A Geology of the British Library

Eric Robinson

Explore the world's knowledge

Eric Robinson has been described as the UK's premier urban geology enthusiast. He taught at University College London for 48 years and retired in 2001. He gets his greatest pleasure in teaching geology through buildings and architectural stones.

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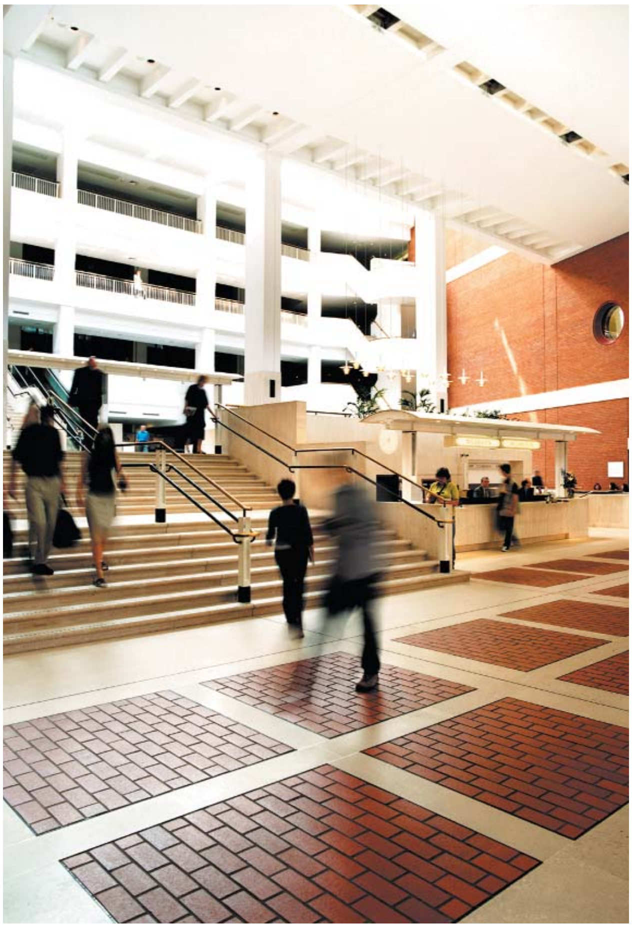
Map source: University of Texas Libraries.

Front cover: Fossilised sea sponge in Hauteville Limestone in front of Conference Centre.

To geologists, the British Library will always be a welcome addition to the geology of the Euston Road. Faced with a site alongside the extravagance of the hotel and station of St Pancras, the architect Professor Sir Colin Wilson chose the strongest possible contrast in form – who could have matched the Victorian Gothic style one hundred years later? At the same time he complemented the prevailing colour contrasts and the textural variety in the materials of the old building.

St Pancras was a red and white building when new, mellowing to a red and buff with a century of weathering. In the hotel, red was there in abundance, thanks to Mr Gripper's patent brick from Nottingham and the New Red Sandstone from Mansfield. A touch of red came with granites from Peterhead and Shap Fell. The paler contrasts were provided by Magnesian Limestone from Mansfield and Lincolnshire Limestone from Ketton, both in horizontal bands.

So, in the Library, red brick as fiery as Mr Gripper's brick was provided from Hampshire, red sandstone from Dumfries, and granite from Royken on the Oslo Fjord were selected. A contrasting white limestone from the French Jura fills the paved area of the outside courtyard, dense and hard to cope with the weather and the foot tread. Once inside, the spacious interior of the reception area and stairways are lightened by the use of Italian travertine and pale limestones from Portland and the Isle of Purbeck. So, although the architecture is a conscious contrast to the neighbouring building, the colour matching is subtle yet effective.



This guide leads you, as a visitor or a Library Reader, to an awareness of the different stones and their place of origin. All of this can be achieved quite simply as you walk from the main entrance on the Euston Road, past Eduardo Paolozzi's Isaac Newton, and make your way to the Library entrance or the Conference Centre. Looking at buildings is now an accepted pathway to urban geology, and one has to say that the path is easier for the new Library than for our reading of nearby St Pancras station.

