

Mapping in 3D

Integrating disparate datasets for the Chalk of Berkshire

by Don Aldiss¹

- A The geological map showing the seven local Chalk formations is draped over a shaded relief model of the Berkshire Downs.
- B Typical Chalk downland near the Uffington White Horse (on the skyline). The position of two formation boundaries is shown, mapped at breaks of slope.
- C Part of a field slip, showing a geologist's field observations and the interpreted geology at the surface.
- D Part of the fair-drawn geological map corresponding to the field slip shown in (C).

Making a new geological map? That sounds interesting. But how do you know what's underground?' So runs a typical comment from an enquiring passer-by to a BGS geological mapper.

In part, the answer comes from the geological map itself. If you look at the shape that a rock layer makes where it meets the ground surface (which is what is shown by a typical geological map), then you can usually work out the thickness of that layer, and how steeply it dips away below ground.

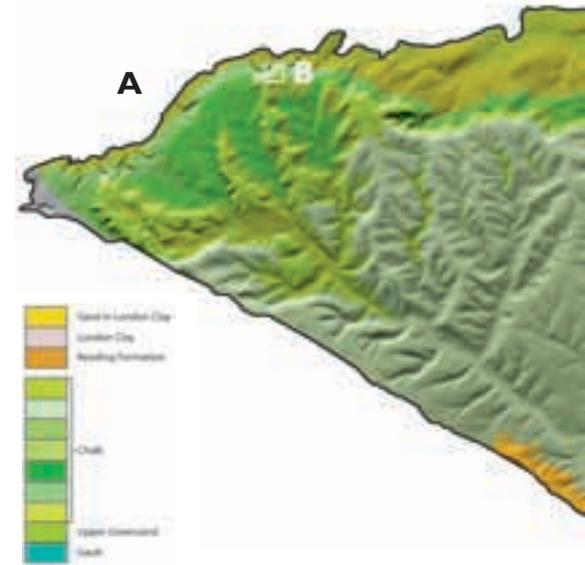
But no rock layer has uniform thickness and inclination, so predictions based on outcrop patterns alone can be taken only so far. If one is to know what is going on underground, information from down there is needed as well. And

if you want to help others understand the local geological structures, it can be useful to create images which show the 3D shape of the rock formations.

In the Chalk downlands of Berkshire, we can observe the subterranean geology in boreholes, mostly drilled for water, and through seismic surveys, made to investigate the hidden Berkshire coalfield.

These records reveal the depth of one or more of the seven layers in the Chalk at a scattering of places across the area. A specialised computer software package is then used to interpolate between the data points, predicting how each layer extends down from the surface.

As a result, we gain a better understanding of the local structure of the Chalk. In turn, this should help understand how groundwater moves through the Chalk, how much can be abstracted without ill effect, and how it can best be protected against contamination. ■



E Lithostratigraphical log of a cored borehole, with corresponding geophysical logs. This example records changes in the natural gamma radiation from the Chalk, and in its resistivity (inverse of electrical conductivity), with depth in the borehole.

F Portion of geologist's manuscript log of borehole core.

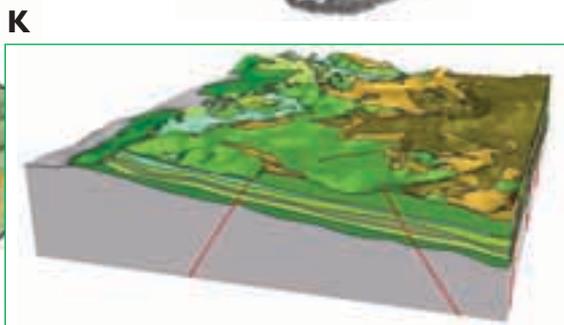
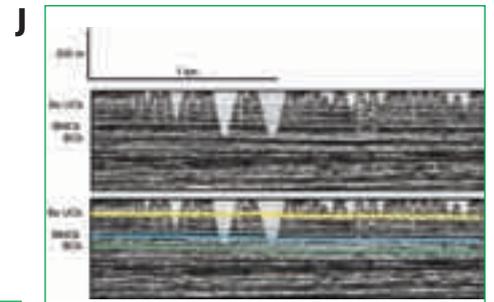
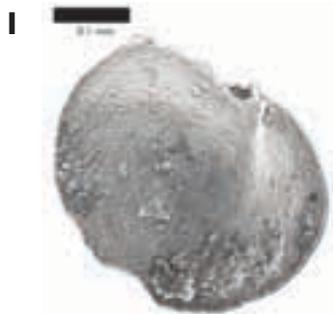
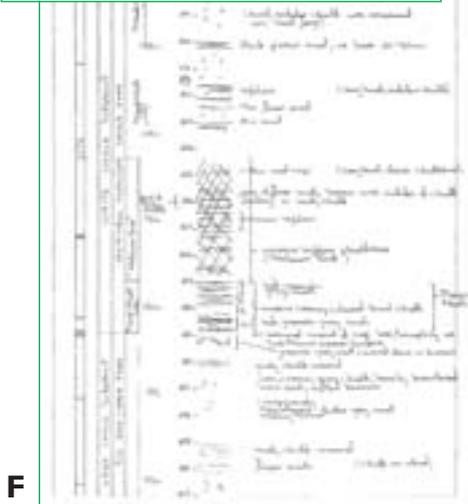
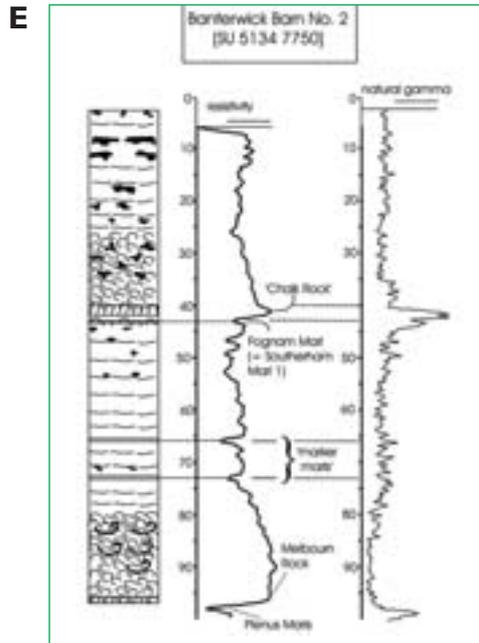
G Portion of a videoscan log showing the Chalk Rock in the wall of a borehole. The Chalk Rock is very hard and is tinted green by the mineral glauconite, which is mildly radioactive.

H Fossil from Chalk core: a fragment of the bivalve mollusc *Cremnoceramus*. Fossils help us to work out the age of the Chalk and can be diagnostic for a particular formation.

I Microfossil from Chalk core: the foraminifer *Osangularia cordieriana*.

J Portion of a seismic survey profile. Artificial shock waves are reflected from various levels within the Chalk, and at its base.

K Cross-section and perspective view of a 3D model of the Chalk of the Berkshire Downs, created using EarthVision® 3D modelling software.



¹ With contributions by Kate Royse, Dave Evans, Ian Wilkinson and Mark Woods.
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