A Geological Walk in the City of London Cemetery

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Introduction

The Cemetery

The City of London is the largest cemetery in London; it is attractive, well maintained and contains a balance of old and new memorials and buildings. There is good literature available, free from the front office; and it even boasts and excellent cafe. This cemetery offers a range of rock types, buildings, memorials and flora which is arguably the best in London, including the so-called “magnificent seven” cemeteries.

The cemetery was opened in 1856 after overcrowding in the City made it no longer a fit place for burials. The buildings, including an Anglican Church, a Chapel for dissenters, the Catacombs and Columbarium, and a little later the Crematorium, were architectural splendours. The grounds were designed to be both a beautiful and tranquil site for burials and a place for quiet enjoyment and recreation.

The site is notable for the number of memorials marking the re-internment of bodies from City of London churches, 35 in all, most of which are no longer in existence.

The City of London Cemetery and Crematorium publishes the following:

A Heritage Brochure, which gives a description and history of the cemetery, including well-known people buried there and some of the more notable buildings and memorials.

A booklet “The Cemetery in a Garden; 150 Years of the City of London Cemetery and Crematorium” by David Lambert.

A Tree Trail, locating and describing 43 notable and/or exotic trees within the cemetery.

See also official website at:-

http://www.cityoflondon.gov.uk/Corporation/LGNL_Services/Community_and_living/Deaths_funerals_and_cremations/cemetery_crematorium.htm
The Monuments

The more elaborate of the older memorials tend to be made of either grey or red/pink granite or white marble. Marble is softer and more suited to intricate carving of figures, much of which has been done to such high standards in Italy. Granite is much harder but gives a superb polished surface. Shaping and polishing of this was brought to a high degree of proficiency in Aberdeen during the 19th century.

The older monuments are of traditional materials which are common in many cemeteries and elsewhere. Granites such as that from Peterhead in Scotland and Cornwall, black gabbros from South Africa, slates from Wales and marbles from Italy may be familiar to many. Examination of some of the more recent memorials reveals an intriguing and attractive array of stones from further afield, such as gneisses, migmatites and more exotic granites.

Adorning the monuments which include chests covering vaults, crosses, figures, angels and columns are a variety of devices which traditionally have some meaning, mainly coming from their popularity in Victorian times. Such meanings include:

- hands clasped = close bond or farewell
- urn = ancient Greek for mourning, vessel of the soul
- anchors = attachment with the sea
- broken columns = life interrupted/early death
- descending doves = spirit coming down from heaven
- dove with olive sprig = hope or promise
- Celtic cross = the circle symbolises eternity
- torch = life (upright) or death (inverted)
- flowers = many things from passion to resurrection to marriage
- book = faith, learning, the Bible

For further information see [http://www.vintageviews.org/vv-tl/pages/Cem_Symbolism.htm](http://www.vintageviews.org/vv-tl/pages/Cem_Symbolism.htm)
The Geology

Geologists divide rocks into the three broad categories of igneous, metamorphic and sedimentary:

(a) Igneous rocks are formed by cooling and solidification of hot, molten magma; examples such rocks are found in the cemetery as granites, gabbros and volcanics. Granites and gabbros are coarse-grained rocks formed when large bodies of magma do not reach the surface but cool underground very slowly allowing time for large crystals to form. Granites are lighter coloured rocks rich in silica and poor in iron and magnesium, whereas gabbros are darker rocks rich in iron and magnesium and relatively poorer in silica. Granitic magmas cool from about 800-1000°, gabbroic from about 1000-1200° (iron and magnesium rich minerals are the first to solidify and separate from gabbroic magmas). The Earth’s mantle which lies underneath the crust and stretches down to the core, is iron- and magnesium-rich. Therefore granites generally are more evolved with complex histories; this can be seen in the wide variety of granite types. Volcanic rocks are those which have been erupted onto the surface, giving rapidly-cooled, fine-grained rocks. A common volcanic rock for monuments is a pyroclastic, volcanic ash from Borrowdale in Cumbria, which has been explosively ejected, settled in layers under water and slightly altered (metamorphosed).

