How to construct a stratigraphic column (graphic log)

Important points:

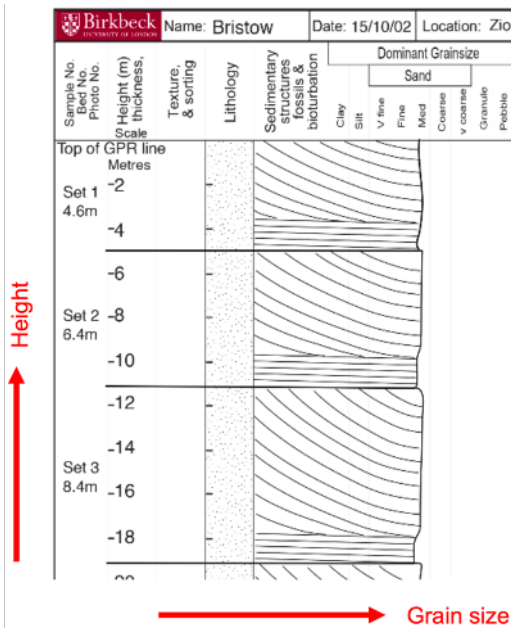
- The aim is to create a realistic and data-rich representation of the rock. Draw what you see, and make the log look like the rock.
- "Logs should be as detailed and realistic as the artistic abilities of the drawer will allow." (Anderton 1985 p. 37)
- Remember that observation and description are separate from interpretation.

1. Introduction

a. The graphic log is the standard way to record and summarize successions of sedimentary rocks.
b. It provides a graphic representation of the layers of sedimentary rocks that were deposited on top of one another.
c. Efficient, clear, universal, appealing representation of data (summary)
d. Show vertical changes in bed geometry and thickness, lithology, grain size, sedimentary structures, and fossil content.

2. Vertical scale

a. The graphic log is essentially a graph with a vertical axis representing thickness and a horizontal axis showing grain size.
b. The vertical scale varies with the level of detail required, as well as the project objectives. (A typical scale may be 4 cm of log per 1 m of rock.)
c. The vertical scale can be adapted to fit the objectives of the project, the time available, and the variability and thickness of beds (e.g. if beds are very thin and/or highly variable, a finer scale is needed; if beds are very thick and/or monotonous, a coarser scale can be used).
d. In the field, one can log ~10-30 m per day, depending on complexity.
e. Information such as sedimentary structures, fossils, paleocurrent measurements, samples, photos, etc. can be recorded symbolically on the main column or in adjacent descriptive columns.



3. Horizontal scale

a. The main horizontal axis is the grain size scale divided into: clay, silt, sand (vf, f, m, c, vc), granule, pebble, etc.
b. Sketch the grain size curve to show fining-up or coarsening upwards trends within beds when present.

c. Use a realistic ragged, curved right edge to reflect variations within a bed, as opposed to simple rectangles.
d. The rock type (lithology) is represented by standard symbols, e.g. stipple for sandstone and a brick pattern for limestones. See the key below.

4. Sedimentary structures

a. Represent sedimentary structures with standard stylized symbols.
b. Contacts between units should be accurately represented as sharp planar, wavy, gradational, scour, etc.
c. Again, draw what you see, and make the log look like the structures in the rock.
d. Use the full width of the grain size columns to sketch out the structures present.
e. Details of beds pinching out or changes in the dip of cross-strata can be shown accurately.
f. We all come across new features, fossils, or trace fossils where we are not certain about the identification: if you are not sure what the structure should be called, you can draw it, take a photograph, and then look it up later, or ask an expert for a second opinion.

