Geology 320, Sedimentology and Stratigraphy
FINAL EXAM

- **You may use your book and notes.**
- **You may NOT use the web. Any use of the web will be considered grounds for violation of the UST academic integrity policy.**
- **The ONLY use of the computer should be if you choose to write your responses in Word.**

Attached you will find three figures:

> **Figure 1A:** A measured section with detailed descriptions through the Lytle and Plainview Formations (also showing contacts with the underlying Morrison and overlying Skull Creek Formations). Each formation has been subdivided into units (labeled A, B, C. etc.).
>
> **Figure 1B:** A legend to help you interpret some of the features on figure 1A.
>
> **Figure 2:** The same column as in figure 1A, with all notations removed and a space for your interpretations. There are extra copies of this figure available if you need them.

It is your job to answer the following questions in as **detailed** and comprehensive a manner as possible as the 2-hour time limit allows. You may use Word to write up your responses, or you can write your responses out in longhand.

1. What is the methodology that we have used to interpret sequences of sedimentary strata in this course? Your response to this question should be no more than a paragraph in length.

2. How were the Lytle and Plainview Formations deposited? In what environment(s) were they formed? Support your interpretations thoroughly, clearly and concisely. **You should also label figure 2 with your interpretations**; this should be a brief summary of your interpretation, with your support/justification laid out in more detail in your written response. Feel free, also, to label figure 2 with any other information that you think might be relevant or useful, but keep it neat.

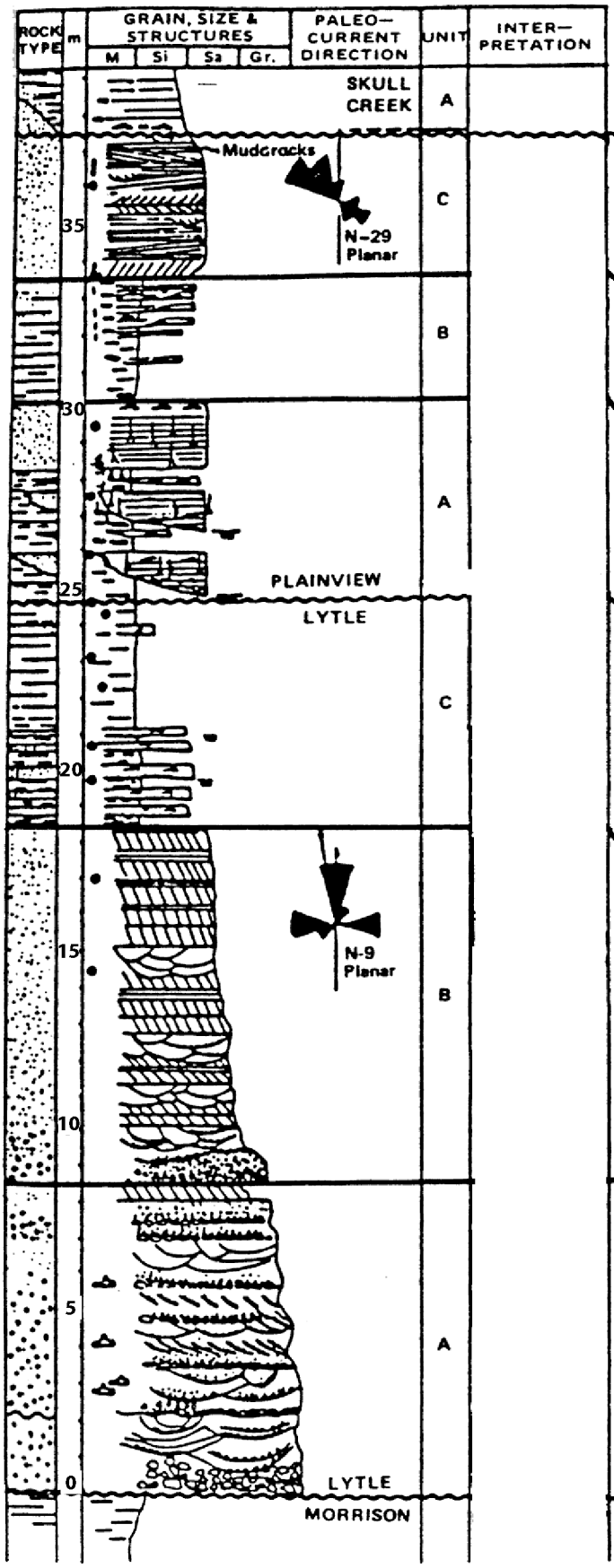
2. Are there any sequence boundaries present on the measured section? If so, label them on the diagram and justify your interpretation in your write up.

