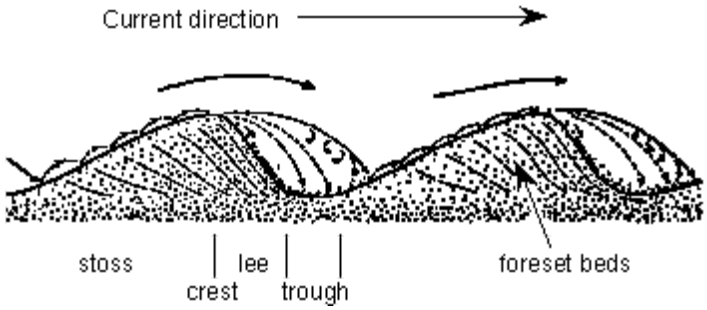
Terms and Definitions:

- **2D and 3D dunes and ripples**: Where loose fine sedimentation is transported by wind or water causing it to form ripples (5cm or less) and dunes (greater than 5cm). Anything else?

- 2D- one direction of flow As indicated by linear crests and bounding surfaces. Typical of LOW FLOW velocities.

- 3D- overall one direction but undulating or liquid forms, as indicated by undulating crests, curved throughs and curved bounding surfaces. May be “in phase” (where the undulations are aligned), or “out of phase”.

Ripple and Dune Terminology



- **Abandoned channel:** Are point bars. A collection of abandoned channels make up point bars. A channel moving sideways by erosion on the outer bank and deposition on the inner bank is undergoing lateral migration, and the deposit on the inner bank is referred to as point bar.

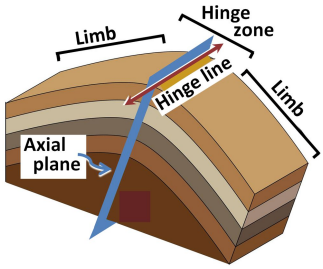
- **Angular Unconformity**: An unconformity is the break in sedimentation and the erosion of underlying strata. Angular unconformity; in which units above and below have different orientations (attitudes), and may be due to the deformation and erosion prior to deposition of younger beds.

- **Anticline**: *OPPOSITE SLOPE;* the beds dip away from each other on opposite side of the arch-like structure. ~~Beds are literally bent upwards~~. A fold with an “arch-like” shape in which the limbs dip away from the hinge (Marshak, pg G-1).

- **Apparent dip**: The inclination of beds as seen from a vertical cross section, that is NOT perpendicular to the strike of beds.

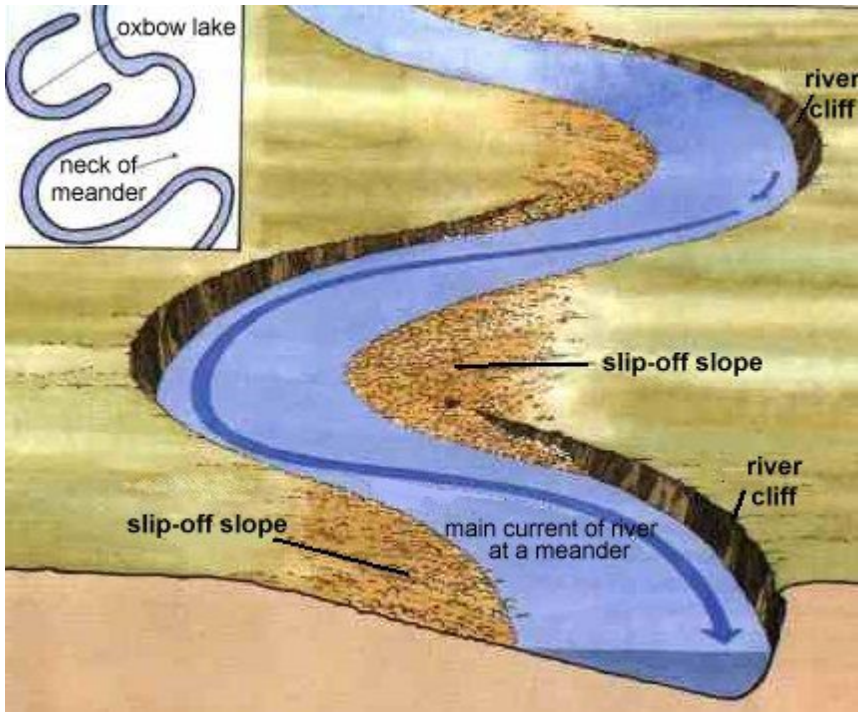
- **Attitude** = orientation, the level of a plane, eg horizontal. ...position of linear structural features such as faults, beds, joints, and folds

- **Axial Plane**: Is in the below image….



- **Azimuth**: a) The azimuth is the compass direction measured relative to NORTH, i,e. East = 090. b) Can also be used synonomusly with “Trend” as the direction of a linear feature.

- **Bar**: A point bar (?) is a depositional feature made of alluvium that accumulates on the inside of bend of streams and rivers below the slip-off slope.



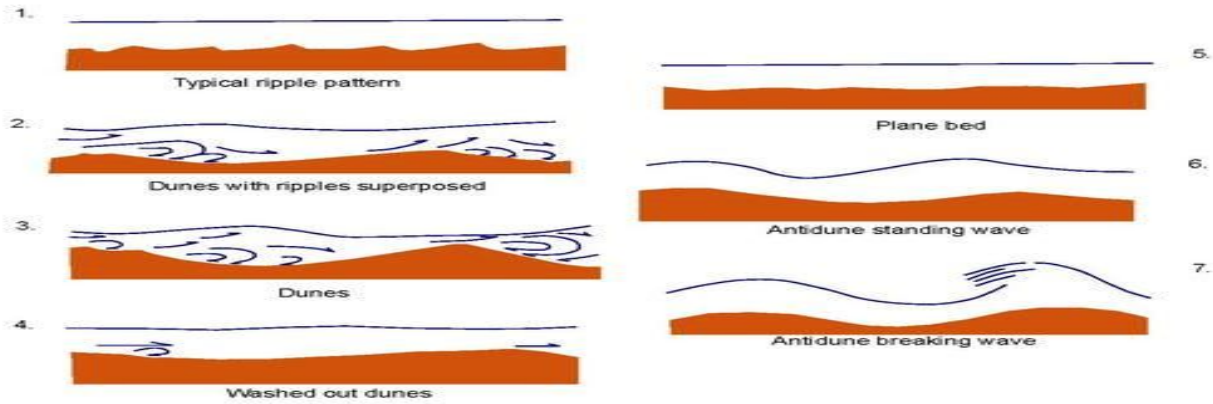
- **Basemap**: Geologic data, in a layer fashion, are represented on a basemap...basically all the maps we have ever worked with in this course.

- **Basement**: (Basement or Crystalline basement) rocks below sedimentary platform/cover, or sedimentary rocks or basins that are metamorphic and igneous in origin. i.e a craton

- **Bed**: Smallest lithostratigraphic unit ranging in thickness from a cm to several m and distinguishable from beds above and below it due to lithological, structural, and/or textural similarities.

- **Bedding**: Read above definition for bed

- **Bedform**: The shape of the surface of the bed of granular sediment produced by the flow of water/air over it. Nature of bedform depends on flow strength, depth, and grain size.

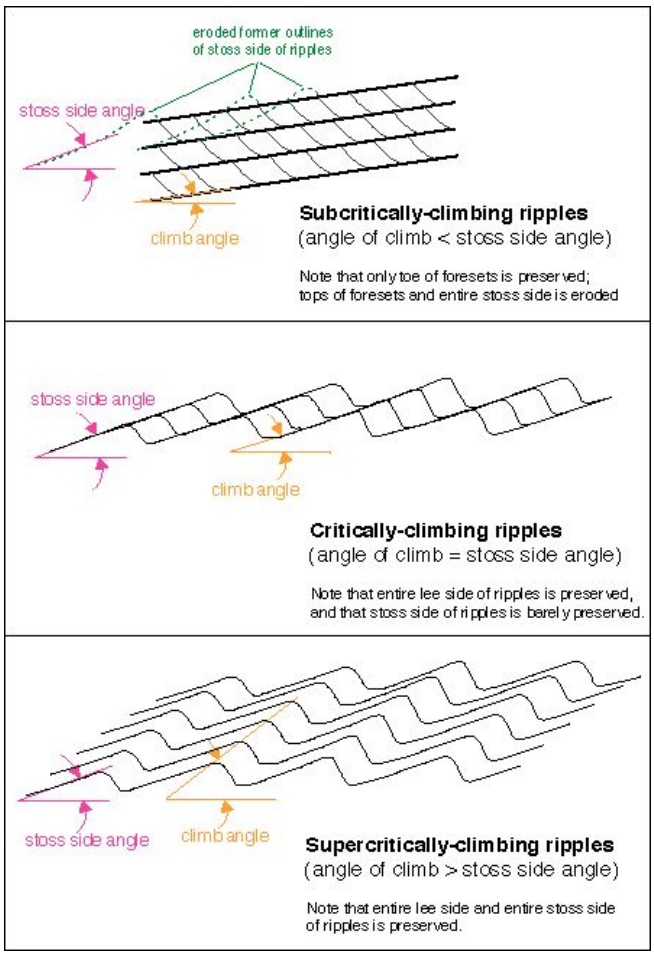


- **Bedform bounding surface**: Makes up boundary of one set of cross laminations. For 2D ripples they are straight, relatively planar, and cross laminations are thin beds laminae. For 3D ripples, they are not planar, may be curved or truncated.

