University of Anbar

College of Science

Department of Applied Geology

Field Geology

Title of the lecture

rock successions, standard thickness and distance measurements

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Graphic logs

The preceding section should have provided you with the tools to start recording the features of individual units that make up sedimentary rock successions in the form of written notes and also sketches of both large -and small - scale features. However, the standard way to record and summarize data on sedimentary rock successions is by using a graphic log (Figure 1).

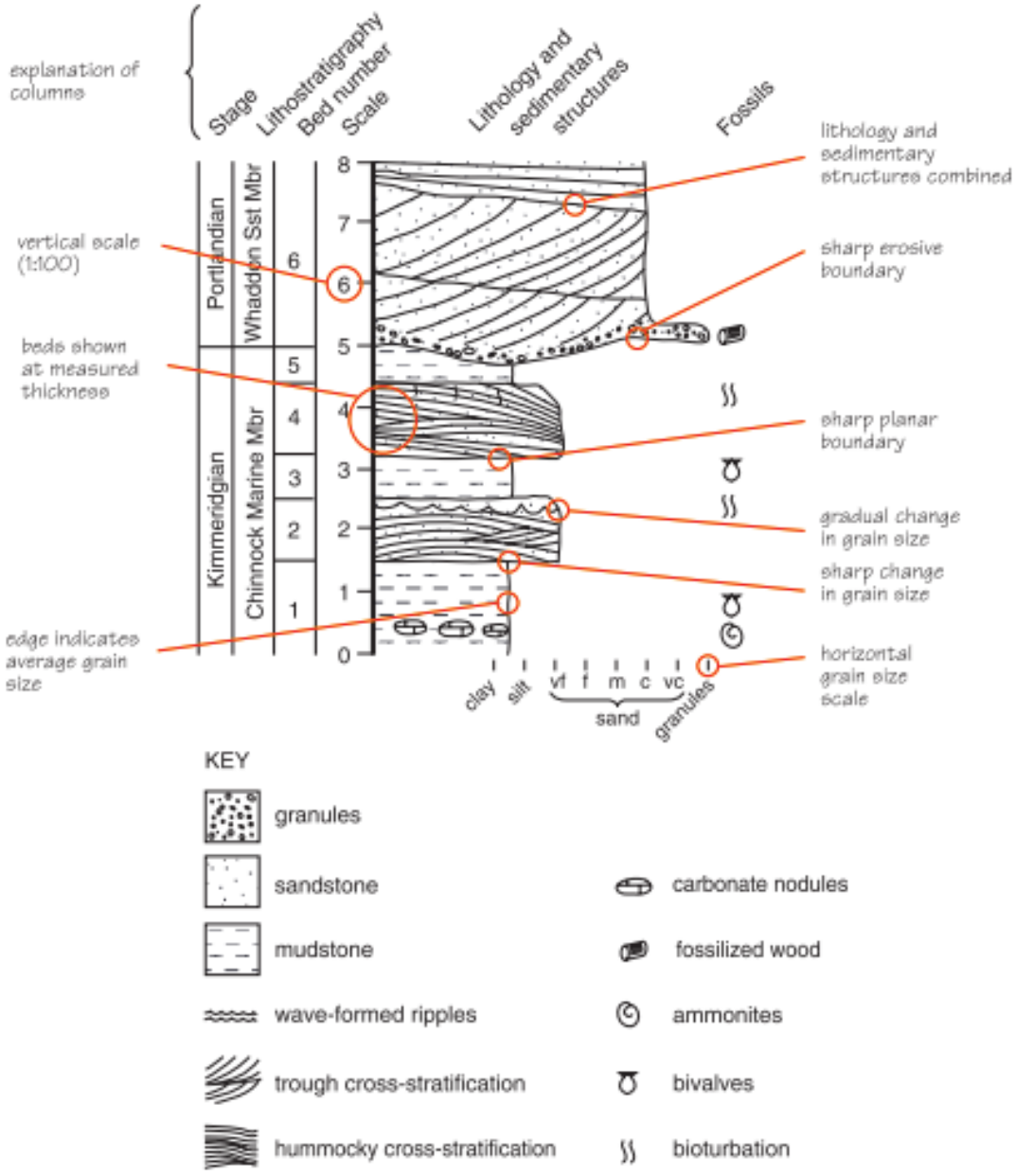

Figure 1 A neat version of a typical graphic log with some of the key features labelled. The field version should look very similar except it might not be drawn to scale vertically and there might be other columns with samples, photographs and links to more detailed notes on particular contacts and/or units.