It is an unwritten tradition in substantial buildings that at ground level we find that hardest of all rocks, granite. So it is with the British Library as we approach it from the busy Euston Road. The lowest half metre is the russet red granite from Norway, with a surface broken across the interlocking minerals so that they sparkle in the sunlight. In the broad steps to the main entrance dominated by Lida Lopes Cardozo's iron gate, the surface of the same granite is roughened underfoot by the tougher crystals of feldspar, a perfect non slip surface on a wet day. A close inspection of the Library's foundation stone of 1982 reveals the interlocking minerals which make this a typical granite. The well-formed rectangles are feldspar, the most abundant mineral, which bestows the overall colour to the Royken granite. Filling the spaces between the feldspars, the dark mineral is quartz. Small black flecks are a form of mica. These three minerals are the main components of the granite. We see it everywhere at the base of the walls around the courtyard and in the walls of the Conference Centre, blending with the rich red tone of the brickwork.

If you stand in the Piazza, looking back towards the main gate, you can take in the next contribution to the redness, the New Red Sandstone from Dumfriesshire. Sadly, it is too high above the ground to be studied at close quarters, but from a distance, you can appreciate that these are slabs of stone cut from a larger square block taken from the quarry. One of those blocks had a darker margin which you can identify running through several of the panels. This may also be seen when viewing the entrance gate from the Euston Road side.

ROYKEN GRANITE

This is one of several granite bodies which were intruded into the crust beneath southern Norway around 250 million years ago in the Permian period. These granites were probably the reservoirs of molten rock that erupted at the surface as a thick pile of lavas which are another feature of the Oslo Fjord region. It seems that at that time, the crust was locally deeply fractured in much the same way as in Iceland today.

The colour is a deeper red than we see in British granites; Peterhead is a pale pink granite which we see in the polished pillars to St Pancras Station. The Swedish granite seen in the *The Rocket* pub at the foot of Chalton Street is a deep blood red tone. Identifying granites often rests on such recognitions of unique colour characteristics of the rock.

RED SANDSTONE

The red sandstone used here comes from a geological time period which is often referred to as the New Red Sandstone (Permian period) to distinguish it from the Old Red Sandstone (Devonian period)! The two time units are separated by the Carboniferous period, the time of the Coal Measures and the limestones of the Pennines. This sandstone was deposited in desert conditions, when sand grains were blown into large moving dunes, piled up and physically moved by prevailing winds very similar to the patterns we see in the deserts of the Tropic belts of today. Magnification would reveal these wind-blown grains of sand to have a smooth outline like a grain of rice; if they had been river sands, the grain shapes would have been more irregular. The red varnish of iron oxide is another confirmation of a dry desert-like climate, the grain coatings creating the overall red colour of the stone.

The striking pattern of white strips bounding the squares of red paviour bricks in the Piazza give us our first sight of the white limestone, Hauteville, from the high ground of the French Jura. Full of fossils, the stone is best studied in the copings of the wall in the south east corner closest to St Pancras. When the stone was brand new, it was deathly white and structureless. As it has weathered and become slightly grimy, it is now clear that the limestone is made up of clumps and cauliflower shaped lumps of stone separated by a different lime mud. These are the features of stone formed in a shallow, warm, lagoon setting such as we might find in the Caribbean or Indonesia today. Those conditions are reflected in the kinds of fossil shells which we can find on the weathered surfaces. Most shells are darker than the limestone so that their outlines are clear. Some are bivalves such as oysters, with two distinct curving valves. Others are coiled snails, their shells twisting about a long axis. These shells are intact, showing that sediments were laid down in calm waters. The best area for study must be the flat top slabs to the low wall, but several of the pavings will catch your attention as you walk across the courtyard, especially on wet days when details stand out more clearly.

