from the extraordinary *Ghost Forest* in Trafalgar Square to your recent Coronavirus project. Tell us about how you first found out about the teak you've used in the exhibition.

For *The Ghost Forest*, I brought mighty African tree stumps from a logged virgin forest in Ghana to Trafalgar Square to highlight the depletion of our rainforests. The timber experts who helped me with *The Ghost Forest* were involved in raising a consignment of teak which had lain undisturbed on the bottom of the Irish Seas for the past century. When they salvaged the timber from the shipwreck they immediately contacted me, knowing I would be excited by how it had been naturally sculpted by sea life.

I was also riveted by its story: the timber was originally travelling in a cargo ship, *Pegu*, in 1917 from the then Burma (now Myanmar) having been purchased by the British Crown for warship building in Liverpool docks. En route, *Pegu* was torpedoed by a German U-boat off Galley Head in County Cork.

I was mesmerised by the swirling forms sculpted into the soft core of the teak by the marine boring insects in sharp contrast to the areas of dense hardwood into which the insects have scarcely penetrated. The hardwood, reckoned to be some 300 years old, has been immaculately preserved by the saltwater, and some of the teak still retains the stamp of the British Crown. The teak column also bears the steel from the shipwrecked *Pegu*, which has been grafted onto the wood.

**Where the stones have billions of years history the sinking of *Pegu* alludes to a split second and tragic moment in time. There are many contrasts and comparisons between the two materials you've focused on in this exhibition. Has that been intentional?**

Both the teak and the stone are natural forms which have been weathered and sculpted by different elements in nature, and I was drawn to that. They both

*From the Depths  
of Time (vi)*  
2023, Burmese Teak  
Unique  
101.5 x 46 x 43 cm







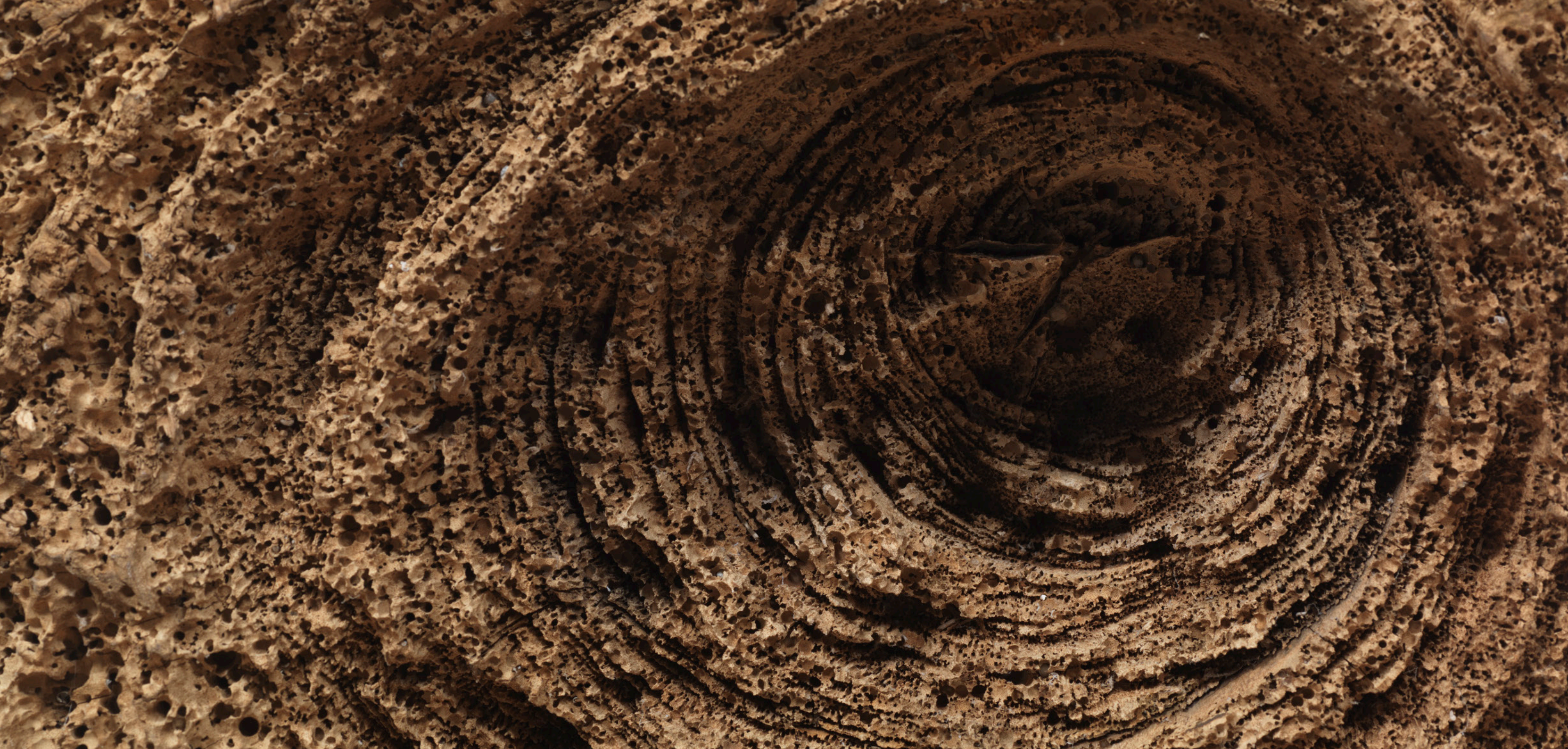
relate to time, but on an entirely different scale. And both have a rich history. As with the stone, I have left areas of the teak untouched and polished other parts to expose its deep, rich red hue. This has brought alive the tree rings of the teak, which almost dance on its immaculately preserved surface.

