WILLIAM SMITH AND IRELAND: SOURCES OF IRISH GEOLOGICAL INFORMATION ON HIS GEOLOGICAL MAP OF 1820

PATRICK N. WYSE JACKSON

Department of Geology
Trinity College
Dublin 2, Ireland
wysjcknp@tcd.ie

ABSTRACT

William Smith’s 1815 geological map shows the eastern margin of Ireland, but it is devoid of geological information. The scaled-down version published in 1820 provides a rudimentary representation of Irish geology with the granite regions of the Mourne and Wicklow Mountains prominent. The sources for this information were derivative coming from two maps published in the Transactions of the Geological Society of London in 1816 and 1819.

Keywords: Geological cartography, William Smith, Ireland

1. INTRODUCTION

William Smith’s 1815 geological map of England and Wales is a masterpiece of geological cartography and has been the subject of major study over a considerable period of time. Valuable accounts of Smith’s cartographic output include Sheppard (1915), Eyles and Eyles (1938), Cox (1942), Wigley et al. (2007), Henry (2014), and also Fuller (1995) who highlighted the significance of Smith’s cross-sections. In 1844 Smith’s memoirs were assembled and published by his nephew John Phillips, and since then Smith himself and his labours have been the subject of continual assessment (Eyles 1969a). These specifically include evaluation of his stratigraphical ideas (Cox 1948), his fossil collection and its dispersal (Eyles 1967), and a comprehensive analysis of his work in economic and industrial geology (Eyles 1969a, Torrens 2001, 2003) and drainage (Torrens 2004). Eyles (1969b) lists Smith’s published works, fifty-one in all, that showed an eye-watering wide range of subject matter: geological mapping, drainage works, canal surveying, agricultural methods and improvements, stratigraphy and palaeontology.

In 1801 William Smith produced a manuscript map showing the distribution of strata in England and Wales, and although the outline of the northeast coast of Ireland is shown on the map, the area inland is not coloured geologically (Henry 2014, p. 18). Smith’s 1815 geological map depicts the eastern margin of Ireland, but it is completely devoid of geological information. Similarly the northwest portion of France is shown and on it the only geological information provided is that of a thin wash of green colour between Calais and Cap Gris-Nez that allowed for correlation of French strata across the Straits of Dover with the Chalk exposed along the Kent coast. However, five years after the publication of the 1815 map, Smith and his publisher Cary issued A new geological map of England and Wales, with the inland navigations; exhibiting the districts of coal and others sites of mineral tonnage at the smaller scale of 15 miles to the inch. This map provided a representation of Irish geology along its eastern coast from the Giant’s Causeway in the north to County Wexford in the south (Figure 1A).
Figure 1. Geologic map of Ireland by Smith and his map sources. A. Geology of Ireland as depicted in William Smith’s 1820 map. B. Portion of Berger and Conybeare’s 1816 small-scale regional geological map showing geology of northeast Ireland. C. Portion of Weaver’s 1819 map showing geology of southeast Ireland.
Figure 2. Geologic maps of Ireland not utilised by Smith: A. Portion of Berger and Conybeare’s 1816 large-scale map of northeast Ireland. B. Eastern portion of Richard Griffith’s map of 1838. (B: courtesy of the Map Library, Trinity College, Dublin).
What is the source of the Irish geological information shown on the 1820 map? Is there any evidence that Smith was responsible for determining the extent and boundaries of the lithologic units, or was this information acquired by him from other sources? Eyles and Eyles (1938, p. 208) provided one potential answer: “additions appear to have been taken from a geological map of parts of Ireland and Scotland published in 1816”, whereas Henry (2014, p. 24) stated that the sources of this geological information were unknown. On examination of Berger’s map of 1816 referred to above, it is immediately clear that this cannot be the whole story, and that Smith did not rely on that source of information alone for his Irish geology.

This short communication will outline the sources of information available to Smith, and through comparison of these with the 1820 map aims to determine those sources, if any, that he used.