- **Bedrock**: Lil Wayne ft Drake, Nicki Minaj, Lloyd, and TYGA (We gonna pass the exam if we listen to this!!!) jokes aside. Bedrock is solid rock underlying loose deposits of soil/alluvium. Also, the home of the Flintstones!

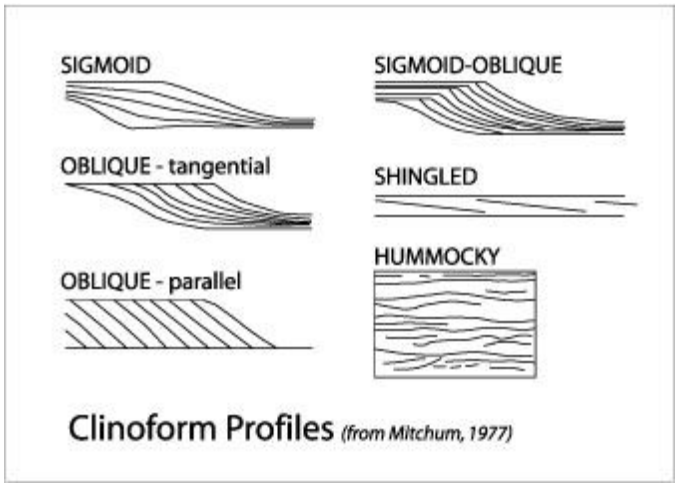
- **Benchmark**: A criterion by which something is measured; a reference point.

- **Climbing ripples** : Formed by a combination of current/wave ripples. Climbing ripples form as a result of decelerating flow velocities and therefore an INCREASE in net deposition during ripple formation which produces an element of vertical and horizontal motion. Formed by excessive suspended sediment in water column. NOT FORMED BY HIGH FLOW VELOCITIES DEPOSITING SEDIMENTS QUICKLY!!!!



- **Clinoform**: basically, a slope - a collection of uniformly dipping strata. Bernard used the term “unicline” in one of the last lectures, this term synonymous to homocline, but is no longer used

- **Clinometer**: An instrument used for measuring angle or elevation of slopes. Part of a

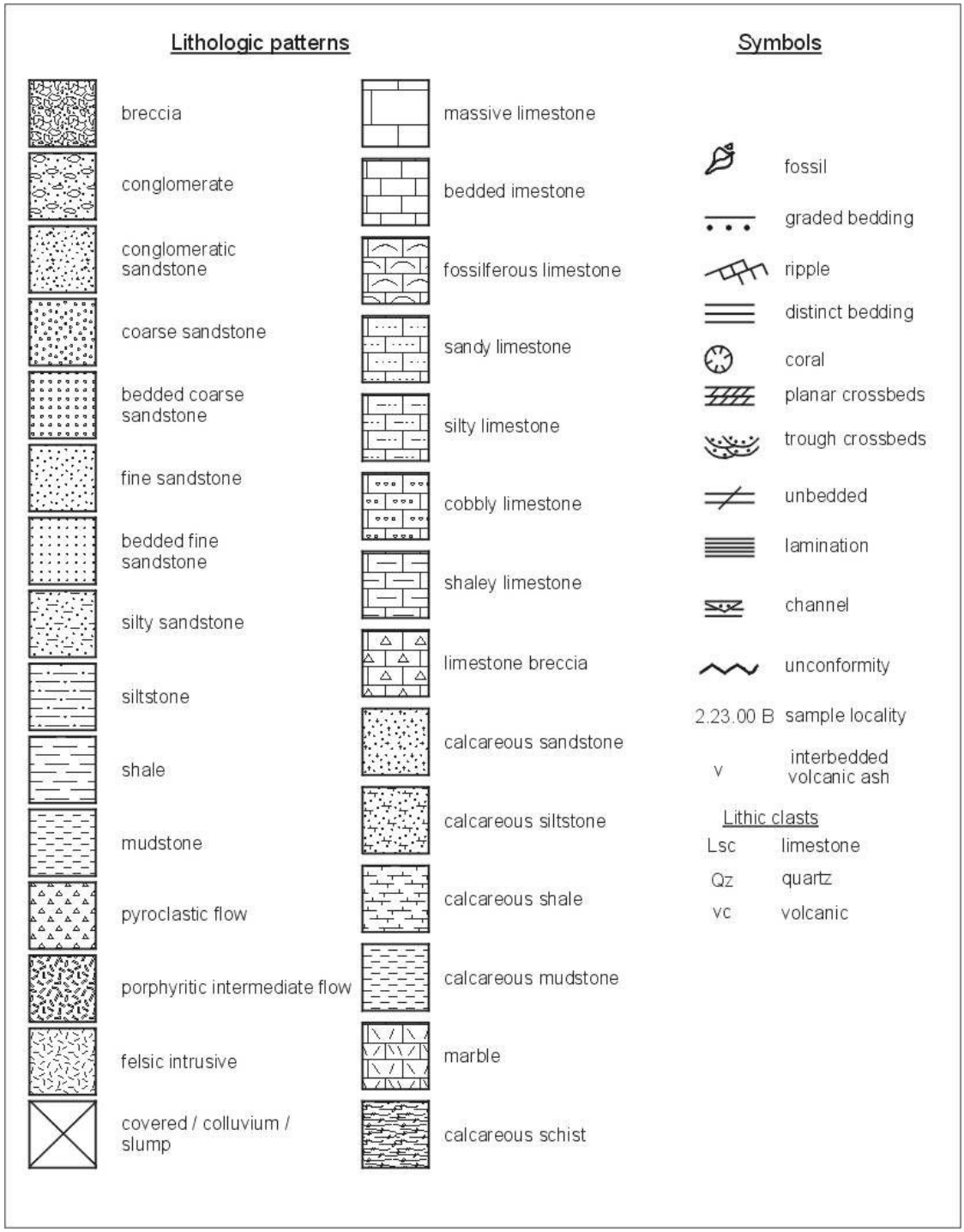


compass.

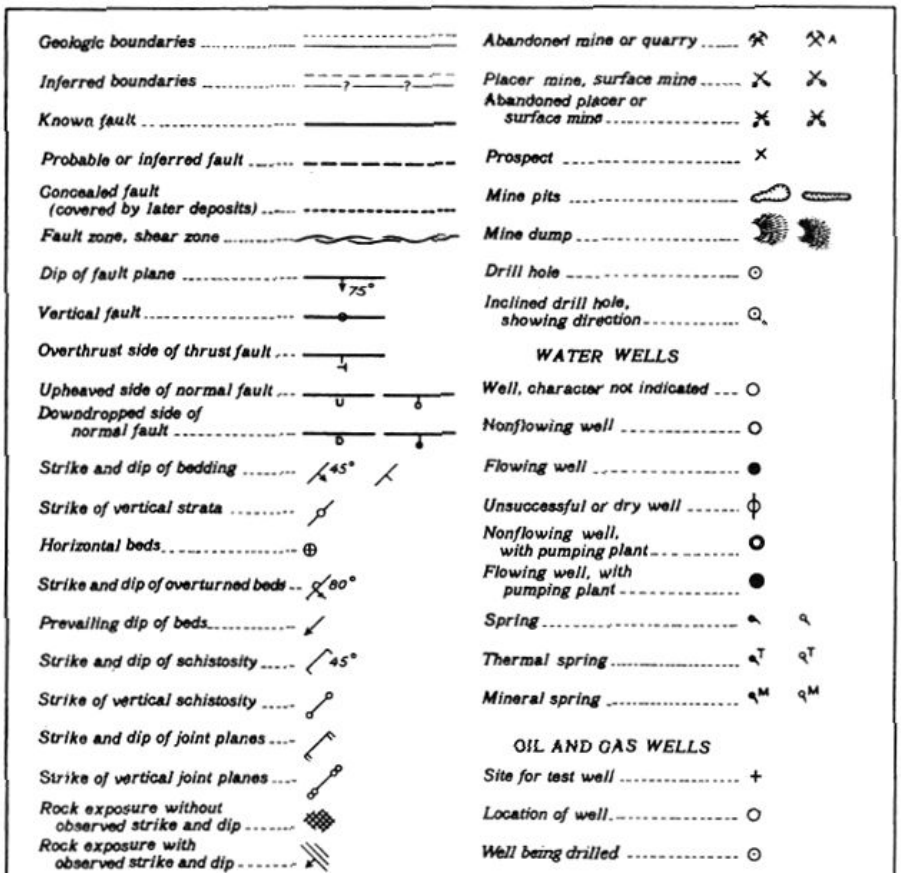
- **Coal Seam**: A bed of coal that is thick enough to be profitably mined.