**If there was one message you wanted visitors to take away from the exhibition what would it be?**

I hope visitors will experience wonder in the presence of these ancient, mighty voices. They speak of the eternal, in sharp contrast to our own ephemeral existence. As we see, touch, and interact with these rocks which were here billions of years before us, and will be part of the Earth long after we have gone, perhaps they will encourage a deeper appreciation and respect for our host, the planet.

Angela Palmer and  
*Torus of Time*









*From the Depths  
of Time (iii)*  
2023, Burmese Teak  
Unique  
59 x 59 x 36 cm



*From the Depths  
of Time (I)*  
2023, Burmese Teak  
Unique  
51.5 x 55 x 18 cm





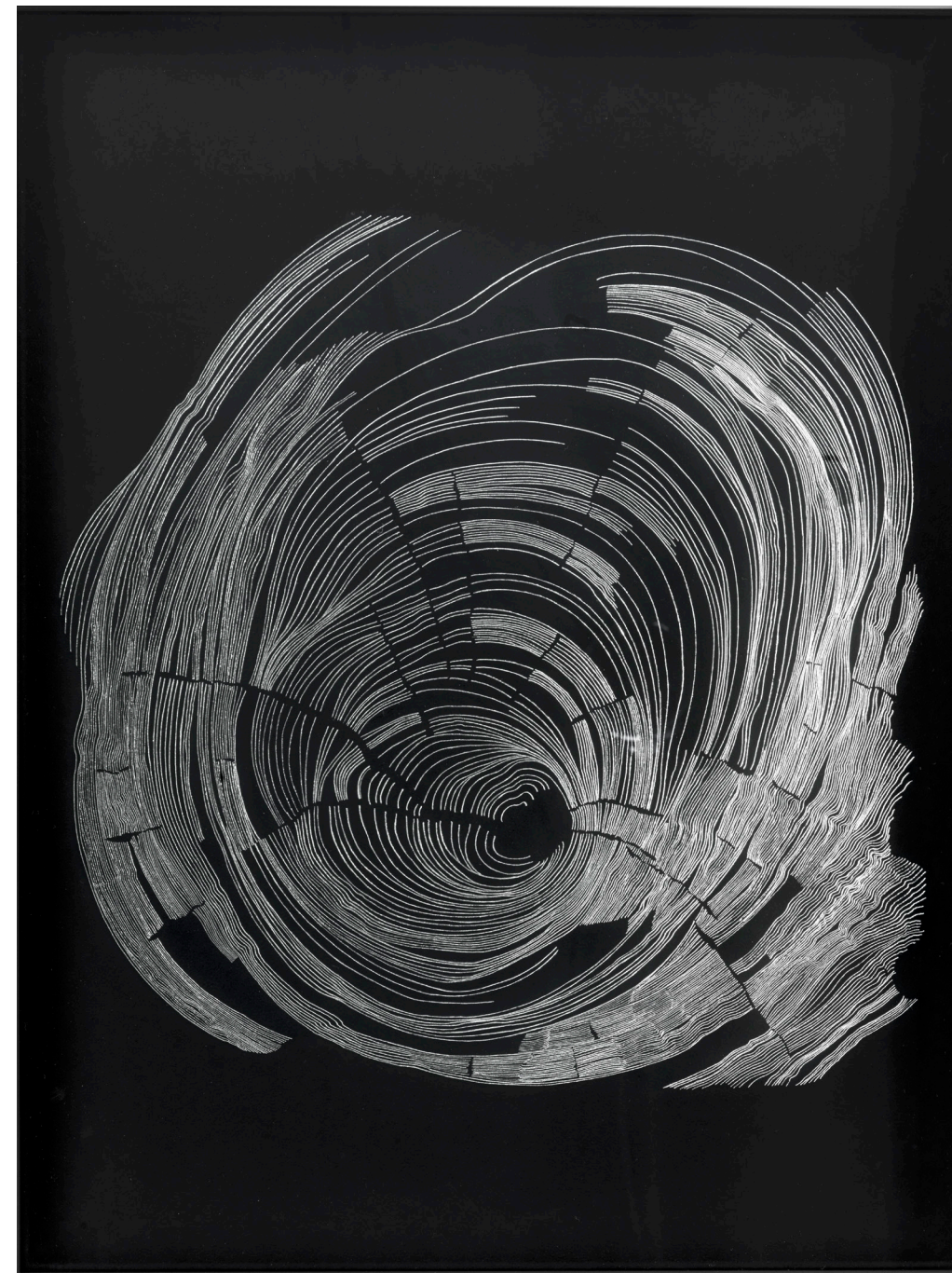


"...the tree rings almost dance on its immaculately preserved surface."

-Angela Palmer

(RIGHT)  
*Lines of Time (ii)*  
 2023, One sheet of  
 engraved glass, underlit  
 Unique  
 64 x 50 x 5.5 cm

(ABOVE)  
*Lines of Time (i-iii)*  
 2023, One sheet of  
 engraved glass, underlit  
 Unique  
 64 x 50 x 5.5 cm (each)





*From the Depths  
of Time (v),*  
2023, Burmese Teak  
Unique  
41 x 41 x 5 cm







*From the Depths  
of Time (iv)*  
2023, Burmese Teak  
Unique  
56.5 x 69.5 x 26.5 cm