2. WILLIAM SMITH IN IRELAND

During the 1835 British Association for the Advancement of Science meeting William Smith was honoured through the conferral of a Doctorate of Laws which “amused and pleased” him (Phillips 1844, p. 120). This significant event took place on 14 August in Trinity College, Dublin (Herries Davies 1969). Following the conclusion of the scientific meeting Smith travelled around the north of Ireland in the company of Samuel John M’Clean, a Fellow of Trinity College. During those travels, they met up with the geologist Joseph Ellison Portlock in Belfast and discussed matters including drainage and agriculture in Ireland (Phillips 1844, pp. 120–121). This was a subject about which Smith had entered into correspondence with his patron the Duke of Bedford in 1802; he had been requested by some Irish gentry and landowners to undertake surveys and assessments of how best to drain large tracts of the Irish countryside. Smith, who had already been engaged in such work in England from around 1796 (Torrens 2004), quoted a price for his services, but apparently he was never engaged in such schemes in Ireland. Smith’s 1835 Irish sojourn came fifteen years after the publication of his small-scale map, and there is no evidence yet come to light that suggests Smith ever visited Ireland prior to this visit, and so it should be concluded that the geology depicted on the 1820 map was acquired from published or manuscript sources rather than from his own personal field observations.

3. IRELAND AND ITS GEOLOGY AS DEPICTED ON SMITH’S MAP OF 1820

The area of Ireland depicted on Smith’s 1820 map extends from the northern coast of County Antrim and Rathlin Island to twenty-two miles south of the town of Gorey, County Wexford, and to the west as far as a line drawn north-south just beyond the western edge of the Giants Causeway and the towns of Randalstown, County Antrim and Ratoath, County Meath (Figure 1A). The names used for a number of towns have now fallen out of use: Newborough in County Wexford was so named on a 17th century charter but never found favour over its older and current name, Gorey, while Clarisford in County Wicklow has now disappeared.

Five lithologic units from Smith’s 1820 map portray the geology of Ireland (Figure 1A):

n: Coal Districts with the Rocks and Clays accompanying the Coal comprising the great Iron-works (coloured Black)

o: Mountain Limestone, alternating with beds of Slate Chert & Gritstone and containing numerous Veins of Lead and Copper (coloured Dark Royal Blue)

p: Trap Rocks (coloured Moss Green)

---

2 The doctoral certificate is now in the Smith Collection, Oxford University Museum of Natural History (ISAD(G) WS/A/3).

3 There are three letters in this exchange: 25 September 1802 Duke of Bedford to Smith requesting Smith consider the offer of the Gentlemen of Ireland (ISAD(G) WS/C/1/0/015); 14 October 1802 Smith to Bedford, containing his charges (ISAD(G) WS/C/2/0/023); 28 October 1802 Smith to Benjamin Richardson, noting that he was waiting a reply from the Duke of Bedford to his letter (ISAD(G) WS/C/2/0/026) (see http://www.williamsmithonline.com; Oxford University Museum of Natural History).
Killas or Slate, and other Mountain Strata abounding with Minerals (coloured Blue-Grey)

Granite, Sicnite [sic] &c (coloured Red)

Smith also provided a table listing rivers and canals on which various mineral resources were transported, but no Irish waterways were given.

4. SOURCES OF IRISH GEOLOGICAL INFORMATION AND COMPARISON WITH SMITH (1820)

4.1 Geological maps of eastern Ireland

Prior to 1820 there were relatively few publications containing geological information on Ireland (see Wyse Jackson 2001 for listing) and many of these were the result of county surveys conducted through the auspices of the Physico-Historical Society of Ireland or the Dublin Society (Herries Davies 1978). However, the geological detail often was scant and for most counties geological maps were not provided. In the context of the eastern portion of Ireland illustrated by Smith in 1820 only Robert Fraser’s Wicklow treatise of 1801 contained a map, albeit rather simplified. This map showed 5 lithologic units—only marked where Fraser considered rock to occur, and described as being unsatisfactory, resembling “plump, fuzzy, and brightly coloured caterpillars . . . slowly crawling their way across the sheet” (Herries Davies 1983).

The Dublin Society also promoted geological work through their employment of Richard John Griffith to survey the Leinster coalfield from 1809 and as Mining Engineer from 1812; he generated a detailed report on the coal-bearing districts of the area (Griffith 1814) and elsewhere in Ireland. Some geological reports and maps were produced by individuals associated with Trinity College and the University of Dublin such as the report on the geology of Dublin and Wicklow by Water Stephens and William Henry Fitton (1812) printed by William Phillips, a founding member of the Geological Society of London. This map shows the northeastern portion of the Leinster granite on which is accurately marked its southern coastal boundary at Killiney, County Dublin. The map also shows the distribution of the quartz rocks (= Cambrian Quartzite) of the Howth Peninsula, County Dublin, and Bray Head, County Wicklow.

In 1807 the Geological Society of London was established and quickly drew members from Ireland. With the initiation of the Transactions geological information on various parts of the British Isles began to be rapidly disseminated. Through the successful efforts of the Secretary, James Laird, and William Babington in raising funds, the Society was able to engage the Swiss geologist Jean Francois Berger to undertake two seasons of geological mapping in north-east Ireland in 1811 and 1812 (Woodward 1907). The results of his survey were read to the Society in April 1814, and edited and augmented by William Daniel Conybeare, who had visited the district in 1813 in the company of William Buckland. Berger’s report was illustrated with two geological maps, and published in 1816 (for portions of those maps, see Figure 1B and 2A).

Further south the Gloucester-born mining geologist Thomas Weaver, who was mine manager at the copper mines at Avoca in County Wicklow for many years, had been assembling a memoir and map on the geological features in the south-east. Weaver had studied in Freiberg under Werner and while in Ireland joined the Dublin Society and was unsuccessful in his attempt to be engaged as either their Mining Engineer or Professor of Mineralogy, losing out to Richard Griffith and Charles Lewis Giesecke respectively. Weaver later worked in Mexico and died in London in 1855. He published two important memoirs—on the east of Ireland (1819), a paper read to the Geological Society on 15th May 1818, and the south of Ireland (1837) in the society’s Transactions. The maps that accompanied both are reasonably detailed, although the dating of some of the successions portrayed in the later maps proved problematic. For example, the rocks lining the valleys of Cork and Kerry were said to be Transitional Series but were later assigned to the Lower Carboniferous. A portion of his 1819 map of the east of Ireland appears in Figure 1C.

At the same time Griffith was working towards producing a geological map of the whole of Ireland and this was finally published on a small scale of approximately one inch to ten miles...
in 1838. Griffith's cartographic masterpiece at the larger scale of a quarter of an inch to the mile appeared the following year, and in various editions until 1855 ([Herries] Davies 1977). The eastern portion of his 1838 map appears in Figure 2B.

It is impossible to know which of these geological publications and maps relating to Ireland William Smith may have had access to. Had Smith relied on the non-Geological Society of London-published sources of Irish geological cartographic information mentioned above, he would have discovered that they provided only a rudimentary outline of the distribution of the different lithologic units. Close examination of his 1820 map and comparison of it with those maps contained in the papers published by the Geological Society of London adequately demonstrates that they were utilised by him in the drawing of geological boundaries for the Irish portion of the map.

While Smith was never admitted as a Fellow of the Geological Society of London, it seems inconceivable that he would not have had access to its Transactions. This he gained most likely through his great friend Benjamin Richardson who had been an Honorary Member since 1808 (Herries Davies 2007). The two papers and associated geological maps that are of most interest in this Smithian story are those by Berger and Conybeare (1816) and Weaver (1819) published in the Transactions by the Geological Society.