Graphic logs have many advantages because they:

• are a succinct method of summarizing a lot of data;

• immediately give an impression of the vertical succession and can therefore aid in the identification of repetitions and major changes in the sedimentary facies.

• are a convenient way of testing and making correlations between sections of similar age from different places.

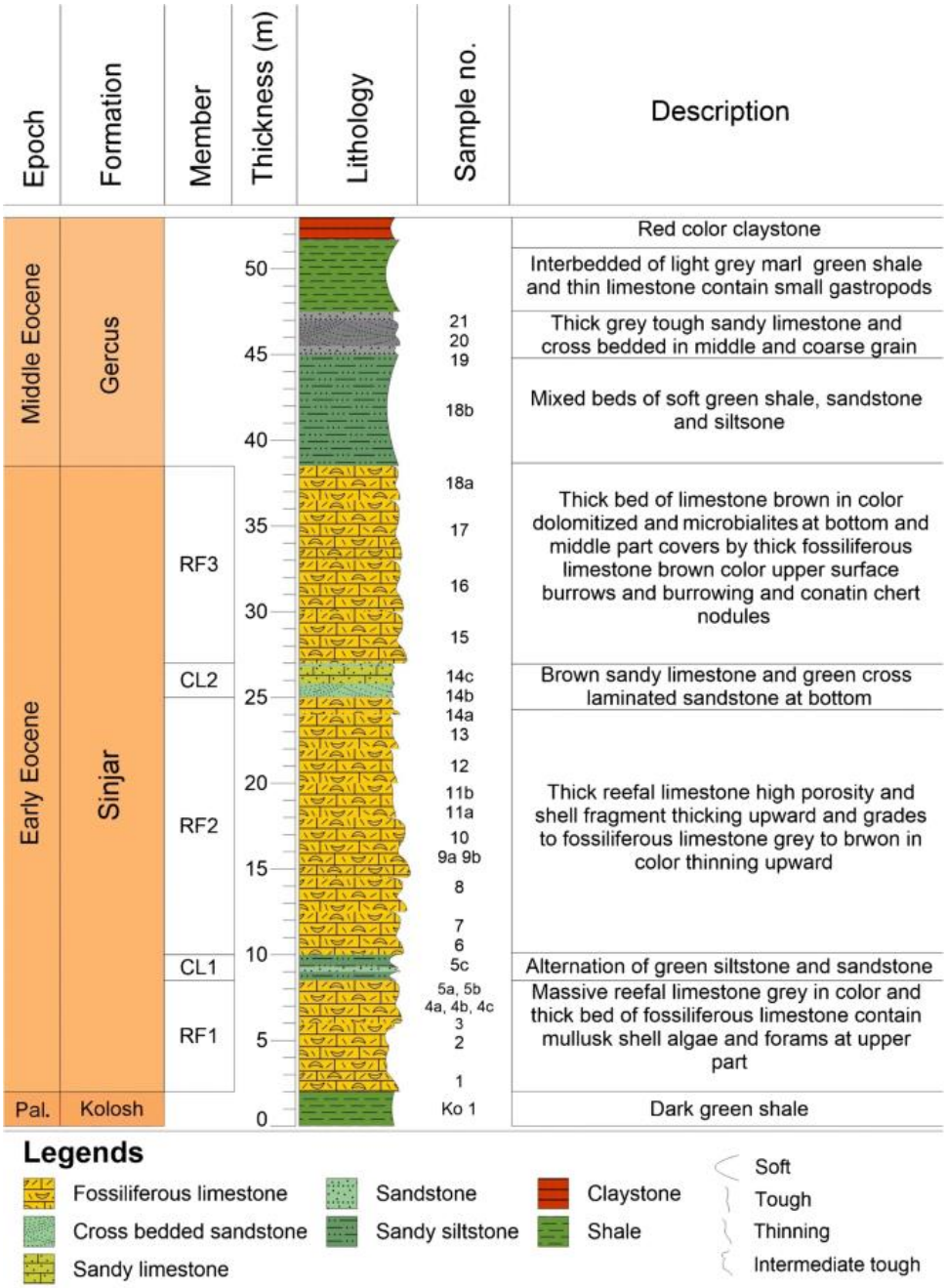

Figure 2 example of stratigraphic column in iraq

Standard thickness and distance measurements

A surveyor' s 30 m tape is useful for large - scale measurements, for instance during regional mapping. ***The retracting metal - tape*** measures also have the advantage that they are stiff and therefore can be used much more easily to obtain an accurate measurement of the thickness of the bed by holding it perpendicular to the bedding. ***Folding plastic metric rulers*** that extend to 1 m or 2 m can be obtained in some countries and are very useful as a scale for photographs and for graphic logging. These stiff rulers can easily be used to measure the thickness of partially submerged beds and can be held at the bottom and pointed up cliffs to measure the thickness of otherwise inaccessible beds. ***A long steel rule or wooden rule*** can also be used for this purpose and for general measurements.

When measuring the dimension of a geological feature it is important to ensure that you have not overestimated the distance by placing the tape oblique to the bedding plane. For instance, to obtain a true thickness the top of the tape would need to be placed closer to the bed so that it was perpendicular to the bedding plane.

