Urban fieldwork – the stories from materials, colours, lines and shapes
Find out the stories told by materials used in building and for decoration

When you look at the stones used for buildings and in parks and cemeteries, there are key features to help you to work out the stories locked up in the rocks.

Use the sheets on pages 3 (colour), 4 (lines), 5 (shapes) and the recording sheet on page 6 to note down what the stones can tell you.

Materials – natural or not
First look carefully at the materials to see if they are natural or have been manufactured. Most of the features below tell you that they are natural. If they are manufactured, go to the ‘Rock around your school’ Earthlearningidea to discover the stories that manufactured materials can tell you.

Natural materials
If the stones are natural materials, the sheets on colours, lines and shapes will help you to find out their stories.

If you want to try to identify the different types of stones, use the Earthlearningideas on building stones (see ‘The back up’) to match the stones you find in the streets with the pictures given – to add even more to the stories of the stones.

Building stones used to add interest to a pavement, hotel and shop fronts in Nice, France. (Google Maps street view).

The back up
Title: Urban fieldwork – the stories from materials, colours, lines and shapes.
Subtitle: Find out the stories told by materials used in building and for decoration.
Topic: Using the colours, lines and shapes of building stones and other natural decorative materials to help to tell their stories.
Age range of pupils: 8 – 80 years
Time needed to complete activity: This depends on the building stone opportunities in the area.

Pupil learning outcomes: Pupils can:
• use the more ‘obvious’ features of building stones, their colours, lines and shapes, to describe how the rocks formed or were later deformed;
• explain how building and decorative stones with different features can be used to add character to an area.

Context:
Pupils use sheets focussed on colours, lines and shapes to begin to tell the stories of the stones used in urban areas. This urban fieldwork helps them to see that, wherever stones are found or used, the features within them can be used to tell the stories of how they formed, and sometimes, how they were later deformed.
Following up the activity:
Use the sheets in the building stone Earthlearningideas to identify, name and find out much more about the rocks the pupils find.

Building Stones 1 – a resource for several Earthlearningidea activities: use a key to identify many different attractive-looking rocks

Building Stones 2 – Igneous rocks: What are the differences between igneous rocks commonly used as building stones?

Building Stones 3 – Sedimentary rocks How do the sedimentary rocks used for building stones differ?

Building Stones 4 - Metamorphic rocks: What are the differences between metamorphic rocks commonly used as building stones?

Underlying principles:
• The more ‘obvious’ features of, colour, lines and shapes of the building stones seen in urban fieldwork can all help to tell their stories.

Thinking skill development:
• Pupils look for patterns within rocks to enable them to distinguish between them.
• Working out of doors provides a good opportunity to make a bridge with normal classroom studies.

Resource list:
• the attached sheets, on colours, lines and shapes and the recording sheet

Useful links:
‘Will my gravestone last?’ from http://www.earthlearningidea.com
http://www.nationalstonecentre.org.uk
http://geoscenic.bgs.ac.uk/asset-bank/action/viewAsset?id=344745&index=96&total=110&view=viewSearchItem

Source: Chris King of the Earthlearningidea Team. Photos by Chris King, unless otherwise stated.

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<table>
<thead>
<tr>
<th>Colours</th>
<th>White</th>
<th>Pale colours</th>
<th>Speckled white</th>
<th>Dark pink and reddish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually formed of pure calcium carbonate, if sedimentary they are limestones, if metamorphic, they are marbles*</td>
<td>Probably calcium carbonate with impurities – giving a range of colours including pinks, greens and greys.</td>
<td>Speckled whitish rocks are probably the pale-coloured igneous rock, granite; individual white or pale crystals are large enough to be seen, with dark mica crystals between them.</td>
<td>Dark pink and reddish materials usually contain oxidised iron minerals; in sedimentary rocks, this usually means they formed in tropical conditions; pink minerals in igneous rocks are feldspars, containing small amounts of trace elements.</td>
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<td>White marble and reddish marble. *Some metaquartzites are white but are not common building stones; they do not react with dilute acid when calcium carbonate rocks do.</td>
<td>Decoration with white, grey and green marble. <em>(Licensed by illustratedjc – Creative Commons Attribution-Share Alike 4.0 International licence).</em></td>
<td>The whitish minerals in granite, with dark micas.</td>
<td>Pink feldspars in granite (coin here and in later photos 2cm across). <em>(Peter Kennett).</em></td>
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<td>Yellowish-brown to dark brown</td>
<td>Yellowish-brown to dark brown rocks contain oxidised iron; brown sedimentary rocks are laid down in many environments; weathering often brings iron to the outer surfaces, giving them rusty yellow colours.</td>
<td>Mid-grey sedimentary rocks are usually quartz-rich sandstones/ siltstones/ mudstones or carbonate-rich limestones – with a lot of clay minerals giving the grey colour; if the finer rocks have become metamorphosed, they form grey slates.</td>
<td>Dark grey sedimentary rocks usually contain a lot of clay minerals or organic material; dark grey igneous rocks have dark iron-rich minerals and are gabbros if coarse-grained, dolerites if medium-grained and basalts if fine-grained.</td>
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Lines (beware – some lines in building stones are the tool marks made during quarrying, and so tell us nothing about how the rock formed – careful observation is needed).