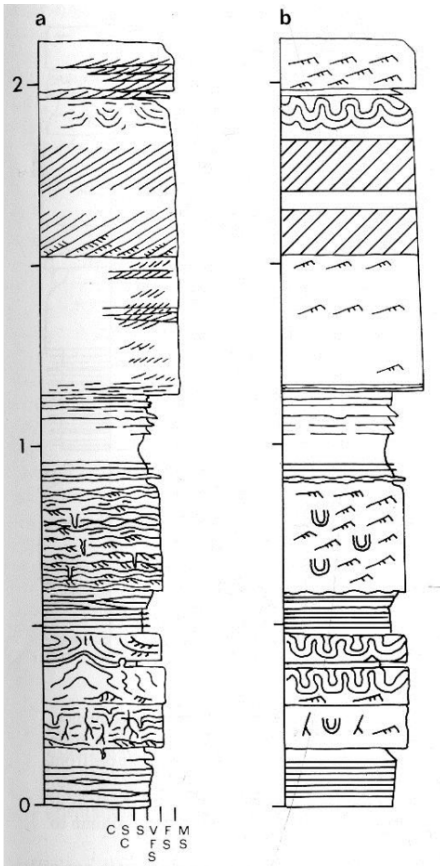


FIG. 1. Logs showing (a) realistic and (b) stylised representations of 2 m of bore-hole core from the Upper Limestone Group, Midland Valley of Scotland.

5. Fossils and trace fossils

a. There are standard symbols for fossils, see chart below.
b. Or, draw the fossil and take a photograph if you are not sure what it is and look it up when you get home.

6. Color

a. Color and color changes can be recorded in the notes. Recognize fresh vs. weathered color of a rock surface.
b. Munsell soil color charts can be used for consistency.

Examples and Reference Charts & Symbols

Table A6.1 Checklist for the description of sedimentary deposits.

Property		Questions
Composition	Grains	What is the composition of the most abundant grains?
	Matrix	Is there any fine-grained (clay-sized) fragmentary material infilling the spaces between larger grains? If so, what is it?
	Cement	Is there any crystalline material precipitated around the edges of grains, or in the spaces between grains? If so, what is it?
Texture	Grain size	What is the most abundant grain size present (use a grain-size card and Figure A6.1)?
	Grain sorting	Are the grains all more or less of the same size (i.e. well-sorted) or different sizes (i.e. poorly sorted) or somewhere in between (use the sorting scale; Figure A6.2)?
	Grain morphology:	See Figure A6.3
	shape or form	Are the grains long and thin or equidimensional?
	roundness	Do the grains have rounded or angular corners (use roundness scale)?
	sphericity	Are the grains like spheres (i.e. high sphericity) or are they elongate (low sphericity)?
	Grain surface texture	Are any quartz grains present smooth and glassy, or are they frosted?
	Grain fabric (packing)	Are the grains orientated in any preferred direction? Are the grains closely packed together? Are the grains matrix- or grain-supported? (See Figure A6.4)
Fossils		Can you see the remains of any body fossils or their movements (trace fossils)?
Sedimentary structures		Are there any obvious layers or other structures in the rocks? (See Figures A6.5–A6.7)

Figure and caption from Coe, A.L., 2010

Table 2.2. Scale of stratification thickness*

Very thickly bedded	Thicker than 1 m
Thickly bedded	30–100 cm
Medium bedded	10–30 cm
Thinly bedded	3-–10 cm
Very thinly bedded	1–3 cm
Thickly laminated	0.3–1 cm
Thinly laminated	Thinner than 0.3 cm

*From Blatt, Middleton, and Murray, Origin of Sedimentary Rocks, 2nd edition, 1980, p. 128