The red bricks are as much geology as the natural stones which take more of our attention, being a use of some of the best quality clays which occur in southern England, high in pure alumina and without gypsum. Firing in a kiln at high temperature with controlled oxygen concentrations creates the conditions to produce the red colour. With the bricks of the Library courtyard, gas escape created the small cavities at the surface which help make this a paviour brick with a non slip character underfoot. The handmade bricks have a curved ‘grain’ and have all been laid ‘smiley side’ up!

HAUTEVILLE LIMESTONE

This French limestone is from the same time as our white chalk, but could hardly be more different in character. Instead of being dusty and soft, crumbling between the fingers, it is hard and crystalline, very dense and heavy. It is the kind of limestone which printers might use for lithography. It is suitable for paving, and covers a large proportion of the courtyard as broad bands separating squares of red paviour bricks. It also forms the broad steps which take us up to the Library entrance.

The limestone is quarried in the high hills of the French Jura, in the angle between the rivers Rhone and Saone. The height rises to almost 1200m, and appropriately is called Hauteville. For several months of the year, the the quarry is snowbound, a fact which created problems of supply during the building of the Library.

Detail showing fossilised sea sponge located outside the Conference Centre. (Penny included for scale).

Once inside the spacious entrance to the Library, we leave behind the geology of red granite and white limestone for a new combination of natural stones, most of which add to the light and airy character of the tall open space. If we first look down at our feet, we come face to face with Portland stone, the finest quality stone in Britain for either building or sculpture. It has this reputation because, unlike Hauteville which we have studied outside in the courtyard, Portland stone is made up of small rounded grains of lime which pack together like tiny ball bearings to make an even textured compact stone lacking any strong layered character. To a quarryman or a sculptor it is a *freestone*, meaning that it will break freely in any desired direction. For the most part, if you look at the cream coloured paving slabs, you will be looking at an even grained stone, but every now and then you will come upon a brown shape which will be a fragment of a fossil shell, usually a piece of oyster shell. Other fossils are white patches about the size of a penny coin; these are calcareous algal pellets.

PORTLAND STONE

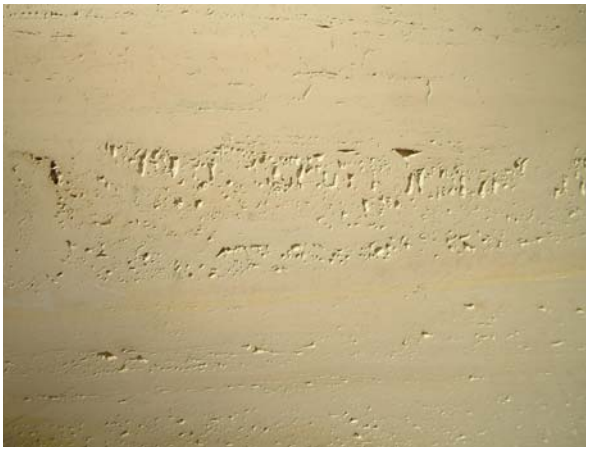
The white paving of the entrance hall is of Portland stone, the finest of our British building stones. Since the 17th Century, vast tonnages of the stone have been taken from the quarries of the Isle of Portland south of Weymouth. Many quarries are on the cliff tops and offload the 5 to 10 tonne blocks of limestone directly onto coastal barges which ferry the stone to Swanage for trans-shipment into larger vessels for the journey to the Thames or other seaports.

Such algae usually form in the warm waters of tropical shallow seas, so, once again we use this as evidence of the conditions in which Portland stone was formed, during the Jurassic period, about 145 to 150 million years before present.

If we move across the foyer towards the shop or the information desk, we come upon another cream coloured stone in the walls and pavings. In contrast to the Portland, this stone is rough textured simply because it is full of cavities, some of them tubes which occur in bands through the stone. This is Italian Travertine, a calcareous spring deposit which is quarried extensively from the Tivoli Hills just outside Rome. It is the stone of which all the classical buildings of Rome and St Peter's were made. The spring deposits are a result of the volcanic activity for which the region is well known.