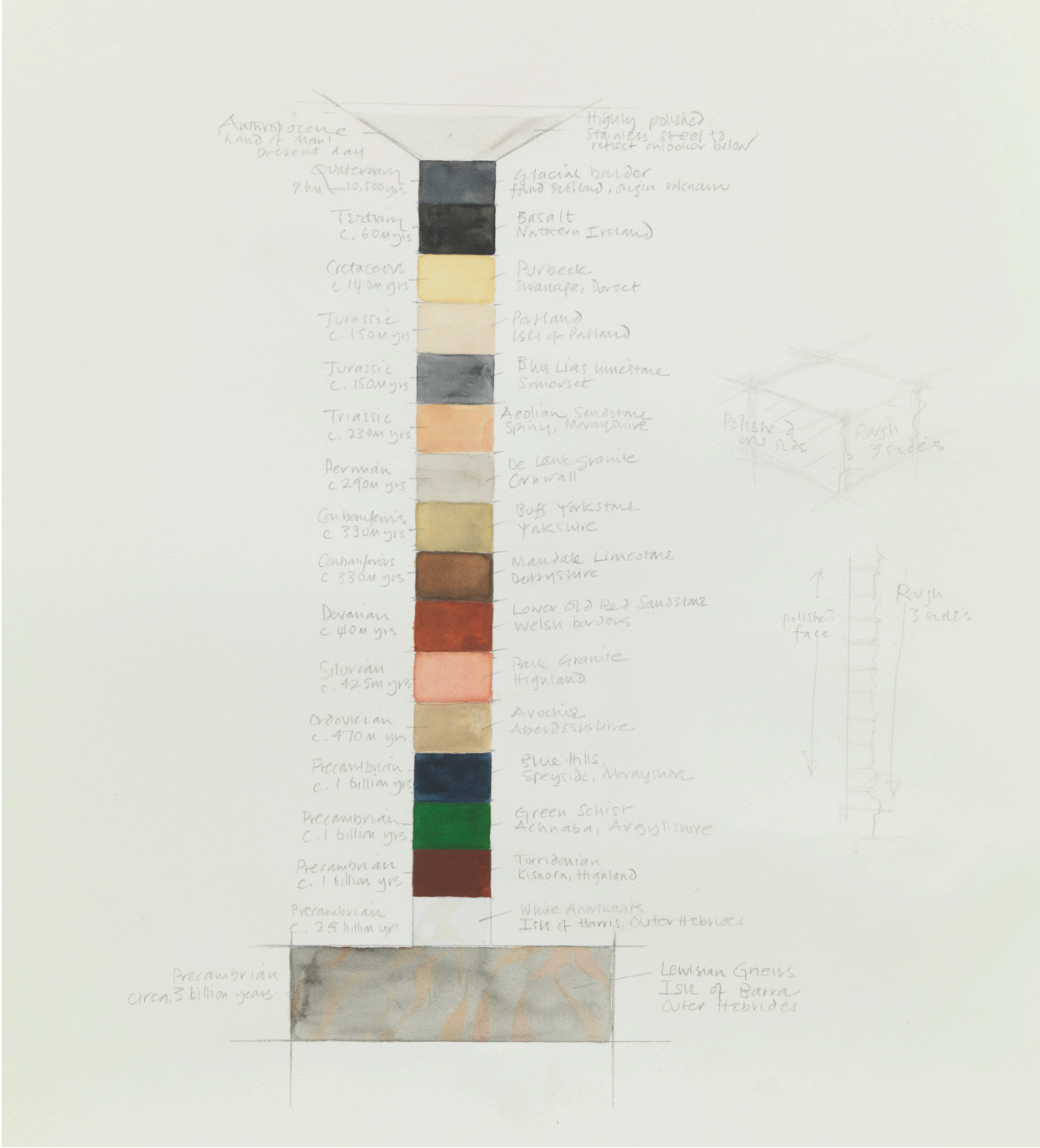




Sketch for *Torus of Time*  
2023, Watercolour  
on paper



Sketch for Tower of Time  
2023, Watercolour  
on paper





# TOWER OF TIME

The term Anthropocene, the Age of Man, is given to the new geological epoch to reflect man's dominance as a geological force on the planet, including changes in atmosphere through man-made gases such as ocean acidification, melting glaciers and rising sea levels, and the effects of deforestation and land use changes, resulting in soil erosion, habitat loss *et al*.

16. Glaciers covered the middle and north of Britain, forming the landscape we witness today. The first humans occupied Britain. Mammoths, bison, rhinos and oxen thrived on chilly lands. About 10,000 years ago, warming climates led to an extinction of most massive mammals, with only the likes of elephants, rhinos and hippos remaining today.

15. In the absence of dinosaurs and giant reptiles, rodent sized mammals emerged. Whales appeared, while on land birds diversified and flourished. By the close of the Tertiary, mammals were rapidly evolving, including primates, horses, bats, pigs, cats and dogs.

14. Dinosaurs such as the Iguanodon and the flesh eating Baryonyx ('heavy claw') roamed southern Britain. A huge extinction followed, variously attributed to volcanic eruptions and the impact of an asteroid. Low temperatures led to a crisis in photosynthesis, catastrophic for land plants and oceanic plankton. The Earth's largest animals including dinosaurs and giant reptiles became extinct.

12, 13. Pangaea split apart leading to a warmer climate and diversification; dinosaurs such as the Brachiosaurus and the Stegosaurus dominated. Reptiles were capable of laying eggs, resulting in the first fully terrestrial animal life cycle. The late Jurassic saw the first flying reptile, pterosaurs, and the earliest known birds. Cone bearing plants evolved with the ability to spread pollen.