(b) Sedimentary rocks are formed, as the name suggests, from sediments; these are usually either (i) clastic sediments - mostly fragments of broken and eroded silicate rocks (such as mud, silt, sand or pebbles which form mudstones or shales, siltstones, sandstones and conglomerates respectively) or (ii) limestones - mostly of calcium carbonate as a chemical precipitate or biological in origin (shells of marine animals). Limestones can be almost pure white calcite as in chalk, be rich in magnesium as in dolomite or contain varying amounts of silicate minerals and organic material when it can range from pale brown or grey to dark grey in colour. When these sediments are buried they are compacted and cemented by percolating fluids to form rocks, a process known as lithification. In the cemetery we will find sandstones and limestones.
(c) Metamorphic rocks are formed when a rock of any type is buried and subjected to pressures and temperatures higher than during simple lithification. The minerals start altering to give a quite different rock. A low-grade metamorphic rock is slate, where some fine-grained, platy minerals give a fabric to the rock which cleaves in one direction. At intermediate pressures and temperatures the grain size gets larger to form phyllites and then schists; these rocks however are rarely suitable for use as memorial stone. At higher grade, during mountain folding episodes, gneiss is formed; this is coarser-grained, often with folds evident in the patterns of lighter and darker bands. Yet greater pressures and higher temperatures produce migmatite, a rock with distinct separation into light bands which have undergone partial melting and dark bands of unmelted minerals high in iron and magnesium. The third but by far the most common metamorphic rocks found among the monuments is marble. Formed from limestones, the calcite from the constituent grains which make up the bulk of limestones have been recrystallised and turned into interlocking crystals, improving the weathering and erosion resistance while maintaining the easily carved nature of calcite rocks (calcite is a softer mineral than silica or feldspar which makes up many other rocks).

For further information and use by schools see Wendy Kirk at http://www.es.ucl.ac.uk/schools/london_fieldwork/col/educational_resource/index.htm

Acknowledgements

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We would also like to express our appreciation of the beautiful and lasting memorials chosen by relatives and close friends to commemorate their loved ones.
The Geological Walk

The walk starts by entering the front gate and proceeding straight ahead towards the distant Chapel, appropriately along Chapel Avenue.

(A) **Haywood Memorial (1)**

The first memorial is a large mausoleum on the left holding the cremated remains of its designer William Haywood. He worked on many projects as Surveyor to the Commissioners for the City of London, works which included the location and design of the City of London Cemetery. It is built mostly of blocks of two different **limestones**, Kentish Rag and Portland Stone. Kentish Rag is an impure, sandy limestone formed under marine conditions relatively close to shore. Close examination reveals a small amount of a dark mineral called glauconite, which is associated with deposition from sea water. Portland Stone is an oolitic limestone (ooliths being rounded grains of calcite) with prominent fossils. The fossils, especially oyster shells, are plainly seen in some areas where they are concentrated. Viewing the groundmass with a hand lens reveals many ooliths forming the matrix in which the fossils are set.

(B) **Saunders Memorial (2)**

Almost opposite Haywood is a classic style memorial to William Saunders (1825-1901), Medical Officer of Health for the City of London. The main body is of Scottish **red granite**, with **grey granite** pillars at the corners and a base comprising finer-grained grey granite. Note firstly how polishing reveals so much more detail and secondly how the crystals making up the granite interlock in a tight mosaic pattern characteristic of igneous
rocks. Above is a carved **white marble** figure of Jesus with cross which is now heavily discoloured, typical of the weathering of marble. The whole monument is on a base of yellowish, laminated **sandstone**.

(C) **Vigiland Memorial (3)**

After a short walk further along Chapel Avenue and a left turn at Central Avenue there is a magnificent memorial to the sailor David Vigiland (1926-1946). It is based on Ruben’s Deposition from the Cross. Recently cleaned (contrast the marble figure in the previous memorial), it was carved from a single 25 ton block of white **marble** in Italy and dedicated in 1955. Although described in the past as a white, Sicilian marble, it has more recently been considered to be the famous Tuscan marble from Carrera. Note the ‘sugary’ feel to a weathered marble surface; the original polished would have felt smoother.