TRAVERTINE

From the Tivoli Hills outside Rome, this is a typical limestone formed by the evaporation of spring waters rich in lime. The lime is laid down as brittle crusts, accumulating layer by layer in terraces and rimmed pools of warm spring areas such as those found in Yellowstone Park in the US. Although remarkably pure, some include clays which can impart a faint colour banding to the stone. Much more evident, however, are the irregular tubes which cut across any banding. These are the hollow stems of rushes and other plants which flourished in the spring pools and which became encrusted with lime. Their stems remained hollow, creating the rough texture to the stone which in turn, makes it an excellent non-slip paving. When the tubes and cavities are filled with a lime paste, a more solid travertine is created which can be polished and used as a wall facing referred to as 'stopped travertine'.



Moving to the Upper Ground floor, the paving underfoot changes once again. There are squares of creamy white Portland stone, full of fossil remains, but alongside, there are slabs which are of a darker tone and much more richly patterned with dark outlines. These outlines are the shells of bivalves preserved with little change to their character. These shells are of freshwater molluscs, like the pea mussel

Upper Ground Floor area as seen from above.

Purbeck – Blue-grey muddy limestone patterned with dark fossilised shells (penny included for scale).

of ponds and streams, and make up the fossil fauna of Purbeck stone, a muddy, dark limestone in contrast to the nearby Portland stone. Purbeck stone is found in the Isle of Purbeck behind Swanage in Dorset. Like Portland stone, it has been shipped by coastal vessels from Swanage to London in vast quantities ever since these stones were identified and chosen by Sir Christopher Wren for the rebuilding of the City after the Great Fire of 1666.

In the case of Purbeck stone, the dark muddy colour and the content of shells allowed it to be cut and polished as a British attempt to match the true marbles of Italy and the Mediterranean in decorative work and interior inlays. The most famous of the Purbeck Marbles is crowded with the globular shells of freshwater pond snails, but the stone in the Library is patterned with bivalves and carries the quarryman's descriptive names of Thornback, Grubb, or Spangle according to the shapes of the shell fragments.

At this point, you have arrived at the point which you intended to reach – to consult a book or a map, or to meet a friend to take coffee or a meal in the café. It has been one of the purposes of this guide to persuade you that geology, a descriptive science if ever there was one, is not closed to anyone with a healthy curiosity. What is more, it is all around you when you walk the streets, but seldom will you find it quite so diverse or interesting as here at the British Library.

If this guide has piqued your interest, you may of course browse geology books and journals in the Science Reading Rooms.

Planets by Antony Gormley

Planets.

Antony Gormley.

This guide to the urban geology of The British Library would not be complete without including Antony Gormley's *Planets*. This installation consists of eight rounded boulders of similar size which are all glacial erratics from Malmo in Southern Sweden. These boulders were scratched and scraped into their present shape as the ice ground its way south to Malmo, serving as evidence of the Ice Ages of the last two million years of geological time. Transformed into a work of art by Gormley, we leave the interpretation to the viewer, and here focus on the geology.

Erratics have shape and mass which is the source of myths and legends wherever they occur. In the countryside they turn up without warning or obvious relationship to their surroundings, having been transported long distances by glaciers. Folklore throughout Europe provides explanations by way of witchcraft and the wilfulness of giants. In Germany they are linked with all kinds of powers, and are often used in national monuments and memorials.

Five of the stones are granite (numbers 1, 2, 3, 5 and 7); these are paler and generally pink or reddish in tone with a texture speckled with visible crystals. The second boulder in the series is rather special – a closer inspection reveals a knotted texture in which a large crystal is overlapped by flatter, platy ones which wrap around to make a distinct 'eye' pattern. This is a granite which was later reheated and squeezed (metamorphosed) as the Scandinavian mountains were formed. It is referred to as a gneiss, and because of the eye pattern, it is known as augen gneiss (augen from the German for eyes). The other granites are more orthodox.