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<th>Bedding</th>
<th>Cross-bedding</th>
<th>Ripple marks</th>
</tr>
</thead>
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<td>The lines seen in many sedimentary rocks are the layers or beds which formed as the original sediments were laid down – called bedding.</td>
<td>Some sedimentary rocks show layers at shallow angles to the main bedding – this is cross bedding, where the original sediments were laid down on a slope; the downward slope direction is the flow direction of the current that laid down the sediment.</td>
<td>The broad parallel lines across some sedimentary rocks are ripple marks, formed by waves as the sediment was first deposited; ripple marks form parallel to wave crests, which are often parallel to coasts.</td>
</tr>
</tbody>
</table>

**Bedding**

- A slab that has been cut across the bedding showing the straight bedding lines.
- Bedding in a pale-coloured limestone called travertine.
- Cross bedding in sandstone, current flow from left to right. (Peter Kennett).
- A ripple-marked sandstone – the original coastline probably ran from left to right.

**Cross-bedding**

- A stylolite and fractures in white marble.
- Small faults and joints in a piece of slate. (Peter Kennett).
- White mineral vein in pink marble.
- Rust-coloured Leisegang rings in sandstone paving stones. (Peter Kennett).

**Ripple marks**

- Lines of rusty yellowish, reddish and brownish colours can cross building stones, often cutting across other features. These are called Leisegang rings and are formed of iron minerals during the rock-forming process.

**Stylolites**

- The wiggly lines in some limestones and marbles are stylolites – that formed as some of the rock dissolved under pressure, usually when it was deeply buried (normally more than 500m deep).

**Fractures**

- The fractures seems in some building stones are small faults (if the rock on either side has moved) or joints (if it has not). They usually formed as the original rocks were pulled apart by tension deep in the crust.

**Fracture filled with minerals**

- Mineral veins form when, long after the rocks first formed, they were cracked by pressures in the crust; then water flowed along the crack and minerals crystallised from the water, filling the crack.
# Shapes

<table>
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<th>Interlocking crystals</th>
<th>Fossils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Igneous rocks are made of minerals which grew together as they crystallised from the molten rock. Their interlocking shapes can be seen in coarse-grained igneous rocks.</td>
<td>Fossils form the shapes found in many sedimentary rocks; they come in a range of shapes and sizes.</td>
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<td>Interlocking crystals in a granite.</td>
<td>Fossil casts in Portland Limestone.</td>
<td>Fossil crinoids in limestone.</td>
</tr>
<tr>
<td>Interlocking crystals in a dark igneous rock – Larvikite.</td>
<td></td>
<td></td>
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</table>

## Interlocking crystals

- Some granites used for buildings have rounded crystals with concentric layers that crystallised in this way as the granite solidified.

<table>
<thead>
<tr>
<th>Rounded crystal clumps</th>
<th>Broken fragments</th>
<th>Angular pieces</th>
<th>Rounded pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some granites used for buildings have rounded crystals with concentric layers that crystallised in this way as the granite solidified.</td>
<td>Some rocks are made of broken fragments of other original rocks, when the broken fragments usually have sharp jagged edges.</td>
<td>Slabs are sometimes surfaced by crushed rock; the angular fragments have sharp edges.</td>
<td>The rounded rock fragments on some slabs were rounded as they were transported as sedimentary particles by currents in rivers or the sea.</td>
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<td>Orbicular granite from Finland. (Peter Kennett).</td>
<td>Rock formed of broken fragments of a white rock, cemented together by a darker cement.</td>
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<tr>
<td></td>
<td>Slab surfaced with angular fragments of broken fine-grained igneous rock – basalt.</td>
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<td>Slab surfaced with rounded fragments of river or beach gravel.</td>
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Recording sheet

Example stone
Where I saw the stone: On the steps of the Boscolo Hotel, Avenue Verdun, Nice in France.

The stone is: manufactured

The colour tells me: The white rock is likely to be marble; the pink rock is likely to be marble too, coloured by containing some iron – both are metamorphic rocks

The lines tell me: The lines in the white rock are stylolites, wiggly lines formed when the rock was buried; the line in the pink rock is a fracture filled by white material – a mineral vein – this formed long after the pink rock was first formed

The shapes tell me: No shapes can be seen in this rock

Summary – the story of this stone is: Both rocks are metamorphic rocks formed of calcium carbonate, called marble; both show later changes, the stylolites in the white rock and the mineral vein in the pink rock.

Stone 1
Where I saw the stone:

The stone is: natural/manufactured

The colour tells me:

The lines tell me:

The shapes tell me:

Summary – the story of this stone is:

Stone 2
Where I saw the stone:

The stone is: natural/manufactured

The colour tells me:

The lines tell me:

The shapes tell me:

Summary – the story of this stone is:

Stone 3
Where I saw the stone:

The stone is: natural/manufactured

The colour tells me:

The lines tell me:

The shapes tell me:

Summary – the story of this stone is: