

The beginning of geological mapping in England

John Henry

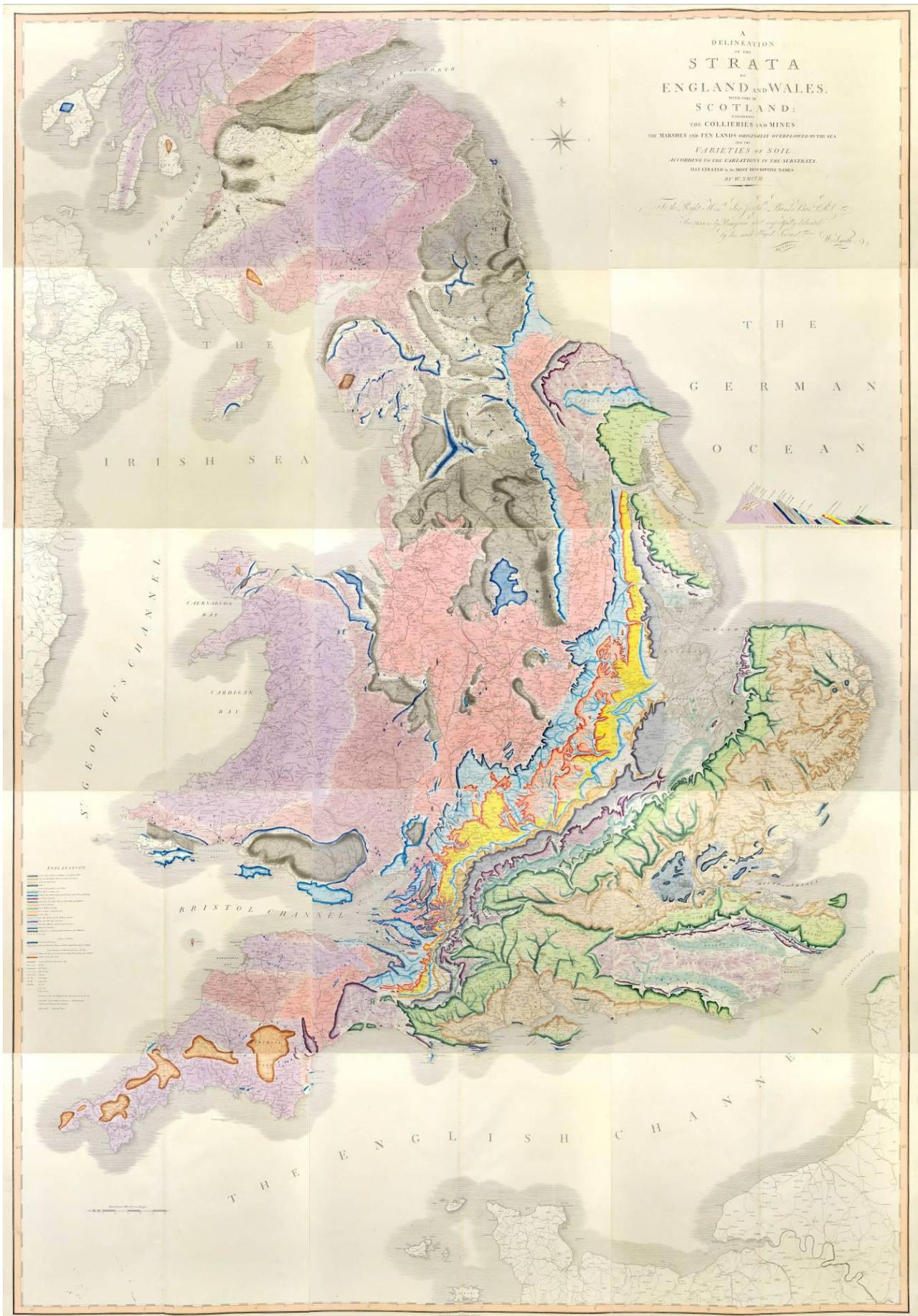
The speaker has spent his professional life producing engineering geological maps from air photographs and satellite images for large construction projects. Although we take geological maps for granted now, supported by air photography, GPS, geophysics, frequent borehole cores and rapid communication, the first geologists did not have these advantages. Accurate maps produced by the OS were fundamental to the development of geology. De la Beche commented that finding a good base map was the first essential and such maps were very rare.

Martin Lister (1630-1712) proposed to the Royal Society the production of a new map with legends showing sands and clays etc in a soil or minerals map in order to understand more as knowing soils at outcrop points to what is beneath. Christopher Packe (1686-1749) produced *A new philosophico-chorographical chart of east Kent* in 1743, the first geomorphological map, which showed the distribution of chalk, gravel and clay pits and soils at a scale of 1¼ miles to the inch. These initiatives led nowhere at the time.