Stop 1 Lytle – Plainview Formations.

BELLEVUE SWSE 13–2N–70W

This location was named the Dakota Group type section for Northern Colorado by Lee (1923). The section is exposed on the north banks of the Poudre Valley and Reservoir irrigation ditch two miles north of Bellvue, Colorado.

FIGURE 1A. STRAT COLUMN WITH DETAILED DESCRIPTIONS



Skull Creek Formation

Unit C
14' Thick

Quartz arenite, brown, fine-grained, well rounded, well sorted, tight. Dominantly low angle laminations displaying parting lineations on bedding planes. *Ophiomorpha & Thallassonoides* burrows occasionally developed. Occasional 102 ft. thick planar tabular crossbeds developed near base. Upper contact transitional with the overlying Skull Creek shale; mudcracked sandstone lines this contact. Lower contact sharp. This unit can be correlated throughout the study area and into the subsurface.

Unit B
17' Thick

Carbonaceous shale and siltstone; siltstone lenses thicken and coarsen upward to ripple laminated very fine grained sandstone. Shale interbeds are heaviliy burrowed. Coaly zones are locally developed along strike. *Planolites, Trichichnus, and Skolithos* burrows dominate. This middle shale layer is continuous throughout the outcrop.

Unit A
15' Thick

Quartz arenite and carbonaceous shale. Four lower sandstone lenses thicken upward from 1 to 6 ft thick separated by dark shales containing a Brachiopod fauna indicative of fresh to brackish water deposition (E. Belt, personal comm.). The basal contact is sharp with the oxidized shales of the upper Lytel; each sandstone lens contains root casts and moderate burrowing (*Thallassonoides, Skolithos,* and occasional *Ophiomorpha*). The uppermost sandstone is laterally continuous for several miles and displays abundant root casts.

Unit C
23' Thick

Quartz arenites, very fine grainded to siltstone, interbedded with red, maroon, and greenish shales with abundant chert lenses, root casts, and limonite nodules. Sandstone lenses vary from 3" to 1' thick, have sharp bases with rip-up clasts of shale. Along strike these sandstones grade into thicker lenticular sandstones up to 75 feet wide and eight feet thick.

Unit B
35' Thick

Lithic arenite conglomerate to fine grained sandstone; sub-angular to well rounded, poorly to well sorted, tight. Contact gradational with underlying units. Sequence is dominated by planar crossbeds up to 5' thick interbedded with gravelly to fine-grained trough crossbeds. This sequence fines upward overall into the overlying shales and sandstones of unit C.

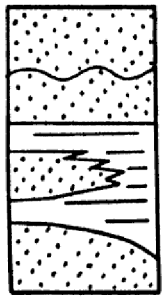
Unit A.
35' Thick

Lithic arenite conglomerate, maroon to brown, locally fine grained with thin discontinuous shale and siltstone layers. Highly variable lateral and vertical grain sizes and sedimentary structures. Pebbles reach 4 inches in diameter. Basal contact sharply erosional with angular fragments of Morrison Formation shale and sandstone clasts common along the contact. Log casts up to 6 inches in diameter occur locally in the coarser grained fractions. Large (20-50 ft.) scour surfaces developed laterally. Structures are predominantly fining upward cycles of horizontally laminated gravels and trough crossbedded fine grained sandstones. Planar tabular sets up to 2' thick locally developed.