- **Coastal plain**: A low plain of little relief adjacent to the ocean and covered with gently dipping sediments.

- **Common Lithologic symbols**:



- **Common map symbols** for geologic maps:



??

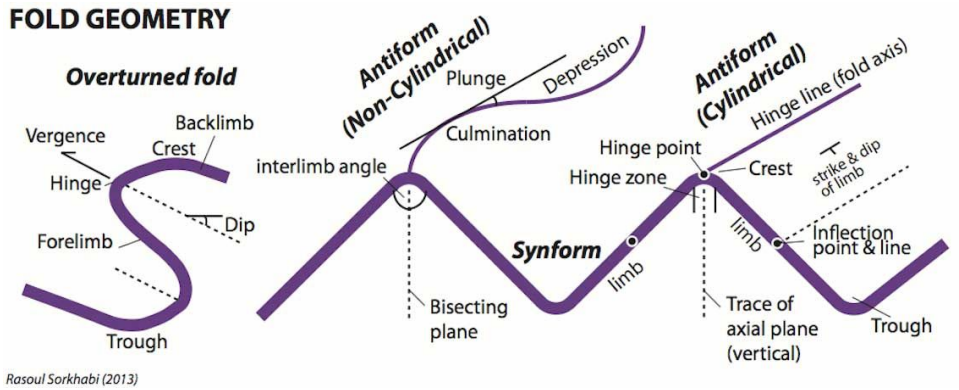
- Common rock types: ummmmmm, common rock types would include sandstone, limestone, shale, etc? - sedimentary, igneous metamorphic

- **Conformable contact**: No evidence of break or erosion in stratigraphic succession. There are two types of conformable contacts: Abrupt and Gradational contacts. The former represents bedding planes with sudden minor changes in depositional conditions. The latter represents a gradual change in deposition conditions (i.e mixing zone).

- **Contour Interval**: Vertical distance between elevations represented by adjacent contour lines on a map.

- **Contour spacing on a map**: The contour interval i.e. 100m

- **Crest and Trough** of fold:



- **Cross bedding**: Layering within a stratum at an angle to the main bedding plane.

- **Cross lamination**: essentially a form of cross bedding where the beds are very thin (few mms) the term lamination is used
  According to Boggs (Sed Strat pg 66), Laminations are layers less than 1cm in thickness. Cross-laminations are the layers that make up the internal structures of bedforms, and are deposited at an angle to the bounding surface.

- **Cross section**: An interpretation of a vertical section through the Earth's surface, most usefully a profile, for which evidence was obtained from a geologic map.

- **Datum**: Fixed starting point.

- **Depositional dip**: Primary dip of the map of interest - in reference to current structures, this the is dip of the lee side of a ripple/dune, perpendicular to the crest (and therefor depositional strike), which corresponds to the feature's depositional surface.

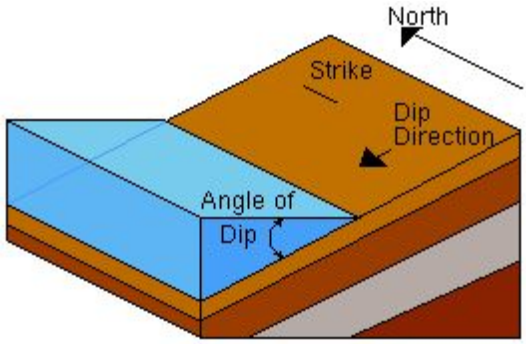
- **Depositional strike**: Primary strike - in reference to a current structure, the depositional strike is the plane of deposition and runs parallel to the crest/trough. In 3D ripples/dunes, this runs on what would be the average parallel surface of the crests.

- **Dip Angle**: self explanatory. Steepest angle of descent of a titled bed or feature relative to the horizontal plane.

- **Dip direction**: 90* angle (perpendicular) to strike, in the downward direction. (By virtue of the “right-hand rule”, dip direction determines the direction of strike.

- **Dip separation**: The distance of separation between formerly adjacent beds on either side of a fault surface. Dip separation is the hypotenuse between heave and throw.

- **Dip vs strike section**:

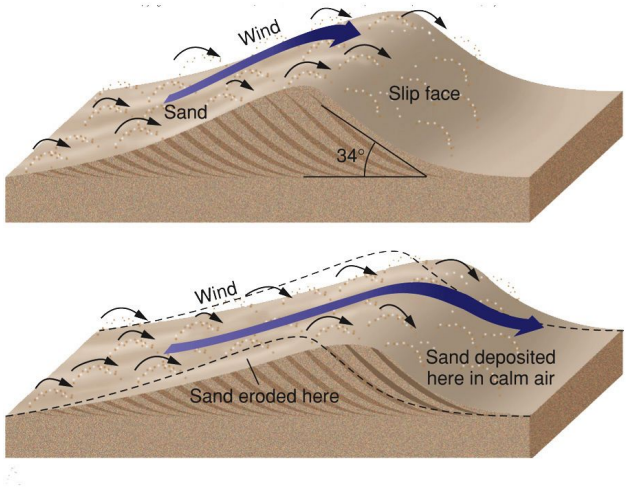


- **Disconformable contact:** The origin of the disconformity in the strata Typically bedding planes with an angular (not parallel) contact.

- **Disconformity**: usually erosional contacts that are parallel to the bedding planes of the upper and lower rock units. They are usually a result of erosion ~~but can occasionally represent periods of non-deposition~~. *Periods of non-deposition are paraconformities.*

- **Discordance**: A discordant coastline comprises rock types of alternating resistance that run perpendicular to the shore, creating distinctive landforms when the rocks are eroded by ocean waves.
  Bernard also said: Lack of parallelism in strata. So when you have a vertical dyke or something going through parallel data… that would be a discordance!
  Another example, the margin between an angular unconformity.

- **Dune**: A sand hill/ridge that is formed by the wind or water. Greater in size than a ripple.

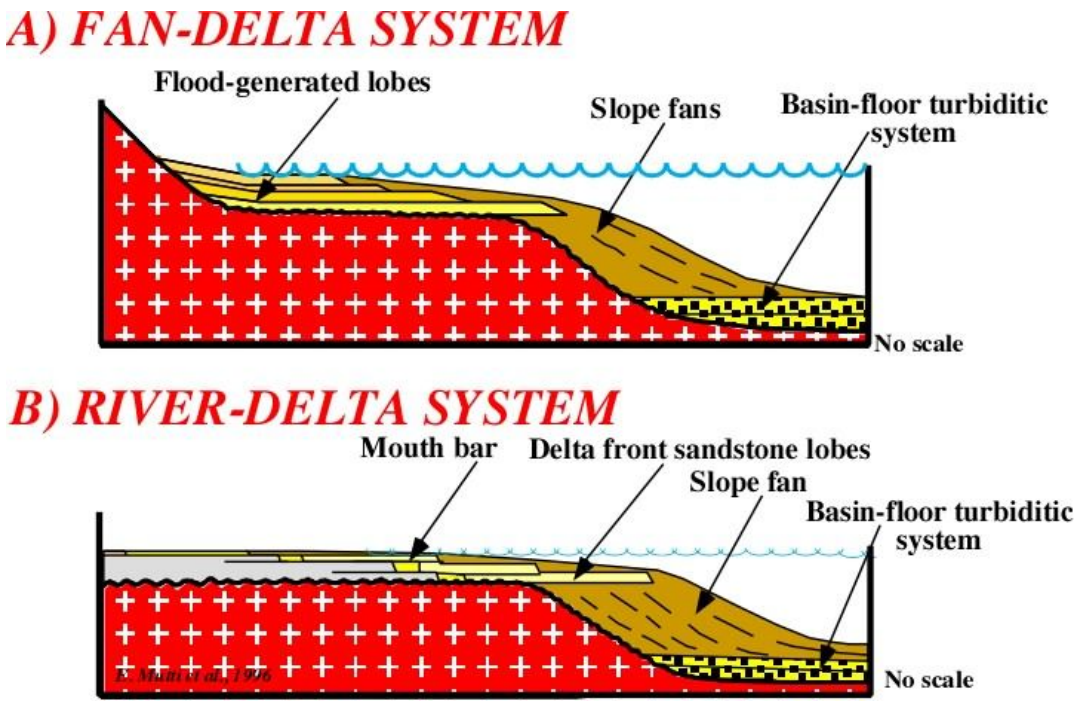


- **Dune Foreset**: TELLS US WHICH WAY THE CURRENT IS GOING

- **Dyke**: An igneous intrusion that cuts across (**NOT** horizontal to current strata) the surrounding rock. Typically through fractures and planes of weakness that are NOT bedding planes.

