Milburn Limestone: Geology Department

Site 5: Campus Geosites @ Otago

Location: In the quadrangle in front of the Geology Building (west side of building)

Learning outcome To gain a basic understanding of limestone, a common sedimentary rock.

Keywords: Sedimentary rock; limestone; calcium carbonate; fossils

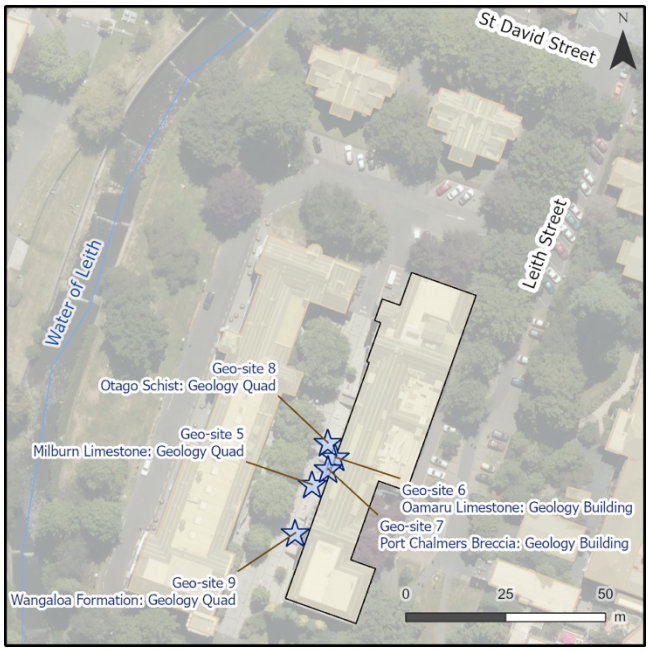


Figure 1: Milburn Limestone block containing a partially preserved dolpin skeleton.

Limestone is a sedimentary rock (sedimentary rocks are rocks that formed by the accumulation and deposition of sediments near the Earth's surface) composed of more than 50% calcium carbonate ($CaCO_3$). Limestone often contains lots of shell fragments of marine organisms, and usually forms in shallow marine environments. The formation of limestone can involve accumulation of shells, coral, algal, and organic materials, or direct precipitation of calcium carbonate from ocean water or lakes.

The Milburn limestone boulder in front of the Geology Building contains a wonderful example of a partially preserved dolphin skeleton, as well as a range of other fossil types that tell important stories about the formation of this limestone.

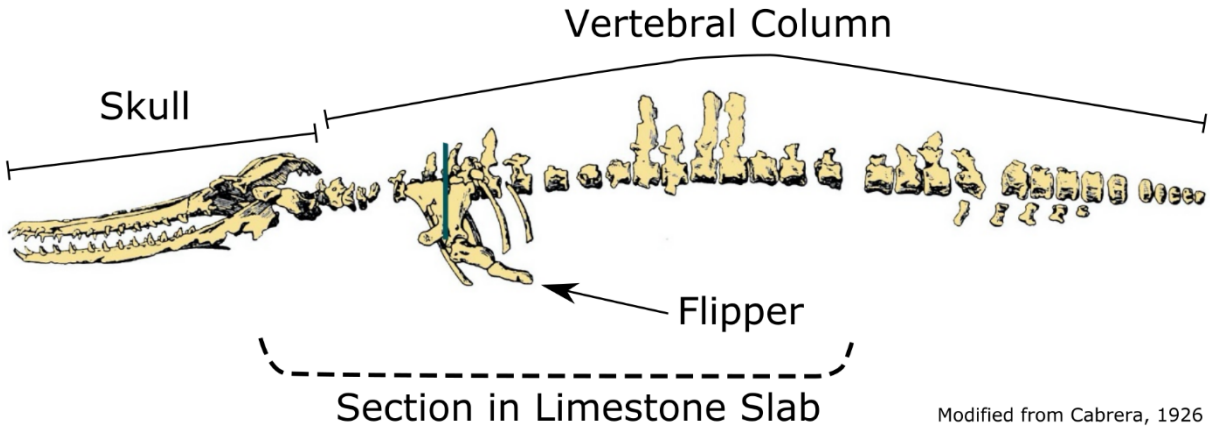


Figure 2: Representation of a dolphin skeleton showing what is preserved in the block of Milburn Limestone. Only the vertebral column and back of the braincase are clearly visible in the block – can you identify parts of the spine?

Exercises

1) Describe the colour of the rock. Are there colour variations?

2) This rock contains a well-preserved dolphin spine (vertebral column). There are also many other shells and fossils preserved in this rock. The table below shows four different types of shell that can be found in this rock. Try and find an example of each fossil and sketch what it looks like.