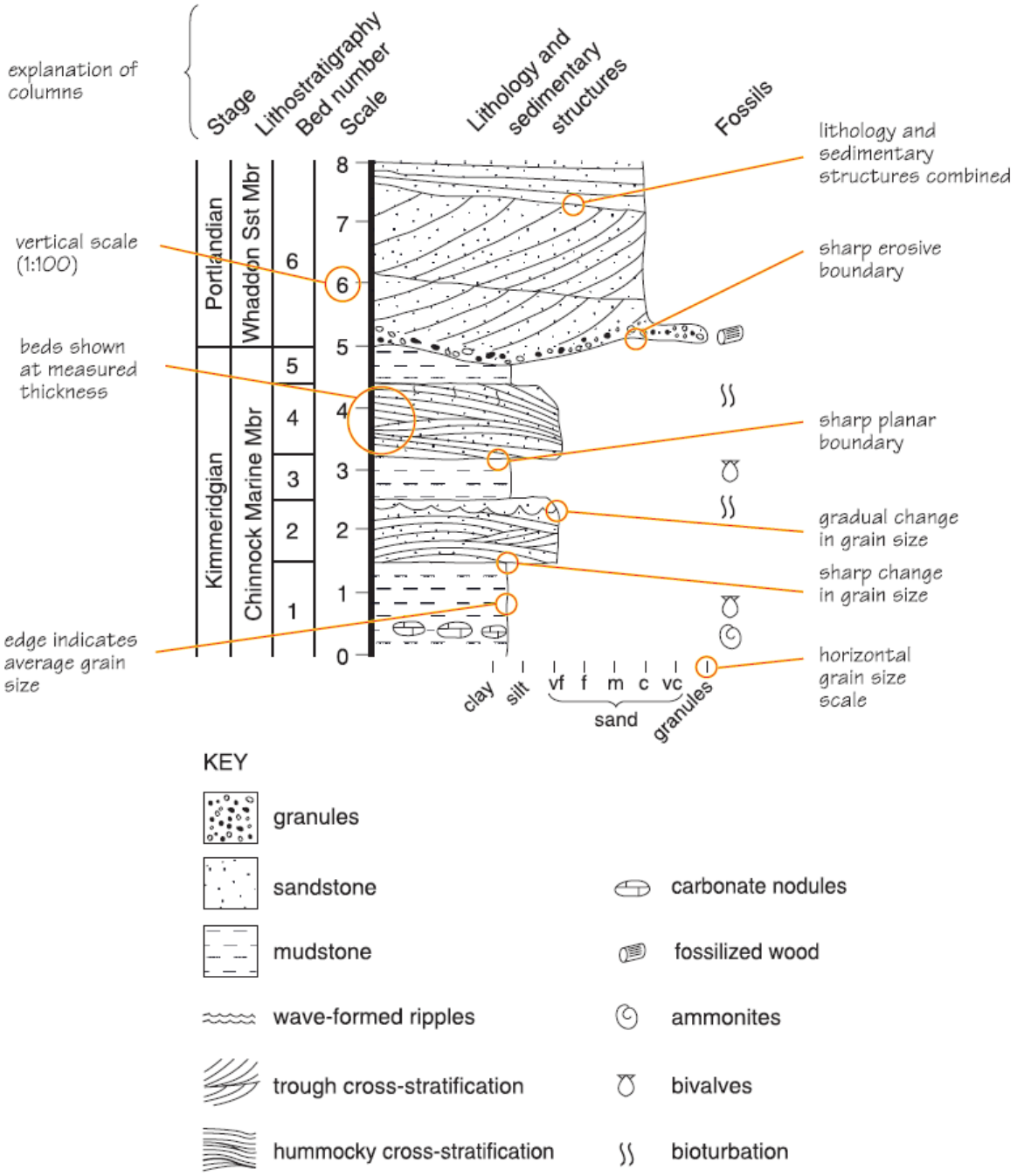


Figure 6.4 A neat version of a typical graphic log with some of the key features labelled. The field version should look very similar except it might not be drawn to scale vertically and there might be other columns with samples, photographs and links to more detailed notes on particular contacts and/or units. For examples of field graphic logs see Figures 4.2b, 5.10, 6.9b, 6.11 and the book cover.

Excellent example.