11: The world witnessed the evolution of the dinosaur, as well as crocodiles, turtles and the first mammals to walk on earth. The climate over Britain was very hot and dry, and desert sand-dunes formed in Sahara-type conditions. A major river, similar to the Nile, flowed over southern Britain.

10: During the Permian, Britain lay on the supercontinent of Pangaea and experienced hot, dry conditions. The period ended in the largest mass extinction on Earth, wiping out 90% of all marine species and 70% of land animals.

8,9: Britain lay near the equator.

The Carboniferous period is named after the vast underground coal deposits formed from prehistoric vegetation originally grown in lush and tropical areas. Deadly poisonous centipedes up to 2m long crawled alongside 1m cockroaches and scorpions. Dragonflies were the size of seagulls while species similar to today's crocodiles grew to 6m in length.

7: The now united Britain lay south of the equator and had a semi-arid climate. Old Red Sandstone (right) was deposited by rivers on the coastal plain. Known as the Age of Fishes, the Devonian spawned the armoured placoderms, which developed into ferocious, fish-slicing monsters up to 10m long. The first forests emerged. The period ended with mass extinction of marine life, with up to 70% wiped out.

6: The nations lay south of the equator covered by sea, with a tropical to subtropical climate. Animals and plants emerged on land for the first time. Fish were diversifying, spiny sharks evolved more menacing mouths with jaws. The Iapetus Ocean closed, Continents collided, and England and Scotland were 'stitched' together close to today's Anglo-Scottish border.

5: Seas covered all four nations which lay south of the equator; dramatic volcanic activity occurred as the Iapetus Ocean separating England and Wales from Scotland and Northern Ireland started to close. The first primitive plants appear: 443m years ago, freezing conditions develop, leading to the world's second largest mass extinction, wiping out half of the marine animal species.

Between 541m - 485m years ago, England and Wales lay near the South Pole separated from Scotland and Northern Ireland, which was joined to North America. A shallow sea covered much of the area; trilobites, graptolites and molluscs first appeared.

600 million years ago, the first multi-celled animals appear, growing on the seabed with no obvious heads, mouths or digestive organs.

Circa 800m years ago oxygen levels reached around 21%, the same as today.

2,3,4: The Neoproterozoic period, extending from 1 billion years to 541 million years ago, is regarded as the most revolutionary period of evolution in the Planet's history with an explosive diversity of large multicellular organisms, heralding a modern biosphere on Earth. It also saw dramatic geological phenomena including volcanic sequences, sedimentary rocks were formed in environments from deep water to terrestrial, plutonic igneous rocks and metamorphic rocks.

1: White Anorthosite was formed near the South Pole, Cyanobacteria evolved Earth's first photo-synthesisers, making food using water and the Sun's energy, and releasing oxygen.

Lewisian Gneiss was formed near the South Pole. No continents, only small islands and a shallow ocean. Very little oxygen and a vast amount of carbon dioxide. Only life on Earth was single-celled.

With thanks to The British Geological Survey and The National Geographic

Highly polished stainless steel element to represent the Anthropocene, the current geological age (the steel surface reflects the onlooker below).