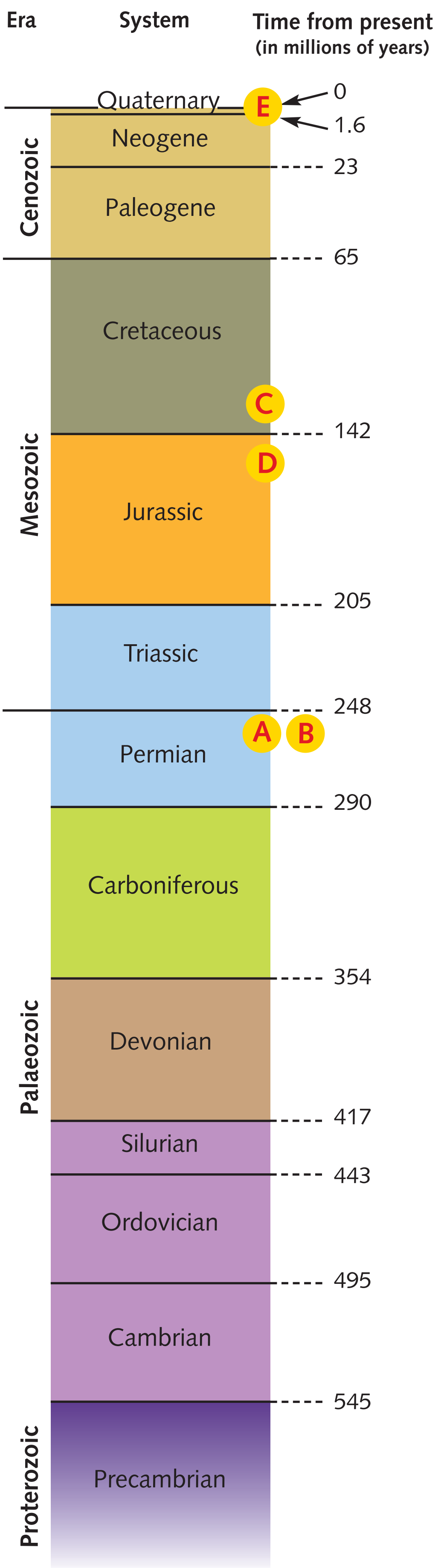
The darker coloured stones (numbers 4, 6 and 8) are a category of rock which was introduced into the crust from deep volcanic sources, melting its way into strata as distinct sheets called sills. The molten rock was chilled in the process and so the minerals failed to grow to a size easily visible to the naked eye before the rock solidified. They are poor in the white mineral quartz, hence the darker overall colour compared with the granites which are rich in this mineral. These rocks are called

dolerite and, if the crystals are particularly small, basalt. Their rusty-brown surface crust, acquired as they were weathered and transported, allowed the sculptor to create his figures in outline by chiselling through the crust to reveal the black body colour.