In the British Isles, geological mapping began with William Smith (1769-1839). His career began when he was apprenticed to a surveyor. His first solo job, in 1792-93 in Wiltshire, was to produce the High Littleton Estate map with detail of the villages. He was tasked to go down mines and measure sections. In the course of this work, he noticed differences in the fossils in different strata and that they were always in the same sequence in different shafts. He was the first to recognise index fossils and the order of strata, where previously fossils were simply curiosities. Working as he was in the Somerset coalfield, he was employed by the Somerset Coal Canal Co as engineer and produced a 4 inch to the mile map of the canal. Both canals and coal were novel in southern England and he made a journey to the north of England in 1794 to learn more, finding that the same strata were present there. From the top of York Minster he recognised the Wolds as chalk from their contours and recognised features in the Hambleton Hills similar to the Cotswolds.

In 1799, Smith produced a geological map of Bath at 1½ miles to the inch with outcrops plotted on a tourist map. He formed the idea of doing a national map. He was familiar with John Cary's base map published in 1794 but realised he needed to map in more detail and sought subscribers to fund the work. At the close of the 18th century, before the Ordnance Survey one inch to one mile scale, mapping, produced by private surveyors, existed for most of England and southern Scotland and ½ to ½ of Wales. The first OS map was not published till 1801 for Kent, priority being given to mapping the areas most under threat from the French. Smith relied on landform to extrapolate from points of observation and learned to disregard some of the base-map information as being inaccurate. Cary engraved a custom-made base map removing topography, most roads and most place names, reducing the font size and adding drainage detail and feature names at 5 miles to the inch.

Smith's 1815 map used shading of the colours to indicate the succession of strata, which was expensive, requiring more skilled colourists. His first map submitted for a Royal Society of Arts prize took one week to colour. His 1815 map, *A Delineation of the strata of England and Wales with part of Scotland*, was financially unsuccessful and in a vain attempt to recover it was 'repackaged' as geological sections, as a poster map and in county maps. 8 sections were completed in 1817-19 covering the south of England and Midlands, with one from London to Anglesey at a scale of 5 miles to the inch. A poster-sized map was published in 1820 based on John Cary's 1796 15 miles to the inch map, which was de-cluttered. The 1815 map ranged in price from 5.5 to 12 guineas while the poster map cost £1.00. The county geological atlas was on Cary's 1809 county atlas but not de-cluttered and with the legend in individual tablets positioned opposite the outcrop. It had 24 sheets covering 21 counties with 4 for Yorkshire because of its size.



William Smith's map, *A Delineation of the Strata of England and Wales with part of Scotland*, published in 1815, is the first geological map of a country.

The Geological Society was founded in 1807 and its first President, George Bellas Greenough, was also chair of the Map Committee from 1808, which wanted to produce a geological map. Their compilation map had many contributors, primarily Smith's map, though it was not acknowledged. Greenough felt that Smith's reliance on fossils was in error. Smith was only acknowledged on the 3rd edition of 1865, ten years after Greenough's death. The map was compiled in 1819 and issued in 1820 but it was never very successful, with only 230 copies sold compared to 370 of Smith's map despite it costing less. In 1831, Smith was finally recognised by the Geological Society by the award of the first Wollaston Medal, the Society's premier medal, under the Presidency of Adam Sedgwick. Smith's first geological map's bicentenary was celebrated last year with, among other things, the development of the interactive website www.strata-smith.com.