- **Equal area stereonet**: Look at your stereonet. Specifically, the Lambert (aka Lambert-Schmidt) net, which we use. The Wuff net is also an equal area stereonet, but is suitable for crystallography.

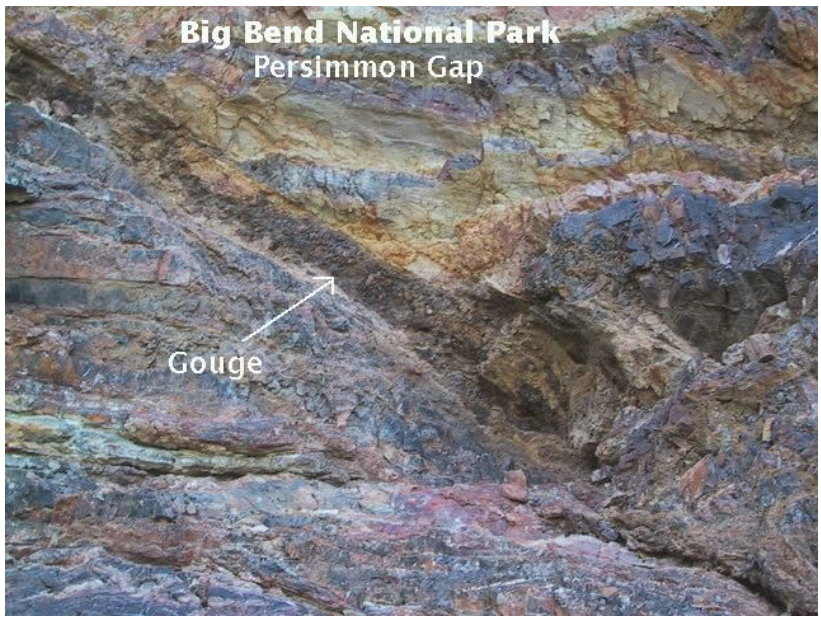
- **Fan delta**: A depositional feature that is formed where an alluvial fan develops directly in a body of water from some adjacent highland.



- **Fault**: Surface of a rock structure along which there has been differential movement of the rock on either side.

- **Fault contact**: The plane along which rock bodies slide past one another.

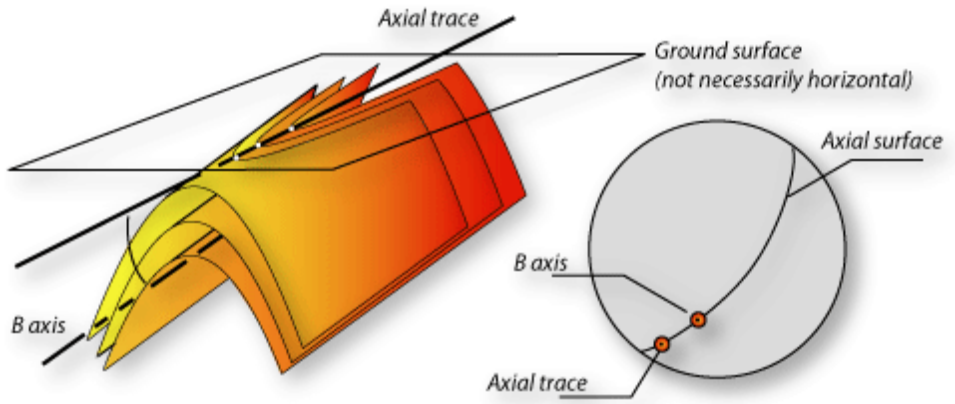
- **Fault gouge**: Is an unconsolidated tectonite with a very small grain size. It usually has no cohesion and is an unconsolidated rock type unless cementation took place at a later stage. Is crushed and ground up rock that is produced by friction between the two sides when a fault moves.



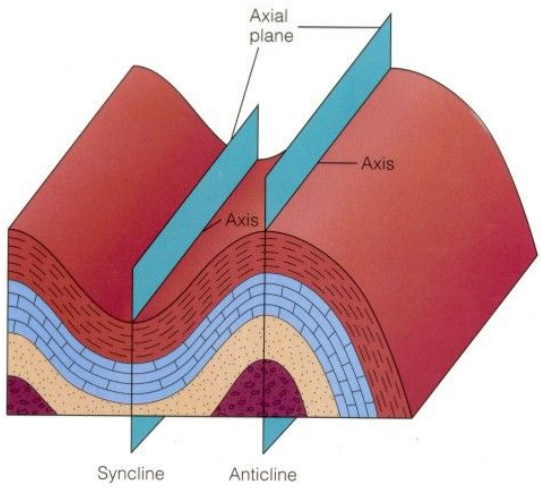
- **Fence diagram**: A system used for the visualization of stratigraphic and structural relationship. It is a software where information of the sub-surface must be input in order to generate results. Basically a cross section.

- **Floodplain**: An area of low lying ground adjacent to a river. Formed mainly of river sediments and subject to flooding.

- **Fold axial surface trace**:



- **Fold axis**:



- **Foliation**: Preferential layering of minerals in metamorphic rocks. Is caused by deviatoric stress (uneven pressure/stress)

- **Footwall**: The wall adjacent to the hanging wall defined by miners as the wall where one would place their foot.

- **Formation**: A formation is a rock unit that is distinctive enough in appearance that a geologic mapper can tell it apart from the surrounding rock layers. It must also be thick enough and extensive enough to plot on a map.

- **geologic events-** events of a geologic nature (faulting,folding)
- **geologic map**- map showing geological features
- **geological horizon** or unit- A distinct geological unit
- **geopetal structure-** indicators of “up” during deposition
- **great circle**- The larger circles on a map projection (or stereonet - which is an equal area projection) = lines of longitude
- grid contouring method-(know how to do)
- **hanging wall**- the wall adjacent to the foot wall defined as the wall which would be used to hang lanterns on while mining
- **heave and throw** (heave out; throw up) horizontal and vertical component of “dip ~~displacement~~ separation” Dip separation is the hypotenuse of heave and throw.
- **heterolithic strata** - *Heterolithic* bedding is a sedimentary structure made up of interbedded deposits of sand and mud. It is formed mainly in tidal flats
- **Hinge of fold-** the central line of folding (fold axis)
- **igneous intrusive vs. extrusive-** basalt vs gabbro ; rhyolite vs granite (= extrusive vs intrusive format)
  Intrusive = plutonic, slower cooling, more coarse crystals (gabbro, diorite, granite - Mafic to Felsic)
  Extrusive = volcanic, fast cooling, smaller crystals (basalt, andesite, rhyolite)

inclined asymmetrical fold- inclined fold with two limbs at alternate dips

interlimb angle- angle between two limbs of a fold

isochore map- equal vertical thickness map

isometric block diagram- equal distance map

isopach map- equal layer of true thickness map

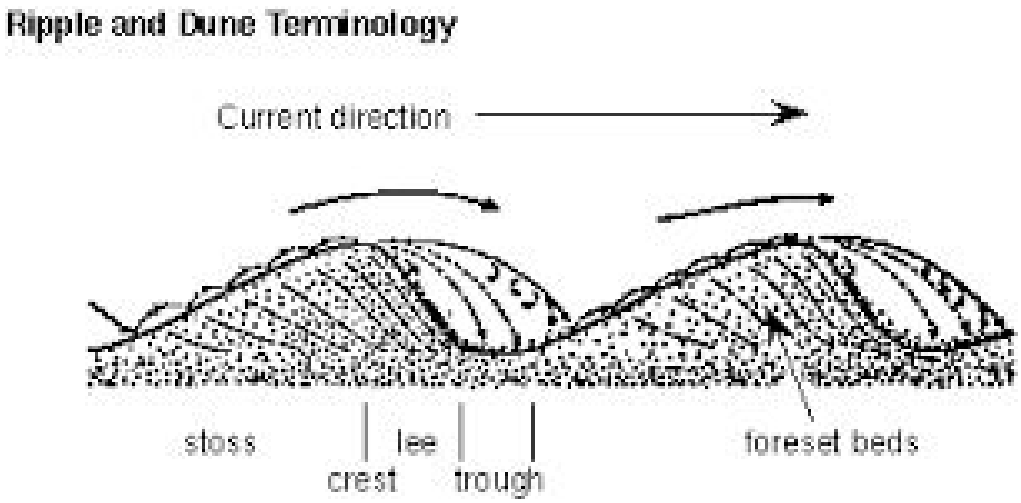
lamina- isolated sheet of lamination

lateral accretion- sediments deposited laterally

Latitude- angle of change on earths surface (N / S)

lava flow- the path and form extrusive volcanic deposits take

lee and stoss sides of ripples or dunes-



limb of fold- one portion of a fold separated by the hinge

Longitude- imaginary lines of equal degree separating the globe laterally (E/W) that run north south

magnetic declination- the order of error associated with the poles also horizontal angle difference between true and magnetic north