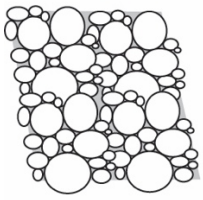
Note that the photos below show perfect examples of each fossil. In the block of Milburn Limestone, most of the fossils are broken and only partially preserved, so you will have to be careful about identifying what you find!

Fossil type	Sketch an example
Heart urchin 	
Tube worms 	

Clam shell 	
Scallop shell 	

3) Based on the images of crystalline and granular rock textures below, what is the correct textural term to describe this limestone?

Granular

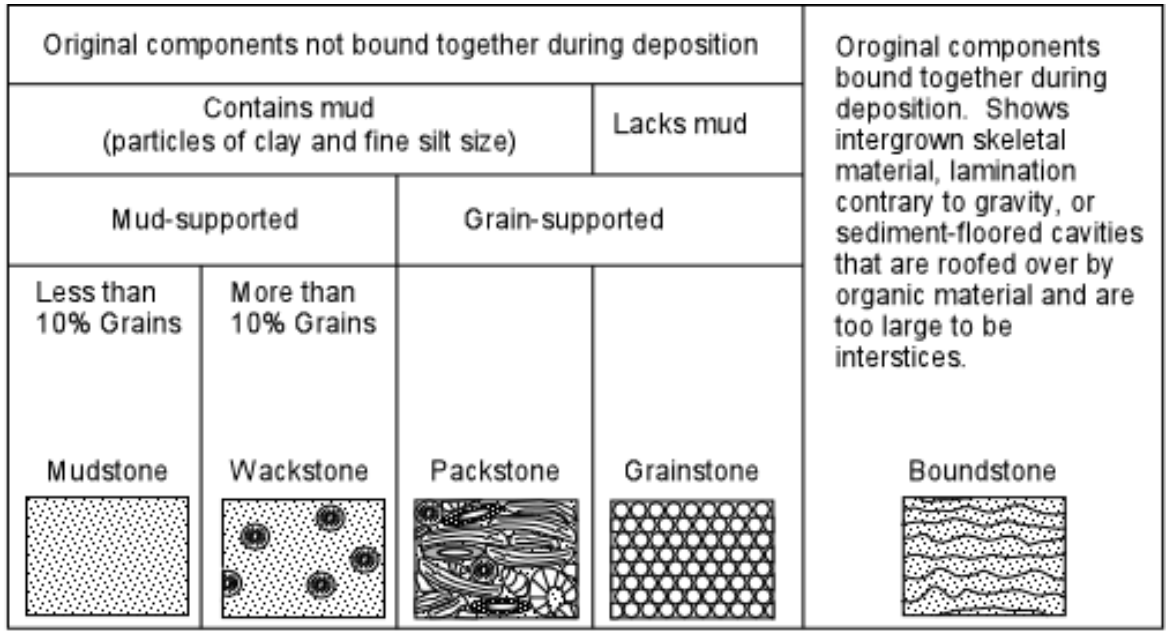


Crystalline

A *granular rock* contains grains that were deposited. Many sedimentary and volcaniclastic rocks are granular. The areas between grains can either be empty (pore space) or filled. A very wide variety of granular textures occurs.

A *crystalline rock* is composed entirely of crystals that formed during cooling and crystallization of magma/lava, or by recrystallization during metamorphism. The crystals are often tightly-packed. A very wide variety of crystalline textures occurs.

4) The following diagram shows the Dunham classification scheme for limestones. Use this classification scheme to determine what type of limestone is represented by this block of Milburn Limestone.



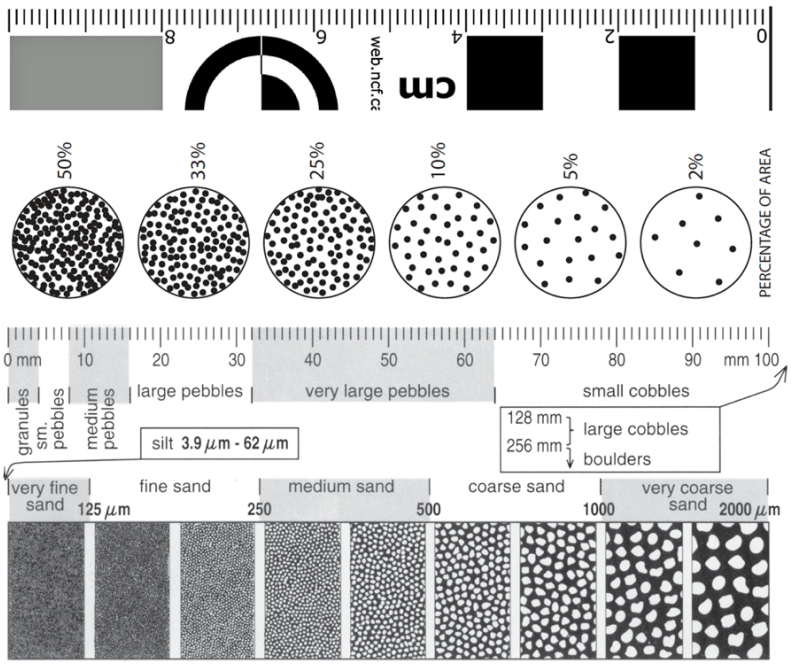
After Dunham , 1962, Am . Assoc. Petrol. Geol. Mem , 117