16. Glacial Boulder, found near Inverness, Scotland Quaternary, deposited between 2.5m years and 10,500 years ago

15. Basalt, County Londonderry, Northern Ireland Tertiary, circa 60m years old

14. Purbeck, Dorset, England Cretaceous, circa 140m years old

13. Portland, Isle of Portland, England Jurassic, circa 150m years old

12. Blue Lias, Somerset, England Jurassic, circa 150m years old

11. Aeolian Sandstone, Morayshire, Scotland Triassic, circa 230m years old

10. Silver Grey Granite, Cornwall, England Permian, circa 290m years old

9. Buff Yorkstone, West Yorkshire, England Carboniferous, circa 320m years old

8. Mandale Limestone, Derbyshire, England Carboniferous, circa 330m years old

7. Lower Old Red Sandstone, Monmouthshire, Wales, Devonian, 410m years old

6. Park Granite, Highland, Scotland Silurian, 425m years old

5. Avochie granite, Aberdeenshire, Scotland Ordovician, circa 470m years old

4. Gneiss, Morayshire, Scotland Precambrian circa 1 billion years old

3. Green Schist, Argyll and Bute, Scotland Precambrian, circa 1 billion years old

2. Torridonian sandstone, Highland, Scotland Precambrian, circa 1 billion years old

1. White Anorthosite, Isle of Harris, Scotland Precambrian, circa 2.5 billion years old ('moon rock')

Lewisian Gneiss, Isle of Barra, Scotland Precambrian, circa 3 billion-years-old



ANGELA PALMER

b. Aberdeen, 1957

Angela Palmer is a Scottish artist who began life as a journalist, working as News Editor at *The Observer* (1986-1988) and Magazine Editor for *The Observer* (1988-1992) before moving to Elle Magazine as Editor-in-Chief (1992-1993). In 2002, Palmer changed careers and studied Fine Art at the Ruskin School of Drawing and Fine Art, University of Oxford where she received the Fitzgerald Prize for her work, before continuing her studies with a master’s degree at the Royal College of Art.

Palmer’s work is in the permanent collections of museums worldwide, including The Science Museum in London;The National Galleries of Scotland; the Smithsonian Air and Space in Washington, US; andThe Ashmolean Museum in Oxford. Palmer’s sculptures were exhibited at the Guggenheim’s 25th anniversary exhibition in Bilbao last year. Her environmental installation, *The Ghost Forest*, which was exhibited in Trafalgar Square, Copenhagen and Oxford, is now in the National Botanic Garden of Wales. Her sculpture of the Coronavirus particle, 2020: *The Sphere that Changed the World*, was acquired by The Science Museum in London and is currently in its major exhibition, *Injecting Hope*.

SOLO EXHIBITIONS

2020	<i>The Sphere that Changed the World</i> , Oxford University Museum of Natural History
2019	<i>Susie Wolff: Portrait of a Racing Driver</i> , Scottish National Portrait Gallery, Edinburgh
2015	<i>Anthropocene</i> , The Fine Art Society, London
2014	<i>Adrenalin</i> , The Fine Art Society, London
	<i>Brain of the Artist</i> , National Portrait Gallery of Scotland
2013	<i>Searching for Goldilocks</i> , Smithsonian Air & Space Museum, Washington
2012	<i>Life Lines</i> , Waterhouse & Dodd, London
2011	<i>Unwrapped:The Story of a Child Mummy</i> , Ashmolean Museum, Oxford
2010-12	<i>The Ghost Forest</i> , installation at the Museum of Natural History, Oxford
2009	<i>Breathing In</i> , Wellcome Collection, London
	<i>The Ghost Forest</i> , installation on Trafalgar Square, London
	<i>The Ghost Forest</i> , installation on Thorvaldsens Plads, Copenhagen
2008	<i>Unravelled</i> , Waterhouse & Dodd, London
2005	<i>Solo show</i> , Bourne Fine Art, Edinburgh

GROUP EXHIBITIONS AND COLLABORATIONS (SELECTED)

2022-24	<i>Injecting Hope:The Race for a COVID-19 Vaccine</i> , Science Museum, London
2022	<i>Motion, Autos, Art, Architecture</i> , Guggenheim Museum, Bilbao
2018	<i>Ceaseless Motion:William Harvey’s experiments in Circulation</i> ,The Royal College of Physicians, London
2017	<i>Race Against Time</i> , a collaboration with Race Against Dementia, London
2016	<i>From Rembrandt to the Selfie</i> , tri-national exhibition of self-portraits, Staatliche Kunsthalle, Karlsruhe, Germany; Musée des Beaux-Arts, Lyon, France; The National Portrait Gallery, Scotland
2015-16	<i>A Modern Adventure</i> , the Renault Art Collection Exhibition,Today Art Museum, Beijing and the Hubei Art Museum, Wuhan
2014	<i>What Marcel Duchamp Taught Me</i> ,The Fine Art Society, London
2013	<i>Natural Selection</i> ,The Fine Art Society, London
2007	<i>Inside Out: Body Imaging Sculptures</i> , Hunterian Museum,The Royal Colleague of Surgeons, London
2006	<i>Divided Selves,The Scottish Self-portrait from the 17th Century to the present</i> , The Fleming Collection, London
	<i>Self Portrait</i> ,Talbot Rice Gallery, University of Edinburgh
2005	<i>Summer Exhibition</i> , Royal Academy of Art, London
	Winchester Festival of Science and Art
	Group Show, Modern Art Oxford
	Director’s Chair Exhibition, Open Eye Gallery, Edinburgh