Map (just to be on the safe side, I'm referring to our profs)

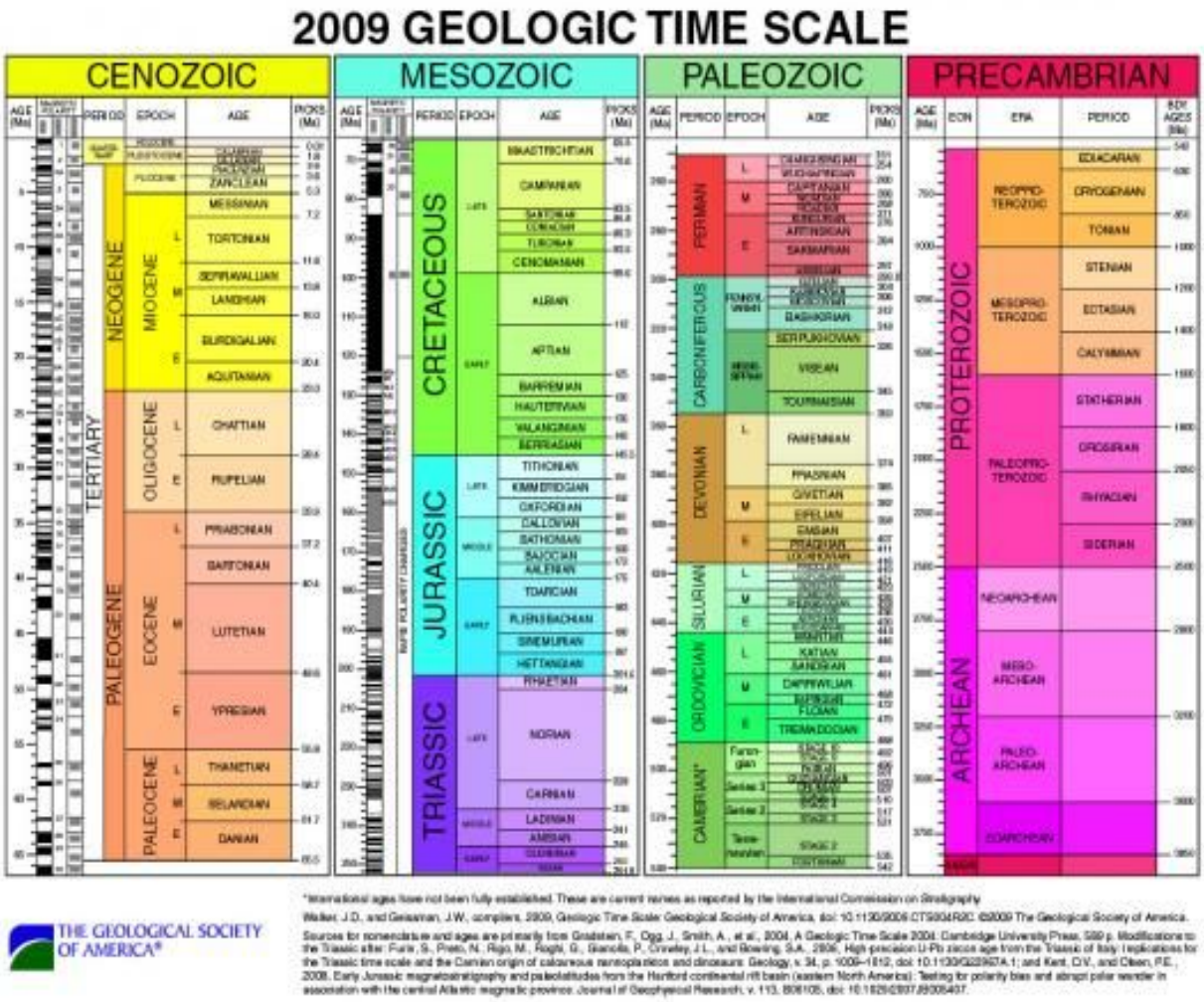
map pattern due to topography- says it in the name

map patterns due to folding-"

meander bar thickness - thickness of abandoned channel

meander cut-bank - new area of accretion and flow of a channel

Mesozoic-



*International ages have not been fully established. These are current names as reported by the International Commission on Stratigraphy

Walker, J.D., and Geissman, J.W., compilers, 2009, Geologic Time Scale: Geological Society of America, doi: 10.1130/2009.CTS004R2C. ©2009 The Geological Society of America.

Sources for nomenclature and ages are primarily from Gradstein, F., Ogg, J., Smith, A., et al., 2004, A Geologic Time Scale 2004: Cambridge University Press, 589 p. Modifications to the Triassic after: Furin, S., Preto, N., Rigo, M., Roghi, G., Gianolla, P., Crowley, J.L., and Bowring, S.A., 2006, High-precision U-Pb zircon age from the Triassic of Italy: Implications for the Triassic time scale and the Carnian origin of calcareous nannoplankton and dinosaurs: Geology, v. 34, p. 1009–1012, doi: 10.1130/G22967A.1; and Kent, D.V., and Olsen, P.E., 2008, Early Jurassic magnetostratigraphy and paleolatitudes from the Hartford continental rift basin (eastern North America): Testing for polarity bias and abrupt polar wander in association with the central Atlantic magmatic province: Journal of Geophysical Research, v. 113, B06105, doi: 10.1029/2007JB005407.

net sand map -The summation of sand interval thicknesses of a stratigraphic interval in question. (I think this is correct)1

nonconformity- sedimentary deposits over igneous layer

normal fault- hanging wall lower than foot wall

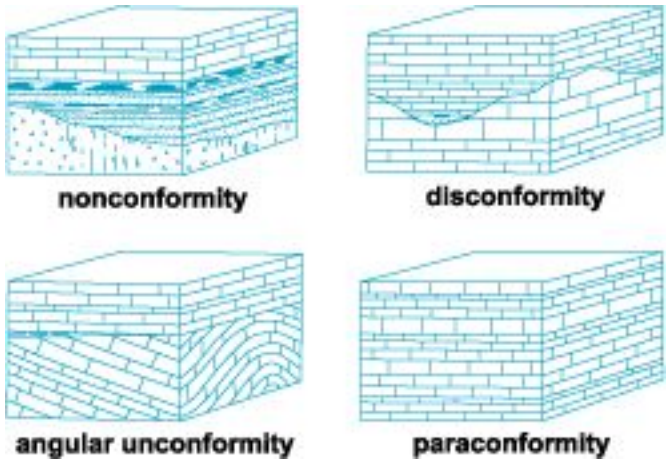
outcrop- An **outcrop** or rocky **outcrop** is a visible exposure of bedrock or ancient superficial deposits on the surface of the Earth.

overturned- a layer invertly deposited (relative to surrounding layers and features)

overturned fold- a fold casing inversion of deposition

Paleozoic- refer to mesozoic

paraconformity-A paraconformity is a type of unconformity in which strata are parallel; there is no apparent erosion and the unconformity surface resembles a simple bedding plane. It is also called nondepositional unconformity or pseudoconformity.

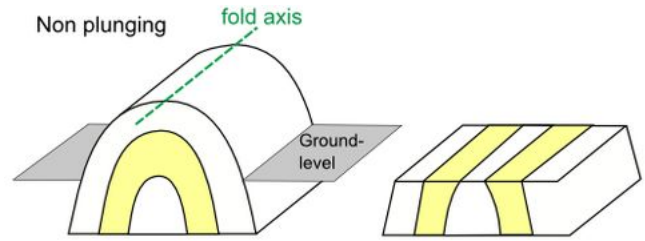


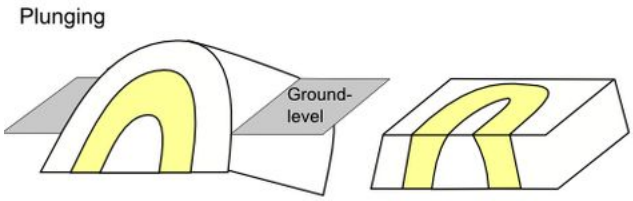
pitch or rake- the angle between a line [or a feature] and the strike line of the plane in which it is found

plane vs. line- 3 d v 2d

plunge- The angle of inclination of the axis, as measured from the horizontal

plunging fold-





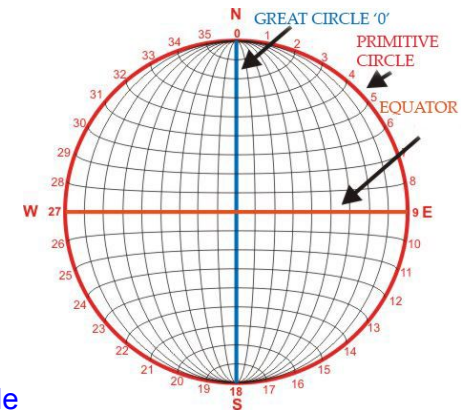
Plunging Anticline

Plunging Syncline

point bar or meander bar - a depositional feature made of alluvium that accumulates on the inside bend of streams and rivers below the slip-off slope.