(D) **Central Avenue towards Church**

Walking towards the Church, on the right is a dark **gabbro** headstone to the grave of Thomas Watts (d.1971) (4). The stone is composed mostly of dark, greenish black augite and some light feldspar. Examination of the polished surface reveals a second dark mineral, possibly magnetite. The appearance of these very dark gabbros can alter if the viewer is some distance or close up and if there is bright sunlight or varying degrees of cloud cover.
**E) Diversion off Central Avenue**

Turning right off Central Avenue down Divisional Road, and walking a few yards off the road to the right can be found two graves, that of Flt. Lt. Wesley Irwin (d.1944) (5) and that of Iness Wood (d.1944) and Charles Braban (d.1957) (6) (right). The headstone to Irwin is of **slate**, a metamorphic rock formed by deep burial of mudstones and subsequent formation of new platy minerals such as micas which align at right angles to the pressure from above and define a natural **cleavage** in the rock. Slate is less common than granite and marble in this area, as is the stone making up the memorial to Wood and Braban. This is a metamorphosed **volcanic ash** from Borrowdale in the Lake District. Layers and lenses of ash which settled under water can be seen with differences picked out to a degree by differences in growth of lichen. Such volcanic rocks weather to a distinct pale green which can be spotted from a distance with practice. This grey-green colour is different from the green seen on marbles during wet weather due to growth of algae, lichen or moss.

**F) Central Avenue towards Church (continued)**

Just past Divisional Road is the family vault of David Wilkin (7) (left) made of limestone with inset marble tablets. The base is of sandstone showing bedding planes parallel to the horizontal. Opposite is the Stevens Family Memorial (8) (right) in marble. Dating from 1878, the degree to which the lead lettering stands proud of the stone demonstrates the degree of weathering where the calcium carbonate rock has been dissolved by natural carbon dioxide in the
atmosphere as well as by acid rain produced by industry.

Two contrasting granites (grey – Dalrymple, and red - Holsten) (9) are found side by side further along on the left. Features to notice are the presence of xenoliths (called heathens by quarry men) especially in the red granite, which are pieces of surrounding rock broken away into the granite melt. As with all granites, there is also much less weathering than seen in the marbles of similar age, just some minor pitting where the small platy dark biotite crystals have been eroded.

At the end of this row on the corner on the left is the family vault of Henry and Isabella Mead (10) (left). It comprises two distinct sandstones, one buff-coloured and the other red, with a white marble tablet. The sandstones have started to split along bedding planes. Most sandstones in cemeteries are buff-coloured. A popular sandstone in this area is greensand from the Weald which weathers a little browner at the surface; it was deposited in marine conditions. In contrast, red sandstones were formed in desert environments, where the air oxidises any iron minerals to a characteristic rusty colour. The bedding showing the original layers of deposition are clearly visible (right).

Note that some of the monuments around this junction show evidence of damage which has been patched up. This is the result of bombing in 1942 which damaged much of the Church and required repair, including a new spire.

(G) Church and neighbouring monuments

Approaching the church, you will notice that the main door directly faces Central Avenue. This was designed to greet corteges arriving from railway
sidings at the other end of Central Avenue, which was planned as the main transport link. It had been envisaged that most traffic would be by rail; however the railway link was never used due to pricing disputes. The Chapel similarly faces a route coming from the east side. Note: both the Church and Chapel are also visible down avenues leading from the main gates.

The Church (11) itself is made of Kentish Rag and Portland Stone with the added complication of extensive repair work after the bomb damage. For the spire and other replacements Caen Stone has been used; this is a Jurassic limestone from north-west France.

Turning right at the Church there is an interesting row of older monuments in an arc on the right worthy of examination. The next stop centres around the section of the Outer Circle to the north of the Church.

(H) The Outer Circle

One of the most attractive of the newer stones is garnet gneiss, the stone used in the beautiful memorial to Maureen Kelly (1946-2002) (12). This is a metamorphic rock of much higher grade than slate. Formed under high pressures and temperatures during mountain-building episodes, large crystals have been formed in swirling patterns during large-scale folding (see inset). Of particular interest are the many large red garnet crystals
called **porphyroblasts**; these can be seen as the metamorphic equivalent of **phenocrysts** (large, well-shaped crystals found in igneous rocks).

Along the same row is a black **gabbro** (Belfast Black – from S. Africa) forming the main part of the memorial to Derek Hart (1930-2007) **(13)**. This is a popular dark stone, a strong contrast to the white of marbles. Unpolished, it has a grey appearance but when polished looks almost black, making a suitable contrast for lettering or decoration. The difference in stones when polished, unpolished or rough-cut is quite marked. It can be appreciated that polished stones offer us a good opportunity for really seeing the detail. This is similar to the enhanced appearance of pebbles found on beaches when wetted by sea or rain.