PERMANENT COLLECTIONS

The Science Museum, London  
The Smithsonian Air & Space Museum, Washington  
Ashmolean Museum, Oxford  
The National Portrait Gallery, Edinburgh  
Wellcome Trust, London  
The Royal College of Physicians, London  
Royal Papworth Hospital, Cambridge  
The Renault Art Collection, Paris  
Royal Bank of Scotland  
Exeter College, University of Oxford  
Institute of Medical Sciences, University of Aberdeen  
Kenneth Clark Art Collection, University of Oxford  
National Botanic Gardens of Wales  
Royal Veterinary College



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By far the biggest star behind the exhibition is the man who built and engineered the *Torus*, *The Four Nations*, the *Tower of Time*, and the four *Columns of Time*: Glyn Lucas of S McConnell & Sons in Kilkeel, County Down, Northern Ireland. I provided the vision and Glyn, together with a team of nine sets of highly specialised hands, made it happen. Even when countless rocks I supplied fractured under the saw (because so many UK quarries use dynamite for aggregate), Glyn was the model of patience as he waited months until I found alternatives, some of which again failed under the blade, requiring yet further substitutes. The only occasion Glyn was faintly fazed was when I sent him a series of diagrams of a sliced banana in relation to an element I envisioned within the *Torus*! My thanks to the brilliant Alan McConnell and the team who worked alongside Glyn: Iain Nicholson, Paul Clarke, Paul Grant, Seamus McGorrian, Andrew McConnell, Michael Grant, Pawel Grabowski and Mihails Kudrjavcevs.

The visionary Clive Brooks of Waywood cabinetmakers in Oxfordshire is still game, after 20 years of collaborations, to accept the challenges I've set, not least the Burmese teak which had been raised from the Irish Sea after 100 years; its soft core had been naturally 'sculpted' by marine life while some pieces still bore steel from the shipwreck grafted to its sides. Clive worked with his colleague Max Shaw on the remarkably well preserved areas of the teak, to expose the deep red hue while bringing to life its tree rings which now dance on its polished surface.

There are countless people I would like to acknowledge for their involvement in *Deep Time* and forgive me if you are not listed below:

My thanks to the leading stone expert, Michael Heap from CED; geologist extraordinaire Professor Mike Daly, The Department of Earth Sciences, Oxford University; Professor David Farrier for his eloquent introduction; the team at Fyfe Glenrock at Oldmeldrum, Aberdeenshire who went above and beyond to help me, in particular Mark Swinhoe, Gordon Duncan, Colin and Raymond; Donnie Macdonald for his invaluable help; Ana Ruiz and Regis Chaperon at the Stone Carving Company in Lincolnshire for their prodigious talents; Gavin Tennant at Tennants of Elgin for guidance and precision sawing; the gifted Josh Locksmith at London Stone Carving company; Hannah Sofaer and Paul Crabtree who guided me so patiently in stone carving at the Portland Sculpture and Quarry Trust; for superb photography, on location in Kilkeel, Ewa McBride and Steve Russell Studios; Patricia Martin at Scarista House, Isle of Harris who aided my quarry sleuthing; Pierre Bidaud at the Stone Masonry Company; Stuart Singer for his unfailing bonhomie at The Redgarth Hotel, Oldmeldrum (and for his sporran keyring); Marcia Bennett Male who instructed me in angle-grinding and stone carving; Simon Fraser for showing me the extraordinary and remote cave of Lewisian gneiss on Harris; Nigel Mahon and his team at J K Francis for safely transporting the sculptures from Aberdeenshire, Lincolnshire and Northern Ireland (and negotiating the interminable Brexit paperwork); Clive at Mid Wales Stone and Justin at Aber Quarry; Rob at Hadspen Quarry; Steve Parry at the British Geological Survey; Laura King at CED; Martha Kearney for constant help and advice; Nigel Hugh-Smith for wisdom and inspiration; Glenda Parker for rescuing the Glenmorangie (another story); to my children, Jack, Will and Rosie; and to the biggest rock of all in my life, Jeremy, my husband.



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