pole to a plane- stereonet

pre-, syn-, and post-tectonic - processes taking place before during and after tectonic process



primitive circle

principle of cross-cutting relations: Is a principle of geology that states that the geologic feature which cuts another is the younger of the two features

principle of original horizontality- everything is originally horizontal

principle of superposition- older at bottom

progradation- In sedimentary geology and geomorphology, the term *progradation* refers to the growth of a river delta farther out into the sea over time

properties map- map detailing properties of a specific nature (

relative ages- as stated

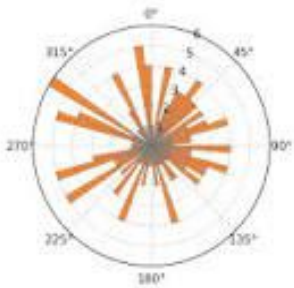
relief- difference in elevation between any two points

reverse fault footwall is lower than hanging wall

ripple- small scale lateral accretion

rock record- geological record

rose diagram -A circular histogram plot which displays directional data and the frequency of each class

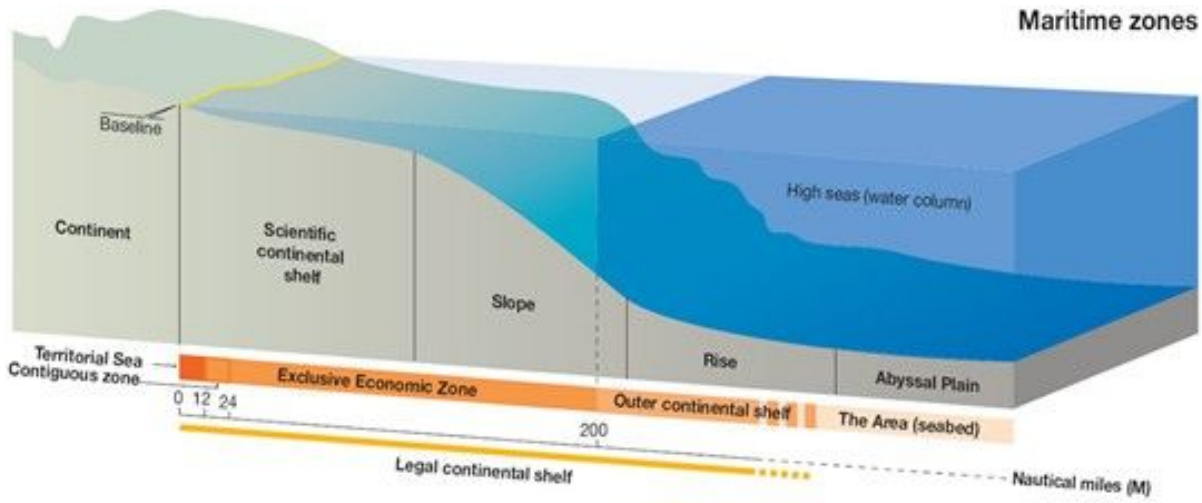


rules of contouring- practice them ie follow logical steps

sandstone- made of sand is a stone.

seismic section- an image generated of the subsurface by analysis of the reflectivity of the underlying strata with distance on plotted on the x axis and two way time on the y axis.

shelf and shelf edge and slope



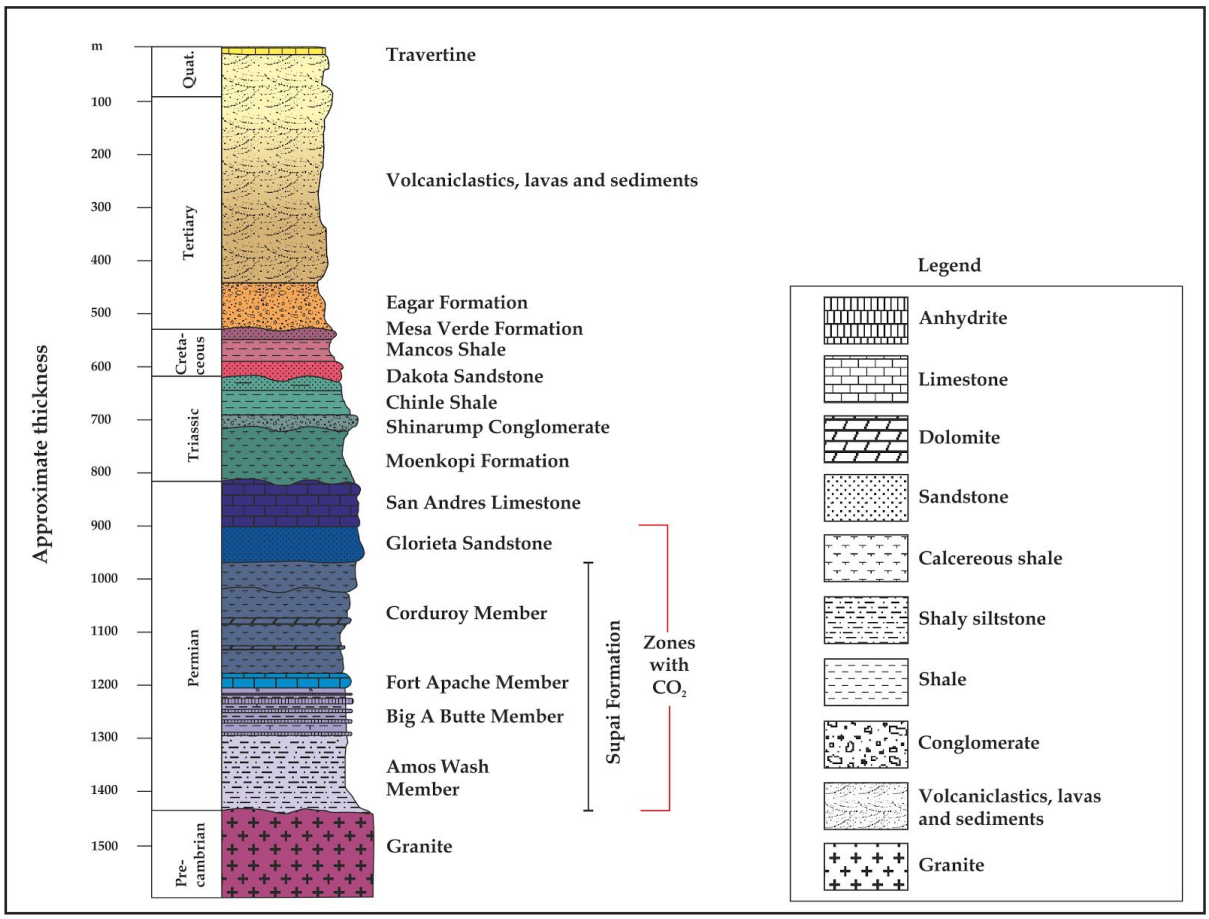
shoreface- edge of the shore

shoreline - not too sure for the definition here
sill -tabular sheet intrusion that has intruded between older layers of sedimentary rock, beds of volcanic lava or tuff, or even along the direction of foliation (vertical to strata) in metamorphic rock.

small circle - (see stereonet) = lines of latitude

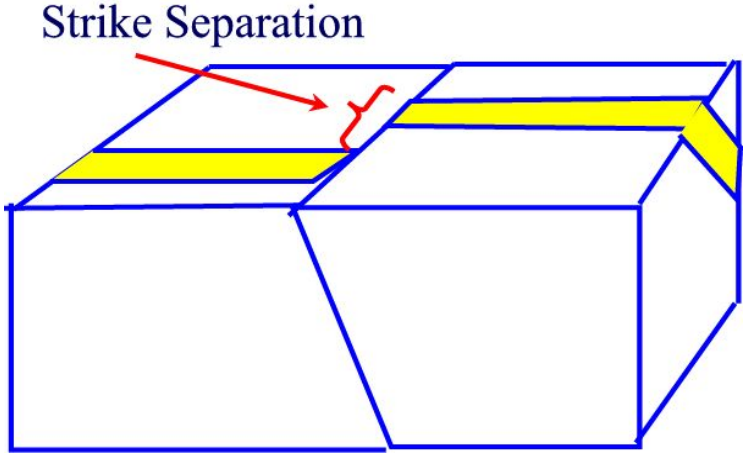
straight vs. curved structure contours - this reflects the stratigraphy of map, straight means that it is uniform, curved reflects valleys and hills
strata - a single bed of sedimentary rock, generally consisting of one kind of matter representing continuous deposition.