Figure and caption from Coe, A.L., 2010

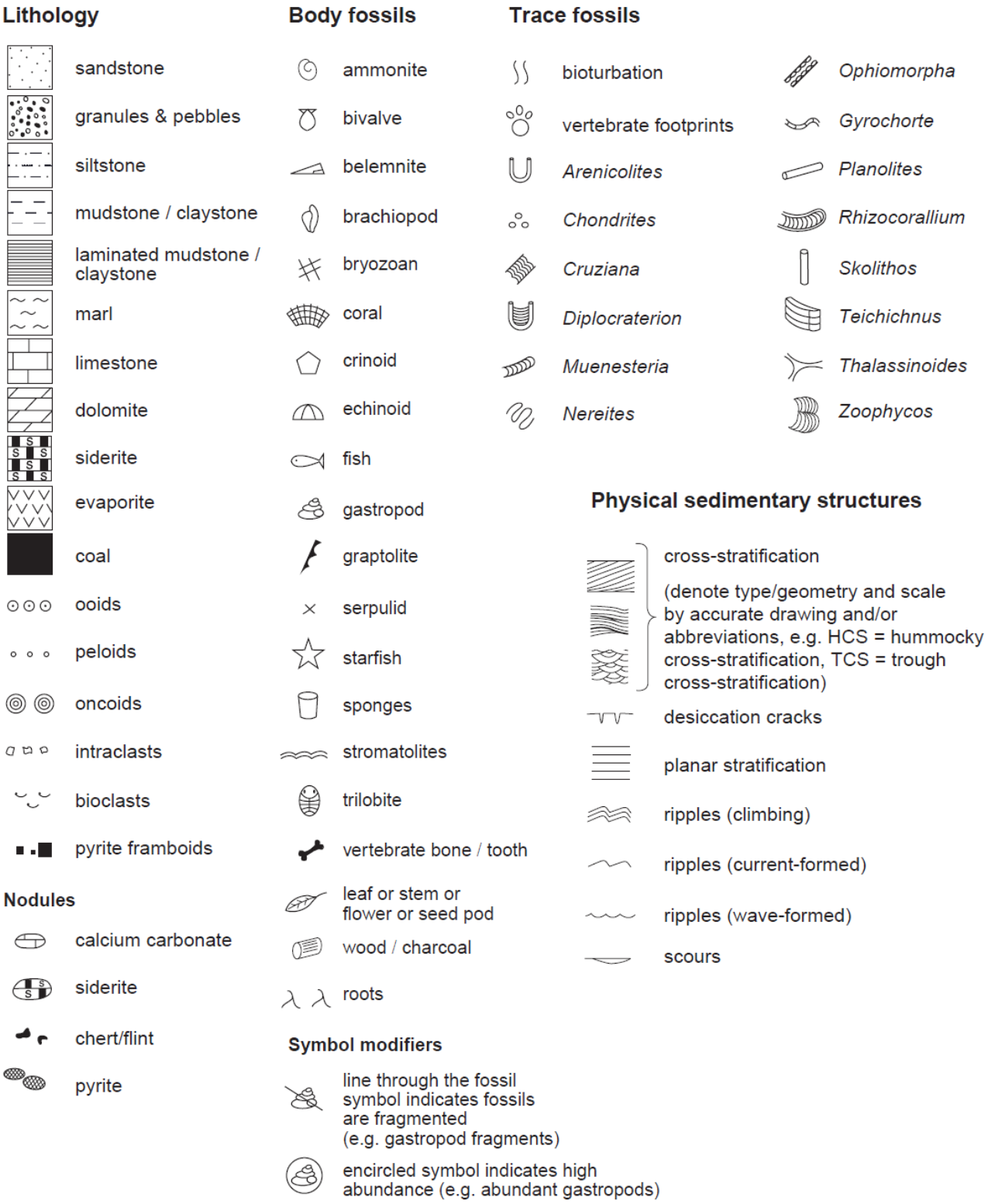
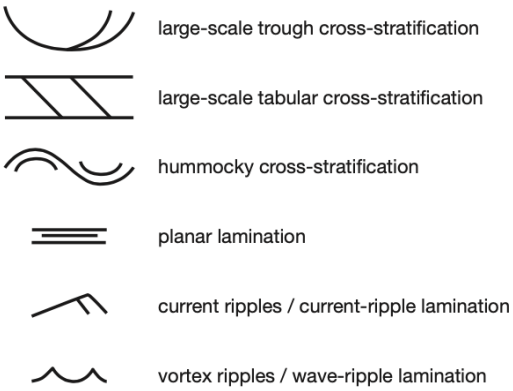


