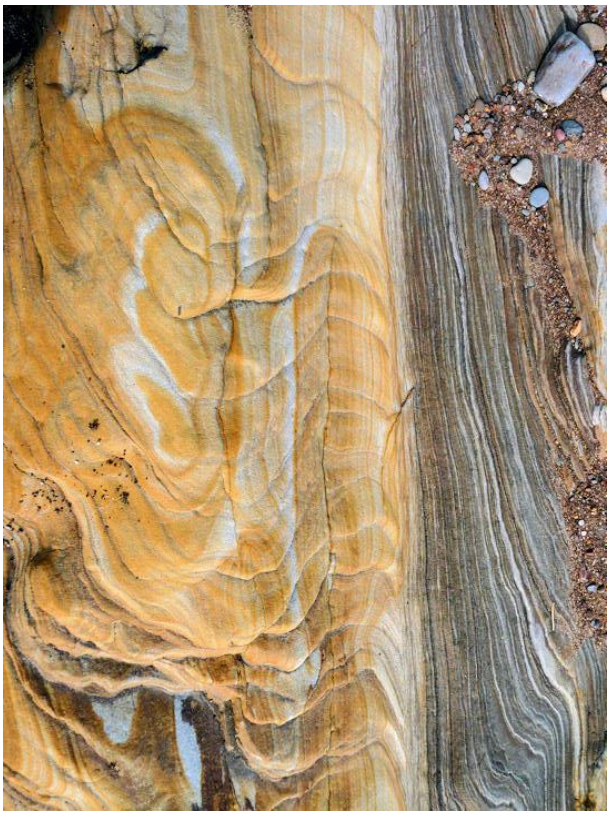

INVESTIGATING WALL STONE (5)

Categorising Sandstone Textures

ABSTRACT

A detailed description of the different types of textures to be found in sandstones and how to go about observing them

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Introduction

This guide is the final guide of three focusing on what may be observed within the Wall stones and how to go about making observations of these different types of rock data. In this guide grain size and shape will be explored in more detail including how to observe and record these variables.

Categorising Sandstone Textures

Sandstones are formed in a variety of dynamic landscapes – rivers, beaches, deserts – and traces of those environments are left in the textures of the sandstones. Texture refers to variations in grain size and grain type as well as the orientation of grains within a given piece of sandstone. Textures, at least the more obvious of them, may be readily observed without a hand lens.

Weathering, which can be problematic for identifying grain shape and type, can sometimes bring out sedimentary textures as different bands within the sandstone weather differentially. In consequence, texture is both an accessible and useful observation to be able to make to help classify sandstone.

Bedding and Laminae

Sedimentary rocks are laid down in a series of (usually) horizontal layers to form beds. Looking at a typical sandstone outcrop, you will see that the beds vary in thickness from a few centimetres to 10s of metres. [figure]. For the purposes of building a wall the Romans would have looked for sandstones which have beds which are blocky and at least the thickness of the wall-stones.

Figure 5: Bedded sandstone at St Bees Head

For the purposes of categorising that stone, there are additional sedimentary textures which can be seen within an individual wall-stone. These laminae form as the flow rate in water (or air for that matter) varies and alters the size and type of particle it can carry. Slower flow means finer particles will be deposited and more energetic flow coarser particles. Sometimes these laminae are virtually absent within a sandstone bed resulting in a homogenous sandstone. In contrast other sandstones are beautifully and sometimes colourfully laminated. [(figures)].

Figure 7: Beds of sandstone with planar cross-stratification at Howick Haven.

The presence or absence of lamination, the scale on which the lamination occurs, how clear it is and what the variation in colour (and mineral type if visible) is, are all valuable observations.

In addition, the laminations are not necessarily parallel to the bedding-plane.

Ripples with a wide range of sizes are common features in flowing water (or air). When ripples form, they leave a distinctive trace in the sediments they deposit, with laminations forming at an angle to the base of the sedimentary bed. Cross-stratification as it is known, comes in a large variety of forms. Each of these give information about the sedimentary environment including the current strength, depth of water, whether flow is in one or two direction, how much sediment there is and the location of deposition (sand bar, river-meander, beach etc.).

Figure 8: trough cross-stratification, harbour wall at Cove

For the purposes of the Stone Sourcing and Dispersal project there is unlikely to be enough of the cross-stratification exposed in each stone to be able to fully diagnose it in a geological sense. Simply noting that cross-stratification (as opposed to planar stratification) exists, along with a description of the form and size of the cross-stratification is sufficient and useful.

Understanding more about cross-stratification is useful as a way of bringing to life the patterns that you can see in the sandstone. More information can be found about this in the recommended reading.

Other Textures

Water Escape

When sediments pile up rapidly it is sometimes possible for an excess of water to be trapped within the sediment. This situation is meta-stable and as such will persist unless the sediment is disturbed. This may be caused by an earthquake or maybe even a heavy-footed amphibian. Whatever the cause the trapped water escapes upwards, and in the process disrupts laminations in the sediments through which it passes. These dewatering structures are distinctive and are occasionally found within the Carboniferous sandstones from which some of the Wall stones are drawn.

Figure 9: Dewatering structures with unmodified beds at the base progressively becoming more disrupted towards the top of the outcrop. Howdiemont Bay, Northumberland.

Diagentic Patterns

Figure 11: Diagenetic iron patterns in a loose boulder from Birling Carrs, Northumberland

The mineralisation processes involved in cementation have been described in the article “Categorising Sandstone Minerals”. It also describes how cementation goes beyond sticking the sand grains together and produces concretions and/or banding. Both are particularly striking if the mineral involved is one of the iron oxides. Concretions and those bands which become so mineral rich that they effectively form veins tend to be harder than the surrounding sandstone. As a result, they are often picked out by weathering and are easy to observe. The finer banding is also straightforward to observe as the colours are so strongly contrasted.

Figure 10: Calcium carbonate concretions in sandstone on Cocklawburn Beach

Classifying Rocks, Taking it Further

The formal classification of sandstones has had a great deal written about it. It will now be clear how closely the make-up of a sandstone is related to the process by which it formed. A good classification system should help in understanding this. The systems for classification used by geologists use many of the pieces of data that we will be measuring in the Stone Sourcing and Dispersal project and more. For example, grain size, grain sorting, ratio of cement to grains, porosity, ratios of grain types are all used to formally classify sandstones. From a

geological point of view this level of detail is needed to understand geological process and compare material from different locations. From the point of view of the stone Sourcing and Dispersal Project it may be of interest to understand this and give a better insight into the stones which are being examined, but is not strictly necessary to be able to carry out the work. For anyone interested to take this further the recommended reading in “Investigating Wall Stone (7): Taking it Further” is a good place to start.