stratigraphic column



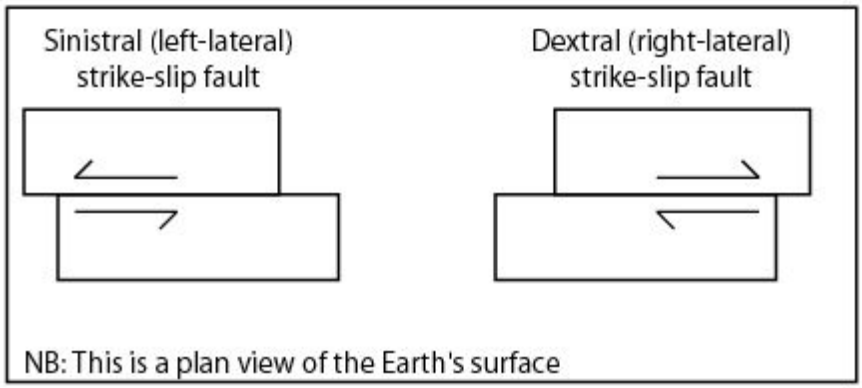
stratigraphic cross-section
stratigraphic separation
stratigraphic thickness vs. vertical thickness
strike - direction of the line formed by the intersection of a fault, bed, or other planar feature and a horizontal plane

strike separation - offset measured parallel to strike of fault



strikeline

strike-slip fault - The fault surface is usually near vertical and the footwall moves either left or right or laterally with very little vertical motion. Strike-slip faults with left-lateral motion are also known as *sinistral* faults. Those with right-lateral motion are also known as *dextral* faults



structural cross-section - a cross section depicting subsurface data (geologic units, contacts, unconformities, etc.), datum is usually sea level.

structural map - we have been using this map the entire course

structure contours - lines that represent changes in units of geology

subcrop - A subcrop is that part of a geological formation (eg a coal seam) that is close to the surface but is not outcropping. It is usually under the soil profile or alluvial sediments.

surface or surficial deposits

syncline - smiley face you think you are so cool Devin, anticlines are frowning faces.

syn-depositional - occurring at the same time as deposition

syndepositional discordance - when sediment is deposited in a method resulting in a non conformable bedding plane. Like dunes… think about it?

tabular cross bedding - consist of cross-bedded units that have large horizontal extent relative to set thickness and that have essentially **planar bounding surfaces.** Tabular cross-bedding is formed mainly by migration of large scale, straight crested ripples and dunes. It forms during lower flow regime conditions and its individual beds range in thickness

from a few tens of centimeters to a meter or more

tan (δ) = tan (ϕ) · cos (β)
δ = apparent dip
ϕ = true dip
β = angle of separation of apparent from true dip (kinda like rake, but it is not.)
thickness map
three-point problem: a three point problem consists of 3 different elevations in which you must take the 2 with the greatest difference in order to help you draw strike lines.
thrust fault - Footwall is displaced above the hanging wall
topographic contours
topographic map
trend - The trend measures the orientation of a linear feature. The trend is measured in the down plunge direction of the line in the horizontal plane
triangulation contouring method - connecting data points with straight lines and subdividing the lines based on the contour interval

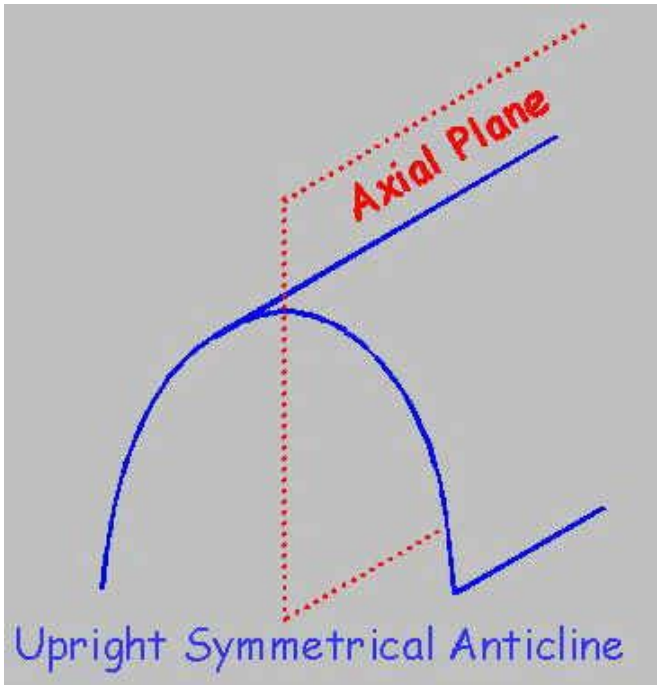
trough cross bedding -Trough cross-beds have lower surfaces which are curved or scoop shaped and truncate the underlying beds. The foreset beds are also curved and merge tangentially with the lower surface. They are associated with sand dune migration

true dip

types of contacts - (types of contacts? These are the contacts used in maps between units: defined, approximate, inferred)

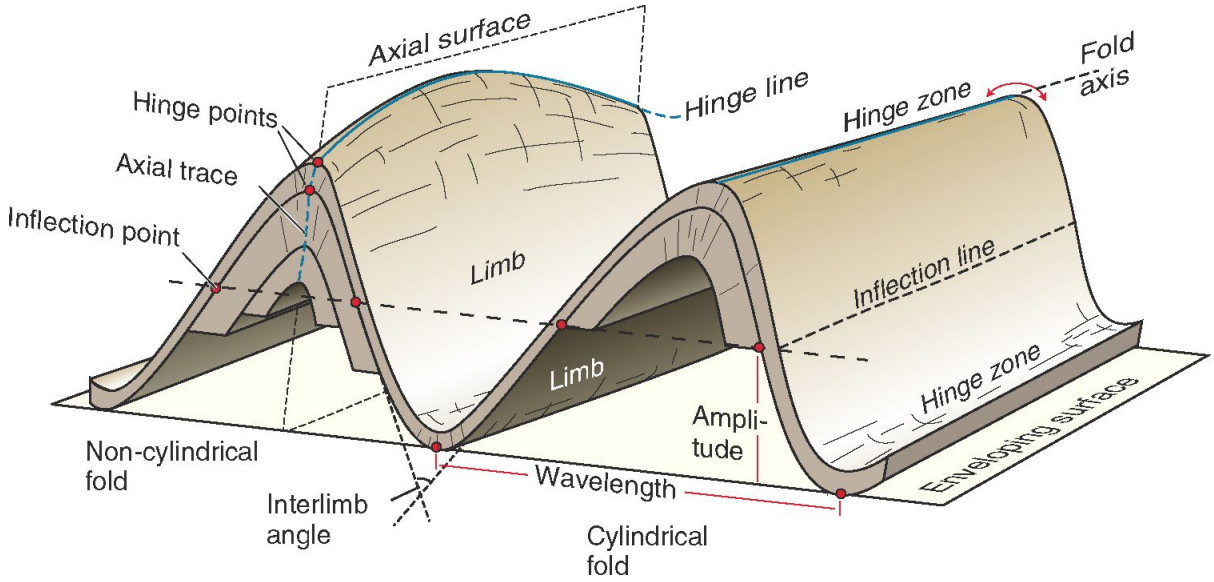
unconformity - gaps in the geologic record that may indicate episodes of crustal deformation, erosion, and sea level variations. Unconformities represent times when deposition stopped, an interval of erosion removed some of the previously deposited rock, and finally deposition was resumed.

upright symmetrical fold - the axial plane is vertical and the dip angles of beds in both limbs are equal



UTM coordinate system - *Universal Transverse Mercator* system uses a 2-dimensional Cartesian coordinate system to give locations on the surface of the Earth. It is a horizontal position representation, i.e. it is used to identify locations on the Earth independently of vertical position, but differs from the traditional method of latitude and longitude in several respects.
The UTM system is not a single map projection. The system instead divides the Earth into sixty zones, each a six-degree band of longitude, and uses a secant transverse Mercator projection in each zone.

vertical exaggeration - the ratio of vertical compared to horizontal. If the horizontal scale is 1cm = 500m and vertical scale is 1 cm = 200m then the vertical exaggeration would be 500/200, or 2.5
wavelength of fold



π-girdle

Some types of problems that might be similar to what they ask us on exam

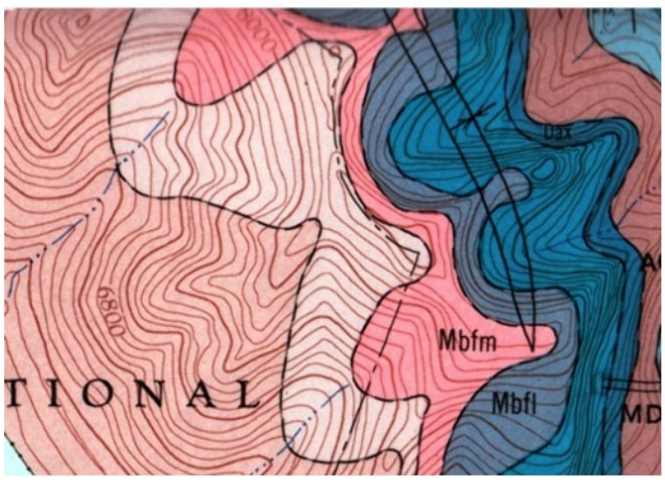
From west to east on the map, how does the dip of the units change?

