Blasts from the past 5: A stratigraphy problem

Peter Williams and members of the ESTA Secondary Working Group

Background

"Blasts from the past" is the section of Teaching Earth Sciences where some of the teaching ideas and activities, originally produced for early publications of ESTA and the Association of Teachers of Geology (the precursor to ESTA), are re-published. We hope that our newer members will find these teaching ideas and exercises useful.

Teaching ideas and activities have been updated and revised before re-publication in the magazine. A pdf of this article and a copy of the cross-section are also available on the ESTA website at: **http://www.esta-uk.net/blasts/**

Copies of earlier publications of ESTA and the Association of Teachers may be accessed in the archive section of the ESTA website, although PDFs of TES 26.3 onwards may be downloaded from the website.

Introduction

The original activity was produced by Andrew Mathieson (Mathieson, 1979). This activity has been adapted by members of the ESTA Secondary Working Group and the original diagram redrawn by Peter Williams. (Don't panic – the solution to this problem is shown on page XX.)

A stratigraphy problem

A sea cliff somewhere in Britain exposes a variety of rocks (A - H) and these are shown in Figure 1.

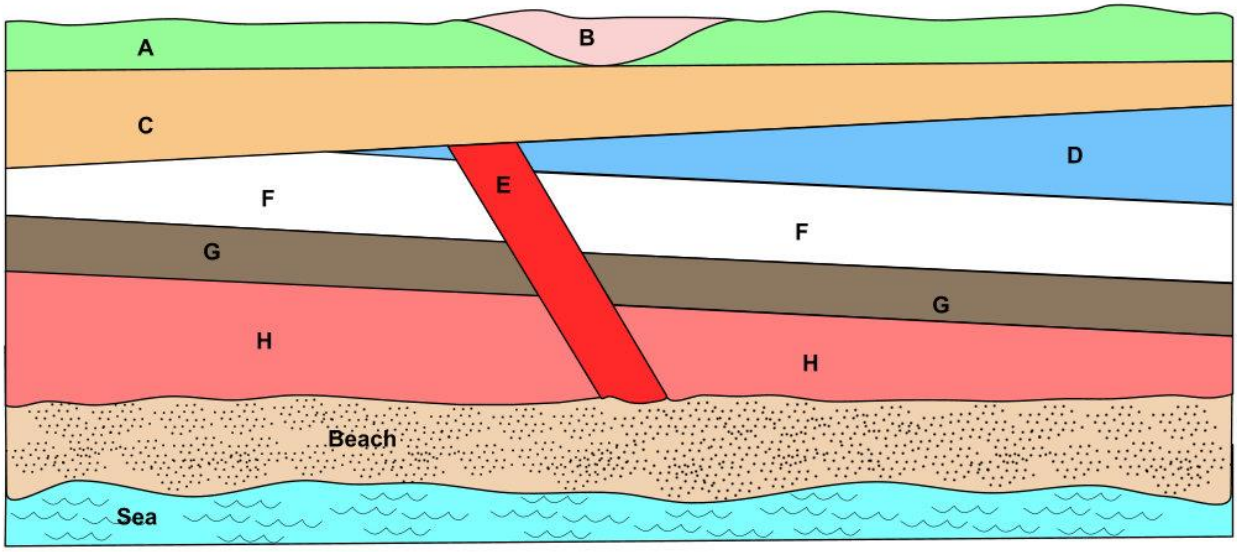

Figure 1: Drawing of the rocks exposed in a sea cliff.

Most of the rocks have some evidence of their age as listed in the table below:

Rock	Information about the age of the rock
A	Contains the mineral glauconite and has a radiometric age of 102 million years
B	Contains wood that has a carbon-14 age of 40 thousand years
C	Contains the fossil ammonite *Asteroceras obtusum*
D	Rock has palaeomagnetic evidence indicating an origin at or near the equator
E	Rock has a radiometric age of 275 million years
F	Age of rock uncertain
G	Rock has a radiometric age of 368 million years
H	Rock contains the fossil graptolite *Didymograptus murchisoni*

Study Figure 1 and the information in the table. List the rocks in their stratigraphical order and suggest when each was formed. With this information, write the geological history of the cliff including how each of the rocks may have formed as well as periods of earth movements and erosion.

References

Mathieson, A. (1979) A stratigraphy problem. *Geology Teaching*, **4** (3), p. 111.

Peter Williams
Department of Earth, Ocean and Ecological Sciences, School of Environmental Sciences, Liverpool, L69 3GP
T.J.P.Williams@liv.ac.uk

A stratigraphy problem: answers

The **stratigraphical order**, youngest at the top, is:
Quaternary
Cretaceous
Jurassic - the ammonite is a zonal fossil of the Lower Lias
Permian
Probably Carboniferous
Age uncertain
Devonian age
Ordovician age - the graptolite is a zonal fossil of the Llanvirn Series

The **geological history** is:

1. Marine sediments were deposited in the Ordovician.
2. Either rock F was deposited in the Ordovician, Silurian or Devonian
   or there is a gap in the succession which indicates erosion and/ or non-deposition.
3. Igneous activity in the Devonian resulted in either extrusive lava or an intrusive sill.
4. Either rock F was deposited in the Devonian or Carboniferous
   or there may have been some erosion and/or non-deposition.
5. Sediments were probably deposited in the Carboniferous.
6. Earth-movements tilted the rocks and a normal fault formed
7. Igneous rock was intruded along the line of the fault in the Permian.
8. Erosion resulted in a flat-levelled surface.
9. Marine sediments were deposited in the Jurassic.
10. Earth movements tilted the rocks.
11. Erosion resulted in a flat-levelled surface.
12. Marine sediments were deposited in the Cretaceous.
13. Erosion, probably with non-deposition.
14. Fluvial sediment was deposited in the Quaternary.
15. Erosion.