Figure A6.16 Some of the commonly used symbols for graphic logs and some ideas for other more specific features.

Figure and caption from Coe, A.L., 2010

Preferred symbols for sedimentary structures

Holland, S., 2020, strata.uga.edu



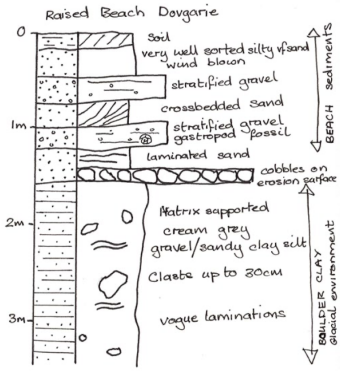


Figure 13b Sketch log, Dougarie, Isle of Arran: Logging templates/sheets are a useful support tool for students when learning how to log and for logging longer sequences. However, when using a logging sheet there is a danger that students will draw very mechanical, rectilinear graphic logs (recording bed thickness accurately but not relationships within and between beds). This sketch log, drawn with a more fluid style, is an excellent qualitative record of grain size variation, lateral changes in beds thickness and the relationships between beds.

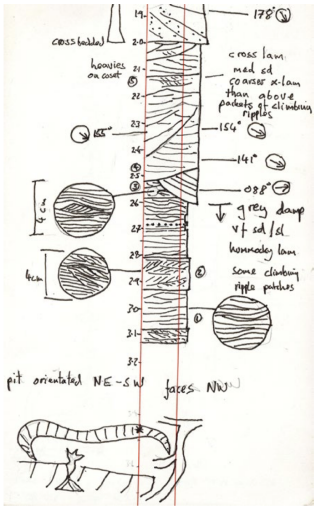
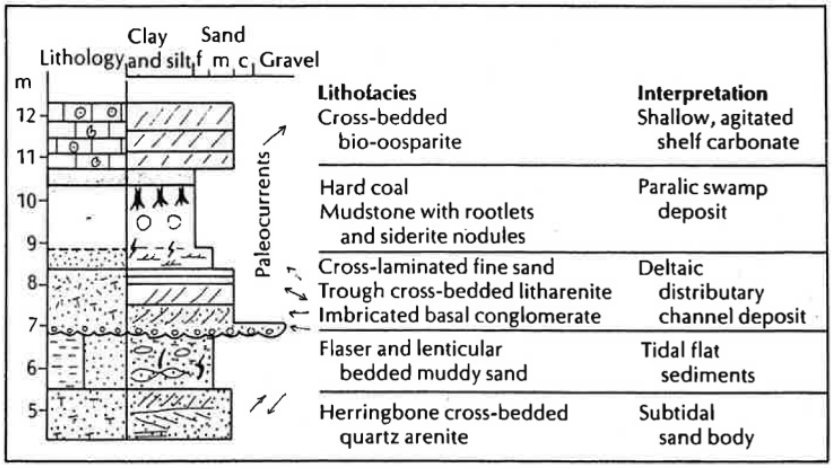