a) *Uniformly E-dipping.*

b) *Uniformly W-dipping.*

c) *East-dipping, decreasing to the East side.*

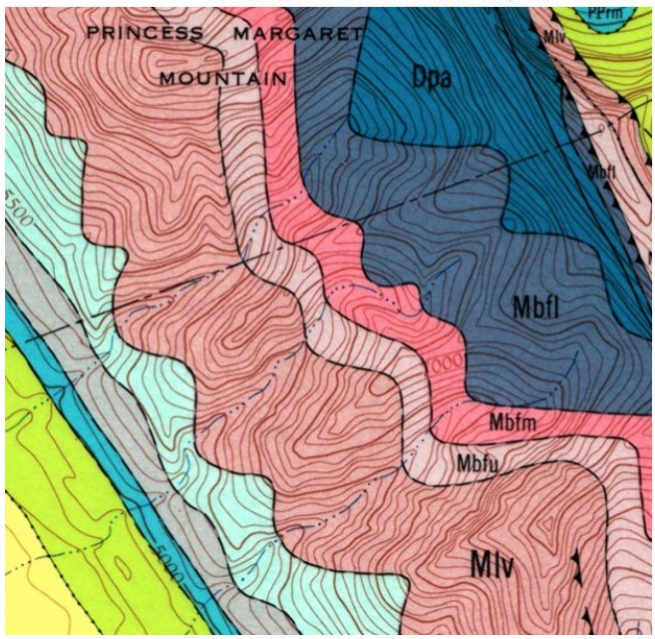
a) *West-dipping, decreasing to the East side.*



Answer: It is not uniformly dipping since there are folds involved. I think it is D?

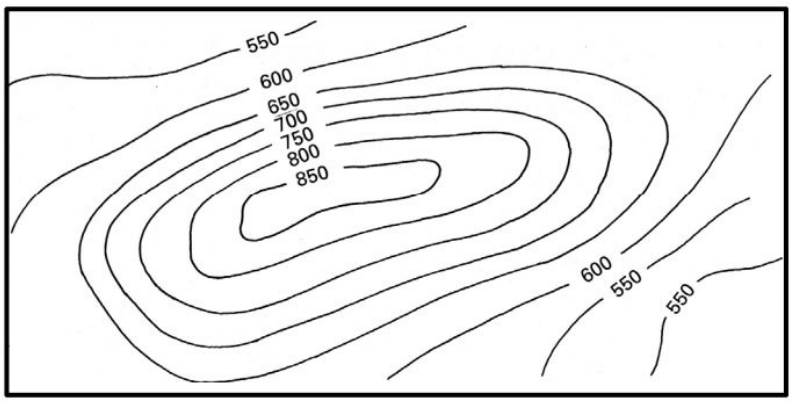
What is the dominant structure illustrated over most of the area?

a) *Anticline*
b) *Syncline*
c) *Units dipping NE*
d) *Units dipping SW*



Answer: The units are all dipping to the SW. There is not enough information to determine whether it is an anticline or syncline. We know that it is dipping to the SW by looking at the contours. The contours are much more closely spaced in the top right hand corner of the map, from this we can determine that there is a scarp in that area, and by also using the contour lines we can identify a general direction for the strike line. Using the scarp and the strike, we can see which way the units are dipping.

What kind of map is this?



Topographic map?

What kind of unconformity is this?

Answer: This is a nonconformity because you can tell that the composition of the rocks is different at the top and bottom. The bottom seems to be igneous or metamorphic rock while beds of sedimentary rock lie on the top so non conformity

What surfaces do you see? What is the current direction?

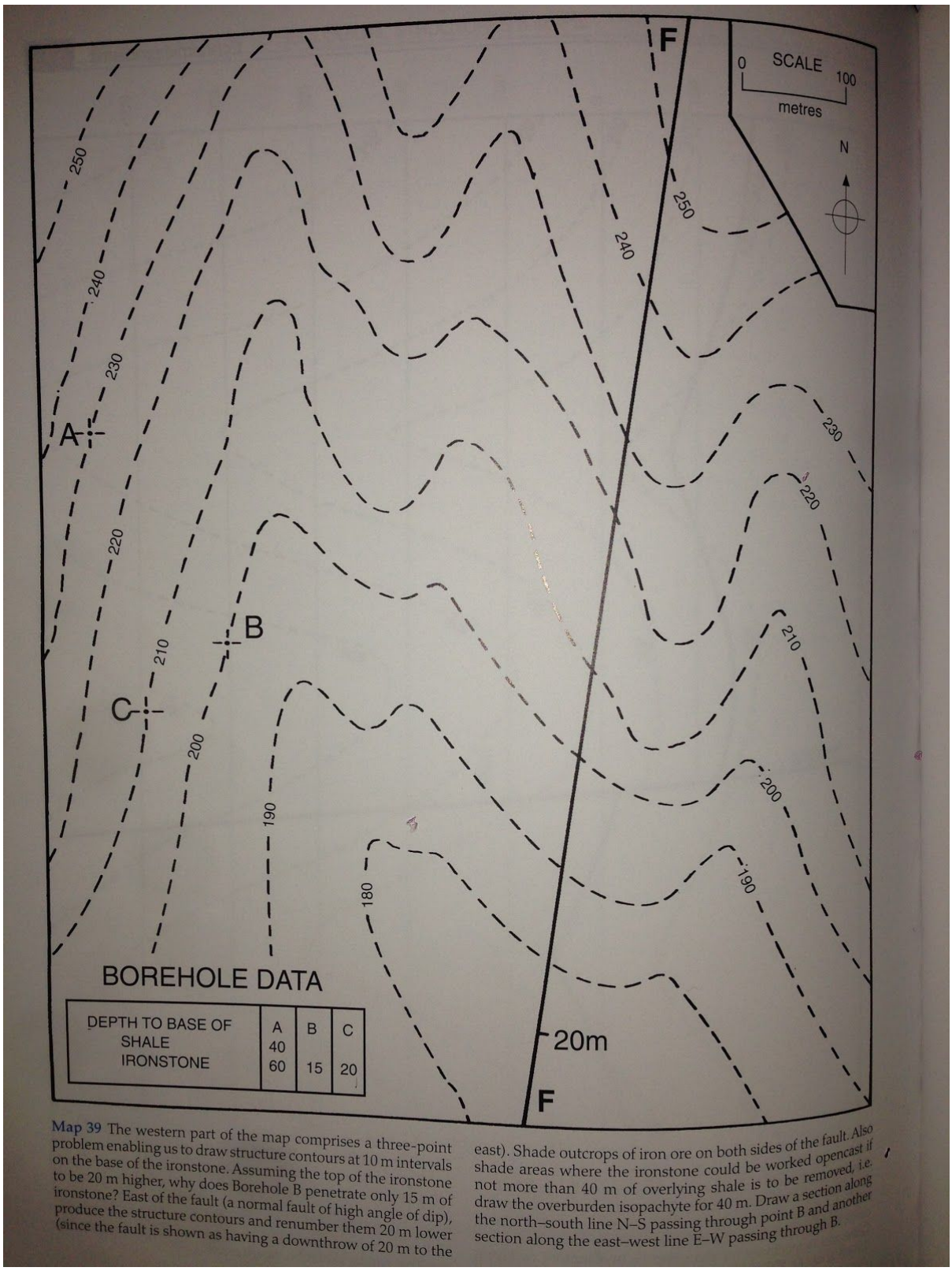
Answer: Surfaces: 3d dunes? Direction: To the left, ← ?

What are the surfaces? What is the current direction

Answer: Surfaces: ripples (3-D trough cross bedding apparently) The current is actually out of the page because the current envelops the rock from either side. I don't think I explained it well =/

Its because of the orientation of the ripple when looked at from the side imagine standing on the left side you'd see the dip coming/going to the right (ie out of the page) its a bunch of concentric ripples that have been eroded away the second part is that it goes from a higher to lower elevation

heres some map problem that i thought might be similar to what he might ask on the exam. or i could be totally off but extra practice never hurts



Map 39 The western part of the map comprises a three-point problem enabling us to draw structure contours at 10 m intervals on the base of the ironstone. Assuming the top of the ironstone to be 20 m higher, why does Borehole B penetrate only 15 m of ironstone? East of the fault (a normal fault of high angle of dip), produce the structure contours and renumber them 20 m lower (since the fault is shown as having a downthrow of 20 m to the east). Shade outcrops of iron ore on both sides of the fault. Also shade areas where the ironstone could be worked opencast if not more than 40 m of overlying shale is to be removed, i.e. draw the overburden isopachyte for 40 m. Draw a section along the north–south line N–S passing through point B and another section along the east–west line E–W passing through B.