I. **Thickness of Strata**

a) **True Thickness**: distance measured perpendicular to the upper and lower contact of a tabular unit.
b) **Apparent Thickness**: vertical distance between an upper and lower contact in a nonhorizontal unit. The apparent thickness is equal to the true thickness only when the attitude of the unit is horizontal.
c) **Outcrop Width**: distance on the map between the bounding contacts of a tabular unit measured along an azimuth perpendicular to strike.
d) **Apparent Width**: distance on the map between the upper and lower contacts of a tabular unit measured in a direction other than perpendicular to strike.
e) Special attitudes:
    1. Vertical strata: if the map surface is relatively horizontal, the distance measured perpendicular to the contacts is the true thickness.
    2. Horizontal strata: the elevation difference between the upper and lower contacts is the thickness.

f) Inclined strata on a horizontal map surface, traverse taken perpendicular to strike.

When dipping rocks are exposed on a horizontal surface only, it is very difficult or impossible to measure directly a true bed thickness. By measuring the horizontal distance perpendicular to strike (d) and the angle of dip of the beds (θ) this can be solved (Figure 3). The true thickness is given by the equation:

True thickness = d x sin θ

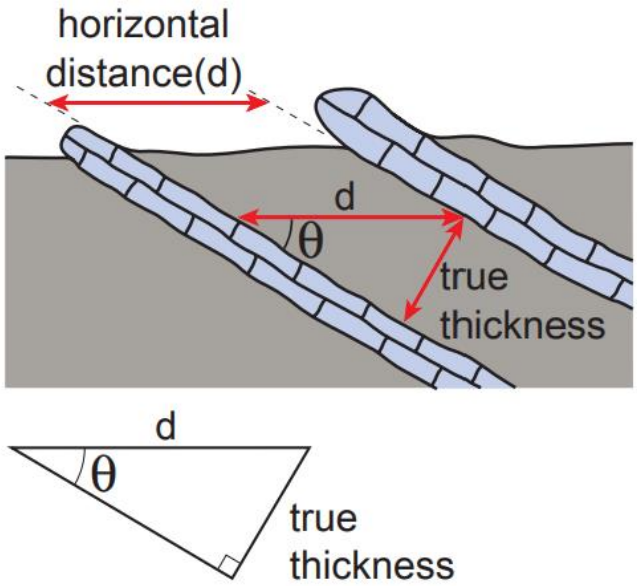

Figure 3 Sketch to show the basic trigonometry for obtaining a true thickness by measuring the horizontal distance between dipping beds.

g) Calculation of true thickness of inclined beds.