Opposite is another **slate** headstone for the labour M.P. Lord Elwyn Jones (1909-1989) **(14)** (left); fine Welsh slate being popular among natives of that country. We are used to seeing roofing slate with almost perfectly flat cleavage. It should be noted that not all slates are as even as this, only the best being used for good roofing tiles and monuments. Next to this the memorial to Robert and Mary Cooke (d.1971 and 1983 **(15)** (right) is of a good example of **larvikite** from Larvik in Norway. This popular stone is an igneous rock more restricted in composition and location than granites and gabbros; it contains many large feldspar crystals. This mineral has a characteristic sheen (called **schiller**) which, if viewed in good light at the back of the monument, shows a play of colours when viewed from different angles. Note the marked difference a polish makes to
hard stones like this (also granites and gabbros), where unpolished areas are dull grey and quite unremarkable.

(I)  **Forges Road**

Forges Road is only included in our tour as we have to get a little distance from the Church and its relatively well off neighbours to find examples of the humble sandstone. Walking away from the Church there are a number of fine monuments which can be admired as we walk along (note the monument to the Church of St. Olav on the right and, further along on the right, the Goldsmith Family memorial in which the depth of lead lettering illustrates weathering of marble spanning 110 years. Crossing the semicircular space at the end, past the red granite Forge monument and ca. 10 metres to the right there is a half-worn away, rusty coloured headstone (16) (right). This is an example of extreme weathering which occurs in sandstones. The most destructive weathering occurs when water absorbed by the porous sandstones is frozen and the ice expands to break off layers especially along bedding planes. Look for other nearby sandstones showing this typical flaking of outer layers which ranges from damaged lettering to severe erosion of large sections of the stone.

Weathering is noticeably greatest at the bottom of stones which remains in contact with wet earth when the upper parts have dried. This can be seen throughout the cemetery and to some degree with other stones, especially limestones and marbles.

We can now return passing the Church and bearing right on to Church Avenue.
Church Avenue

The last part of the walk is to return to the entrance gate via Church Avenue. There is nothing especially new here but the following may be noted on the way back.

Immediately to the left there are a group of memorials (17); three graves in a finer-grained grey granite, all in the name of Cooke, followed by a rough-hewn granite (Hull), a red granite (family Johnson) and an interesting-looking dark grey granite with a number of dark xenoliths and light phenocrysts (Charles Caines).

There are a number of other granites on the way back showing what variety lies in this rock type, with small, subtle differences to major ones.
Suggested Extension to the Walk

Most types of stone are covered by the short walk outlined above but for those wanting more we can recommend the following locations:

(K) **Central Avenue**

A walk along the main part of Central Avenue first reveals a coloured statue of Shiva in a grey granite stand and canopy (18) (left).

This avenue contains a number of monuments commemorating reburials from churchyards of the City of London for which this cemetery is well-known. Of particular note are St. Andrews Holborn and St. Sepulchre Holborn (19) (right), which has been recently restored, St. Helens (21), which includes the remains of the important natural philosopher Robert Hooke, and St Mary Somerset and St. Mary Mounthaw (22) which contains fine granites and a base which includes red sandstone.

Opposite St. Andrews is a Celtic Cross (20) of Carboniferous limestone. This is different from other limestones in the cemetery in containing the remains of a different type of fossil, that is crinoids. These can be seen around the base and ledges of the monument as circular discs of the broken segments of arms (left).
Along Central Avenue are many examples of **porphyrytic**, light grey granites from Cornwall which have large, white, rectangular phenocrysts of feldspar.

Further along, about 150m from the end there are some newer memorials (23) showing black and dark grey gabbros and grey and red granites. Of note is a beautiful black **gabbro** memorial to Joshua Francis. The stone is called **Black Galaxy** (from India or possibly China) in which can be seen bronze-coloured reflections from within of crystal faces of a pyroxene fittingly called bronzite.

**The Old Crematorium and surroundings**

The Old Crematorium (24) is built with Portland Stone plainly showing a number of fossil shells, especially around the entrance.

Around the back is a pond surrounded by blocks of sandstone showing distinct bedding planes.

A short walk along South Drive reveals a number of well-weathered sandstones.

Returning to the crematorium area and down a path sharp left (before St. Dionis Road) a large lawn area on the left has a number of recent graves in attractive modern stones (25).

Further along there is a monument to Croley, Crick, Crick and Auvache (26) which is of interest in that it has lead lettering of different ages in marble which is another example of a measure of weathering rate, the calcite being slowly washed away to leave the lead lettering standing proud of the marble surface with which it was once flush. The lettering in this case has been put in at different times.