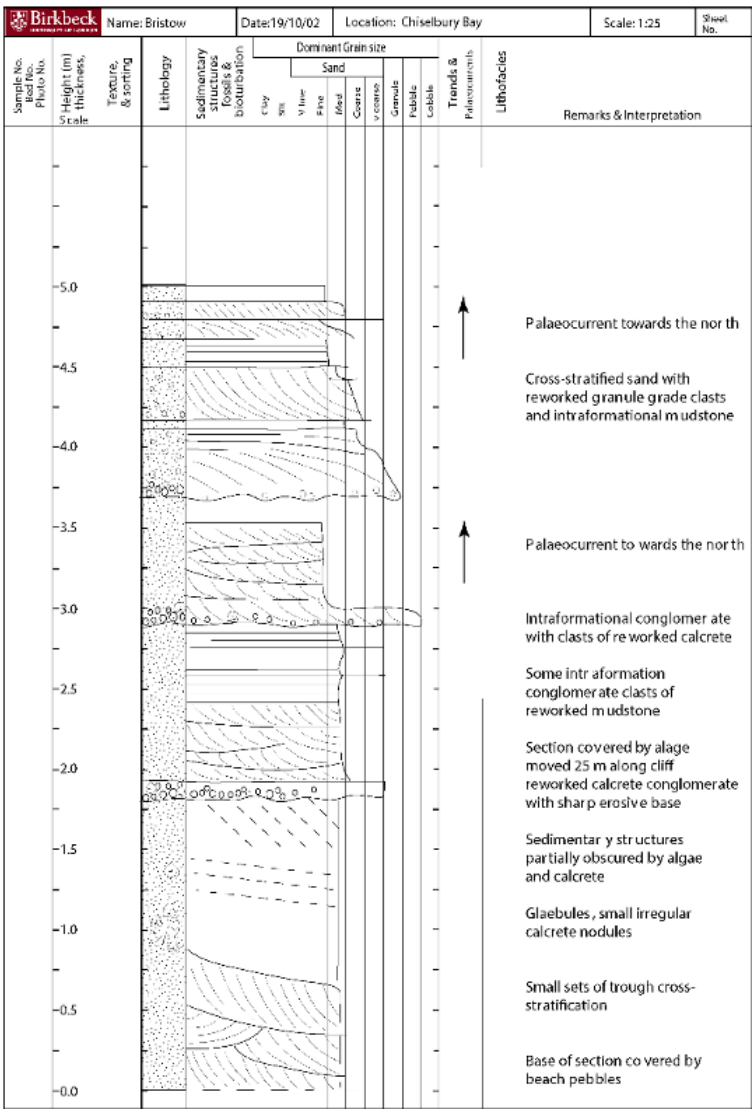
Figure 5 (left): Sketch log of Quaternary shallow marine sandstone, St Lawrence valley, Québec. This drawing makes good use of symbols and detailed enlargements with scales to show specific details. The numbers in circles refer to photograph and sample locations. Note the sketch map which gives sufficient detail to locate the fieldwork site.

Real student examples of stratigraphic columns, using different styles.

www.ocr.org.uk/geology (Geology Drawing Skills Handbook, Oxford Cambridge and RSA, 2018).



Example from Prothero and Schwab



Example from Charlie Bristow, Birkbeck University of London

References

This stratigraphic column instructions were adapted from "Graphic logs lecture notes" by Charlie Bristow, Birkbeck University of London, Seds Online.

Anderton, R., 1985. Clastic facies models and facies analysis. In Brenchley, P., and Williams, B.P.J., Sedimentology: Recent Developments and Applied Aspects. Blackwell Scientific Publications. P.31-47.

Coe, A.L., 2010, Recording features of sedimentary rocks and constructing graphic logs, Chapter 6, in Coe, A.L., Ed. Geological Field Techniques. Wiley Blackwell, p. 102-138.

Oxford Cambridge and RSA, 2018. Geology Drawing Skills Handbook, Geological Drawing, Version 1, https://www.ocr.org.uk/Images/500028-geology-drawing-skills-handbook.pdf.