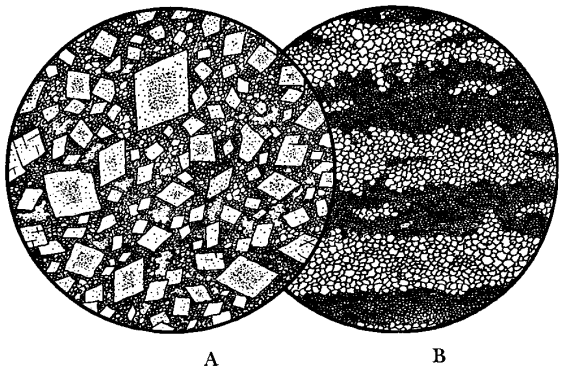
Thin-section 5

GY 402 Sedimentary Petrology (2017)

Carbonate Thin-Sections

1: Tidal Flat and Evaporite Sedimentary Rocks



Dolostones in thin section (field of view for each approximately 2 mm). The one on the right is supratidal.
From Williams, H., Turner, F.J and Gilbert, C.M., 1954. Petrography. W.H. Freeman & Co., 406pp.

Introduction: The rocks and thin sections that you will see today all come to you from ancient carbonate tidal flat environments. Some are from the Cambro-Ordovician Knox Group exposed near Centreville, Alabama. Others come from the Smackover Formation, a subsurface carbonate formation well known as a petroleum producer along the entire Gulf Coast. The rocks are dominated by finely crystalline dolomite and/or fine grained calcitic sediment. You may also encounter a few "beasties" in the rocks.

I have also included a group of thin sections that contain algal materials. Some doubtless came from tidal flat environments, but some may be from slightly deeper environments. The dominant component that you will see in these rocks are oncoids. These are rolled up algal nodules that measure up to 2 cm across. They are easy to spot as you will see in the thin sections provided. The thin sections from Namibia are truly special. They are from Proterozoic rocks, a time before hard body parts had evolved on the Earth.

Lab exercise (do in your note books, not re-doable): The list of tidal flat thin-sections that will be available in the lab is on the next page. All of them have accompanying hand specimens. I would like you to look at one example from each group and to produce a petrography summary page in your hard covered note book of one of them using the new standard format for carbonate thin sections (see attached example). If I were you, I'd try for an oncolite rich rock as they are significantly cooler to look at.

Discussion Question (re-doable): In a separate paragraph at the end of your thin section report, discuss in ½ to one page (handwritten = 100-300 words preferably with a separate diagram/sketch) the origin and significance of "fenestrae" in tidal flat carbonates. This discussion question is re-doable for revised credit.

Due Date: I expect 2 thin section reports in your notebooks and a separate discussion page by the deadline specified on the website and the class calendar.

Thin-sections for this lab

Group A: (tidal flat rocks); GY 344'tidal flat' (Use hand specimen C13) – a nice fenestral mudstone
C25, C26, C27 (use hand specimen C26/27) - mostly limestone
C24 (use hand specimen C11) – mostly limestone with mud cracks
DH16, A22, C 12, C13 (use hand specimen C13) – mostly dolostone
C11 (use hand specimen C11) – mostly dolostone with mud cracks
A32 (use hand specimen C10 or C20) – mostly dolostone
A16, C32A (use hand specimen C35) – dolostone with calcite nodules
Sed 45 (use hand specimen RI 3177) – dolostone with anhydrite

Group B: (oncolites/algal flat); B11, B29, 7, 12A, 17, 32, 30/50, DH26 (Use hand specimen RI 2795), Namibia samples (3) (use un-labeled black slab).

Staining of Carbonate Minerals

Some of the thin-sections you will be seeing today and most of the ones that you will see in future labs have been stained with chemical dyes* to highlight carbonate geochemistry. There will be a brief discussion at the start of this week's lab session to discuss the staining technique and how you should use it to help interpret your thin sections.

Mineral	Geochemistry	Stain color
Aragonite	$CaCO_3$	Pink to red (brown highlights)
Calcite (non-ferroan)	$CaCO_3$	Pink to red
Calcite (ferroan)	$Ca(Fe^{2+})CO_3$	Purple to blue
Magnesium calcite	$Ca(Mg^{2+})CO_3$	Pink to red (yellow with Clayton Yellow)
Dolomite	$CaMg(CO_3)_2$	Not stained
Ferroan Dolomite	$CaMg(Fe^{2+})(CO_3)_2$	Turquoise

*the standard carbonate staining cocktail is Alizarin Red-S + potassium ferricyanide.

November 2, 2000
Petrologist: John Doe

Thin-Section Report 2
Carbonate Grainstones

Sample Number: RI 1123
Thin-Section Number: SED 99

A: Rock Description.

The sample is well cemented, like grey to beige in color and contains abundant ooids and other coated grains. There are also rare bivalve fragments (disarticulated). Grains are well sorted, well rounded and average 1.0 mm in diameter (m-grained). The sample is devoid of any obvious sedimentary structures.

B: Thin-section Description.

I) Allochems

Ooids	5%
Intraclasts	10
peloids	30
echinoderms	5
brachiopods	15

II) Non-carbonate grains

Quartz	1%
Opaque minerals	tr

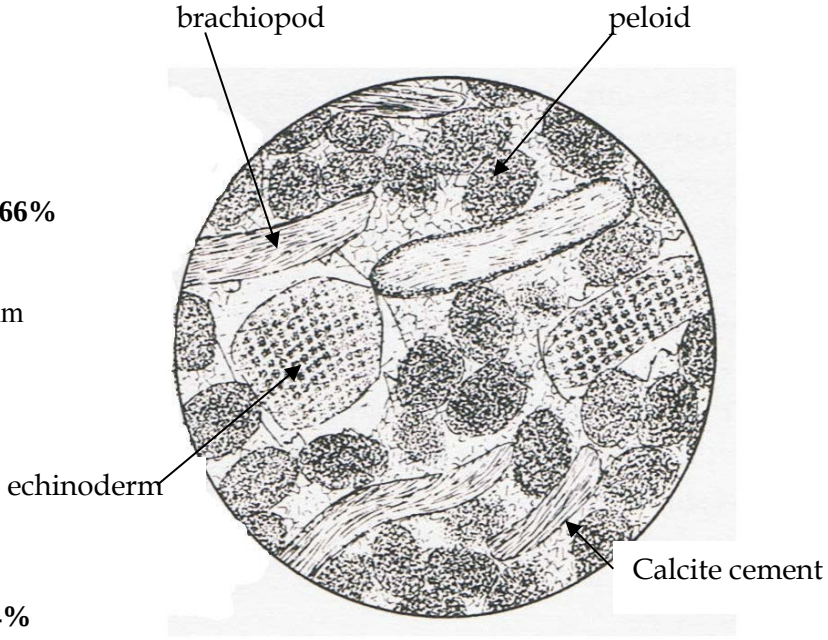
Total Grains **66%**

Mean Grain Size: 500 μm to 1.00 mm
Sorting: good
*Rounding:*excellent

III) Intergranular Areas

Calcite cement	24%
Matrix	10%

Total Intergranular Material: **34%**



1.0 mm (plane polarised light)

Rock Name : Oolitic grainstone/packstone