There are three methods to find the true thickness of the bed depend on the relationship between the dip of the bed, the slop of the earth's surface and the horizontal distance between upper and lower contacts of the bed figure 4.

1. The first case where the dip of the bed and the slop of the earth's surface are in opposite directions.

   t = h sin θ + v cos θ

   where

   t = true thickness

   h = horizontal distance

   θ = dip of the bed

v = vertical distance

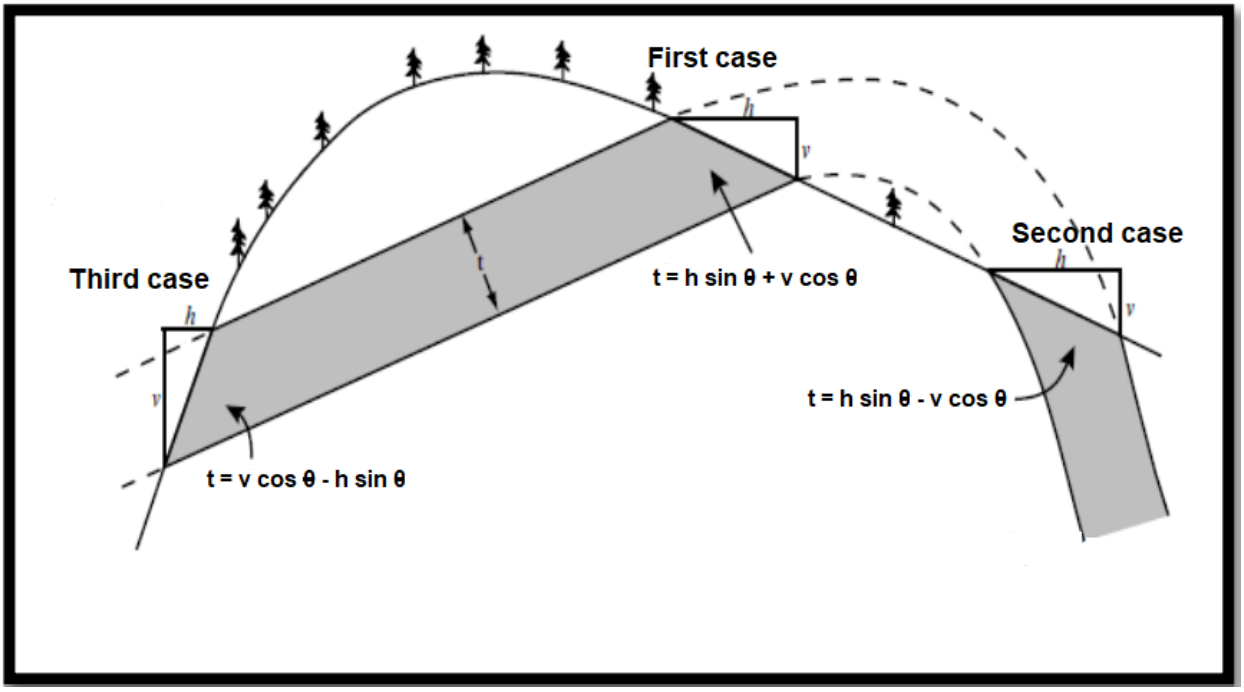

Figure 4 Three cases and methods of true thickness measurement of inclined bed (Rowland, et. al, 2007)

2. The second case where the dip of the bed and the slop of the earth's surface are in a same direction but the dip is steeper than the slop of earth's surface.
   $t = h \sin \theta - v \cos \theta$
3. The third case where the dip of the bed and the slop of the earth's surface are in a same direction but the dip is shallower than the slop of earth's surface.
   $t = v \cos \theta - h \sin \theta$

References

Angela L. Coe Tom W. Argles David A. Rothery Robert A. Spicer. 2010 GEOLOGICAL FIELD TECHNIQUES, Department of Earth and Environmental Sciences, The Open University, Walton Hall, Milton Keynes, UK

Rowland, S. et.al, 2007. Structural Analysis and Synthesis a laboratory Course in Structural Geology, 3rd ed., Blackwell Scientific pub., Inc., California, 301p.