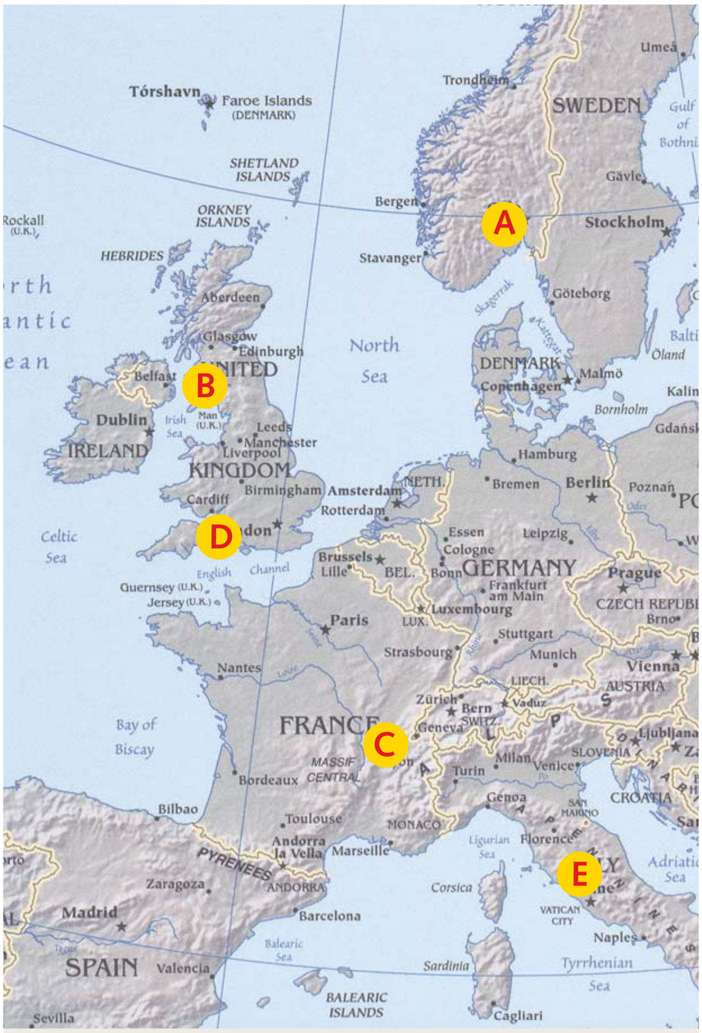
The Planets are igneous rocks – those which originated from a fiery molten state (igne is fire in Latin) – and provide an illustration of a geological feature with a story. The formation of granite was an unknown process in the 18th century, and there were two contrasting theories. In Germany it was thought that granite formation was a cool process; the crystallisation of minerals from a super-saturated sea. Geologists in Britain and France thought that granite was linked to hot molten lavas cooling slowly deep within the crust, resulting in the large, visible mineral crystals. The matter was settled by a Scot, James Hutton, in 1794 when he observed veins of granite penetrating slaty schists in the Perthshire Highlands. He noticed that in places, lumps of the schists were swallowed up in the granite, losing their angular shapes and acquiring new minerals within their form. Taken along with other similar examples at the margins of granites, a hot molten origin was the only conclusion to be drawn. This phenomenon was familiar to quarrymen, who did not welcome these included foreign fragments of rock, which blemished the granite they wished to sell; they referred to the unwelcome inclusions as 'heathens'. A 'heathen' is visible in the first granite erratic, dark against the paler colour of the granite. It is rounded in outline, having been partially melted by the surrounding granite.

Hopefully this understanding of the geology of the erratics will enhance your enjoyment of Gormley's art that sits so well in the quiet area of the Library's Piazza.

Geological Time Scale



Key to Locations



		Period
A	Royken Granite	Permian
B	New Red Sandstone	Permian
C	Hauteville Limestone	Cretaceous
D	Purbeck Stone	late Jurassic / early Cretaceous
	Portland Stone	Jurassic Period
E	Italian Travertine	Quaternary

Plan of the Building

Planning your visit

Hours

The main building
09.30 – 18.00 Mon, Wed, Thur and Fri
09.30 – 20.00 Tue
09.30 – 17.00 Sat
11.00 – 17.00 Sun and Public Holidays

How to get here

The British Library
96 Euston Road
London NW1 2DB

www.bl.uk/whatson

King's Cross/St Pancras and Euston
Bus routes 10, 30, 59, 73, 91, 205, 390 and 476 pass the building, along Euston Road.

There is a covered area for bicycles on the Piazza. Parking is severely limited in the area.

Access

All parts of the building are accessible by wheelchair. A limited number of wheelchairs are available for loan from the Information Desk. Induction loops are installed in many areas, including the Auditorium in the Conference Centre. Assistance dogs are very welcome.

Visitor Services

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