5) Have a look at Figure 1 and the side of the limestone block. Sketch the irregular dark structures that you can see running through the block. These are very common structures in limestones and other rocks that dissolve quite readily. What might these represent?

Stylolite: A stylolite is a surface that forms by dissolution of material in a rock. Material is dissolved, transported by a solution, and precipitated elsewhere. These structures are common in carbonates like limestone and dolostone, but they can also form in other rock types (e.g. quartzites).

6) Based on what you have described, list some of the key characteristics of limestone (e.g. texture, components, visible structures, color, composition).

7) Try and sketch the environment in which this rock might have formed. Include on your sketch: the depositional environment, possible water depth, types of organisms that may have been living in the water column or on the sea floor.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33%
25%
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PERCENTAGE OF AREA
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20
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60
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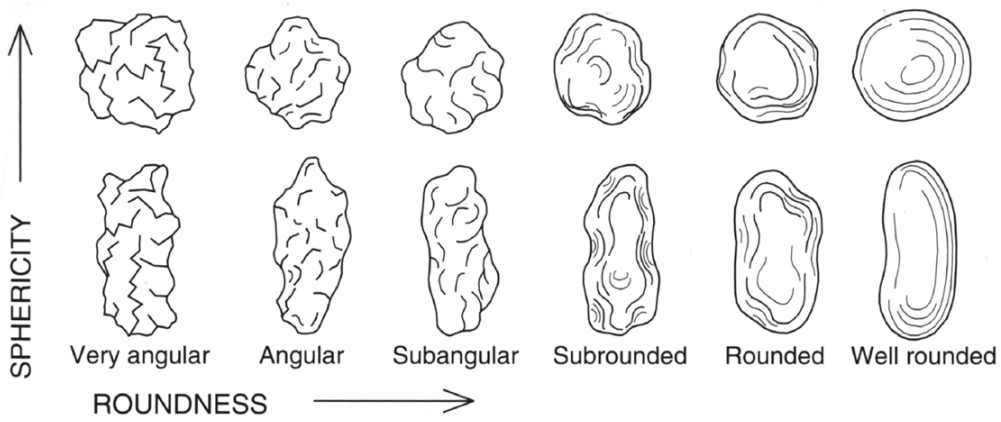
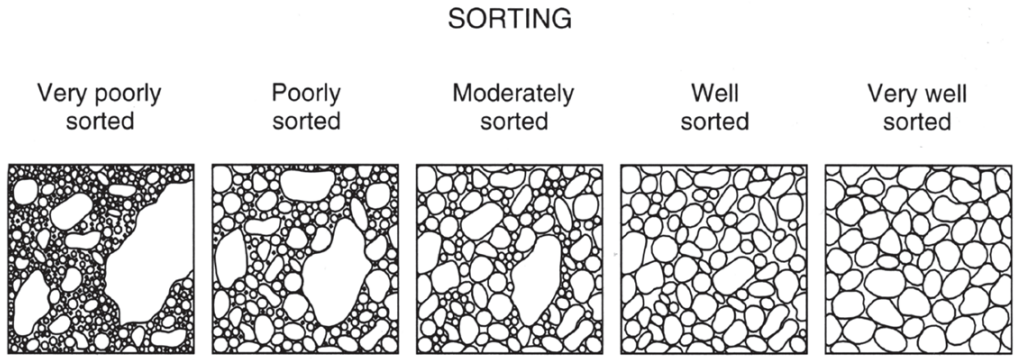
90
mm 100
granules
sm. pebbles
medium pebbles
large pebbles
very large pebbles
small cobbles
128 mm
256 mm
large cobbles
boulders
silt 3.9 μm - 62 μm
very fine sand
fine sand
medium sand
coarse sand
very coarse sand
125 μm
250
500
1000
2000 μm


SPHERICITY
Very angular
Angular
Subangular
Subrounded
Rounded
Well rounded
ROUNDNESS


SORTING
Very poorly sorted
Poorly sorted
Moderately sorted
Well sorted
Very well sorted