Morrison Formation

Figure 1B. LEGEND FOR SECTIONS

CONTACTS



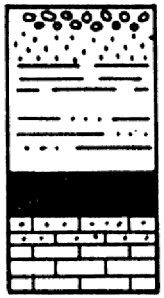
EROSIONAL

SHARP

LATERAL CHANGE

GRADATIONAL

LITHOLOGY



CONGLOMERATE

SANDSTONE

SHALE & CLAYSTONE

SILTSTONE

COAL OR LIGNITE

SANDY LIMESTONE

LIMESTONE

STRUCTURES

LARGE TROUGHS

SMALL TROUGHS

PLANAR TANGENTIAL

PLANAR ABRUPT

HORIZONTAL LAMINATIONS IN SHALE

HORIZONTAL LAMINATIONS IN SAND

REACTIVATION SURFACE

ASYMMETRIC RIPPLES

SYMMETRIC RIPPLES

CLIMBING RIPPLES

STRIKE OF RIPPLES

VERY LOW ANGLE CROSSEEDS

OVERTURNED FORESETS

LONG ARROWS=CYCLE THICKNESSES

SHORT ARROWS=PALEOCURRENT DIRECTION

Secondary structures and trace fossils

Ⓛ LIMONITE

Ⓟ PYRITE

Ⓒ CHERT NODULE

ORGANIC

FOSSILS

HIGH LIME CONTENT

LOAD STRUCTURE

ROOTS

MODERATE BURROWING

UNDIFFERENTIATED

HEAVY BURROWING

MUDCRACKS

JOINTING

COROPHOIDES

OPHIOMORPHA

SCOYENIA

THALLASSONOIDES

DIPLOCRITERION

ARENICOLITES

TRICHICHNUS

SKOLITHOS

CHONDRITES

LOGS

CONE-IN-CONE

PLANOLITES

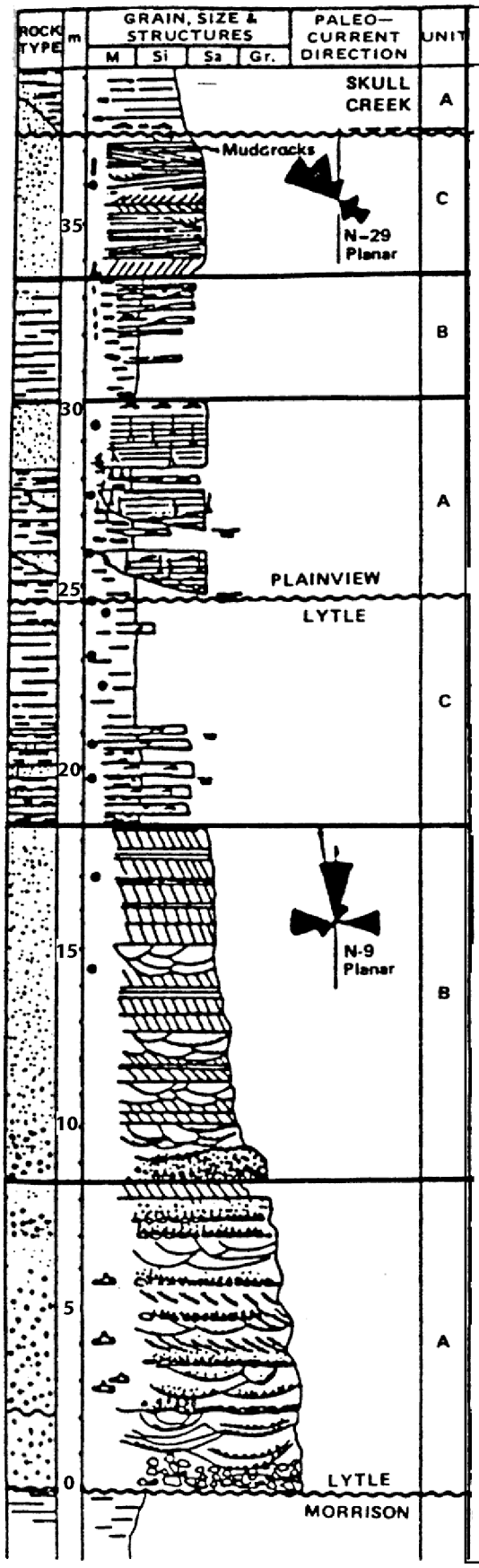
FLAME STRUCTURE

Stop 1 Lytle – Plainview Formations.

BELLEVUE SWSE 13–2N–70W

This location was named the Dakota Group type section for Northern Colorado by Lee (1923). The section is exposed on the north banks of the Poudre Valley and Reservoir irrigation ditch two miles north of Bellvue, Colorado.

FIGURE 2. BLANK COLUMN FOR YOUR INTERPRETATIONS



Your interpretations here!