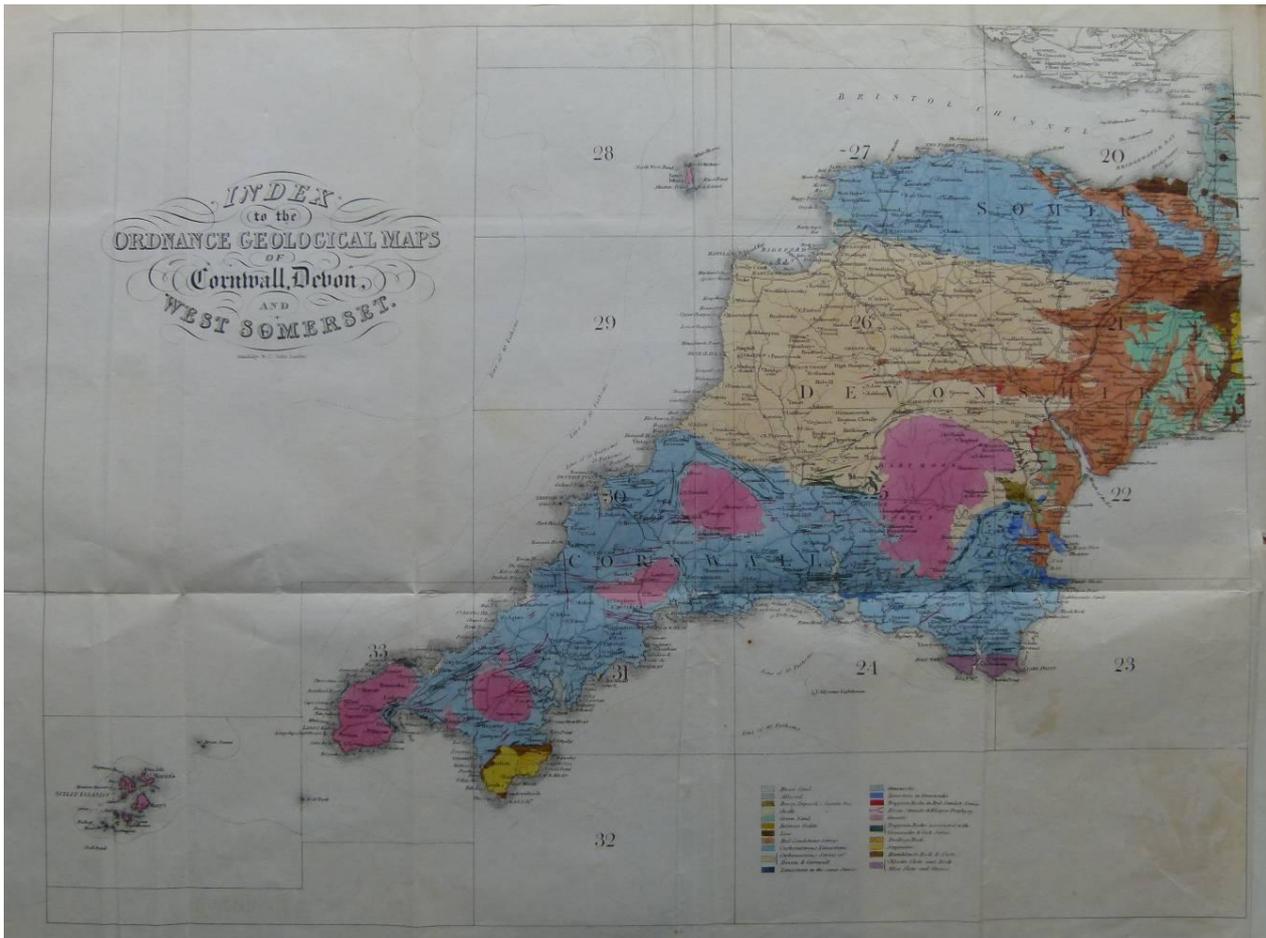


The rival maps of William Smith (right) and George Bellas Greenough (left) hang in the foyer of the Geological Society.

The Geological Survey benefitted from the existence of Ordnance Survey maps. Henry de la Beche (1796-1855) changed his recreational interest in geology to become a professional geologist, firstly as part of the Ordnance Survey then independently as the Geological Survey of England and Wales.

In 1824, De la Beche published his *Geological map of the country adjacent to the coast of Devon and Dorset* and he also mapped geology in Normandy, the French Riviera and Jamaica for his own pleasure and published his maps in the Transactions of the Geological Society. However, in 1832, his income from sugar plantations collapsed with the abolition of slavery and he needed to earn a living. Fortunately, the Director of the Ordnance Survey, Thomas Colby was also interested in geology and a member of the Geological Society. De la Beche, at the time Secretary of the Geological Society, offered to produce 8 geological sheets in the Devon/Dorset area. His offer was accepted and he became the first professional geologist within the Ordnance Survey at a salary of £500 per annum and expenses of £1,000. Although the first published Ordnance Geological map by de la Beche in 1839 was at 4 miles to the inch, for several decades subsequently the scale was

always one inch to the mile. Early maps were folio (approx 29 x 40 inches) but the format changed to quarto sheets (quarters of the folio size).



Henry De la Beche's first official geological report in 1839 was published when the embryonic Geological Survey was part of the Ordnance Survey and included this *Index to the Ordnance Geological Maps of Cornwall, Devon and West Somerset.*

Geological Survey maps were produced using water colourists only to 1900 before being replaced by colour printing, which was more consistent and did not run in the rain. The water-coloured maps required heavy paper and lost information along folds on being folded, so often they were cut into panels and mounted on linen backing for folding. Other problems of the Old Series maps were dense hachuring before contours were used, which distorted colours, and eccentric numbering of the series beginning at London.

Following the early work of William Smith, the start of the Geological Society and the Geological Survey, public interest in geology boomed in the early 19th century. By the 1830s, maps were being issued as atlas pages, wall maps for teaching and as fold-out maps in journals and field guides. All of these early maps had in common that they were water colours on a base map printed from an engraved copper plate. Early directors of the Geological Survey including Murchison, Ramsay and Geikie, published maps privately through commercial printers. In 1901, the Geological Survey introduced the New Series with colour printing instead of hand colouring, more rational numbering and uniform sheet size which continues to the present. However, there has been no conventional printing of geological maps by the British Geological Survey since 2015 with the maps being available on-line or as print-on-demand. From now on, map revision will occur only where there is a contract from a client.