4.2 Berger and Conybeare (1816)

The small scale-map in Berger and Conybeare (Plate 9, 1816) illustrates the general geology of northeast Ireland and the southwestern portion of Scotland across the North Channel, and is rather crude (Figure 1B). Five lithologic units are shown: Granite (red); Mica Schist (yellow); Greywacke (blue); coal and associated sandstones and limestone (pink); and Floetz trap (modern term = basalt) (green), and as such are the same as used in Smith (1820). Importantly, in this case, the coincidence and general delineation of some of the boundaries with Smith (1820) are more faithful although some differences are obvious. The general positions of the older rocks (the granite and mica schists) on the northeast corner (east of Ballycastle and north of Cushendun Bay), and the southwest-trending boundary between the coal and associated sandstones and limestones (around Belfast) with the Antrim basalts and the position where that boundary meets Lough Neagh are certainly similar. However, the town of Ballycastle is shown underlain by two different lithologies: Floetz trap in Berger and Conybeare (1816), and Killas or Slate in Smith (1820). The Larne Peninsula, which encloses Old Fleet Harbour (now Larne Harbour), is depicted as being of trap in the older map and coal measures in Smith (1820). The granite batholith of the Mourne Mountains is depicted east of Newry, and also to the south, extending onto the Carlingford Peninsula on the older map (Figure 1B) whereas in Smith it is absent from the latter district (Figure 1A).

The larger-scale map of northeast Ireland provided in Berger and Conybeare (Plate 8, 1816) (Figure 2A) produced in association with William Buckland (Herries Davies 1983, p. 29), shows (1) Floetz trap (= basalt) (pale green) overlying Chalk (purple) and Red sandstone (pink) in County Antrim near Ballycastle; (2) a band of Red sandstone, Mountain Limestone and coal (pink) running southwest from Belfast Lough; (3) greywackes (grey) south of Belfast; and (4) a dissected dome of granite (light brown) in the Mourne Mountains to the south. However, when compared with Smith’s 1820 map, the boundaries don’t coincide. For example, there is a small patch of Antrim basalt that occurs at the south end of Lough Neagh on the 1816 map but is missing from Smith’s 1820 map. Likewise, on Smith’s map, the Larne Peninsula is assigned to the coal-bearing unit, whereas it is shown as part of the Floetz trap on the 1816 map. Furthermore, the position of the southern boundary of the Coal and Sandstone unit differs on the two maps where that boundary crosses the northern Ards Peninsula. Finally, the extent and degree of dissection of the Mourne granite batholith differs on the two maps. This indicates that

---

4 Smith’s nephew John Phillips was admitted to Fellowship in 1828 and later served as President (1858–1860).
the geology depicted on the larger-scale 1816 map by Berger and Conybeare (Figure 2A) did not inform Smith’s 1820 map.

4.3 Weaver (1819)

Thomas Weaver’s 1819 geological map of the eastern part of Ireland covers an area that extends from County Louth on the north to Carnsore Point at the southeasternmost tip of the country (a portion of that map appears in Figure 1C). To the west the map extends from Leitrim to Limerick. Nine lithologic units are shown. North of Dublin the green-gray ‘Clay Slate’ grades into ‘Transition Rocks’ that extend in a tongue to Balbriggan and these surround an outlier of Limestone (Mississippian, Lower Carboniferous). This distinctive distribution is replicated in Smith (1820). The wedge of ‘Clay Slate’ along the northwest margin of the Leinster granite south of Dublin is depicted as pinching out inland at Rathfarnham, County Dublin in Weaver, but it reaches the coast in Smith (1820). The northern margin of the Leinster granite is similar in both maps. The trend of the southern boundary of this igneous body is similar with a southeastwards bulge of the more southerly part; additionally the southern extent of this batholith shown in Weaver’s map reaches the town of Bray, County Wicklow and Smith’s depiction is likewise. In actuality the true boundary is 7.7 kilometres further north at Killiney, as shown in the earlier cartographic work by Stephens and Fitton (1812).

Weaver provided greater lithological differentiation than later depicted in Smith (1820). For example, surrounding the Leinster granite the Mica Schist metamorphic aureole is picked out in dark blue; the quartz rocks of Bray Head and further south are clearly marked by the use of a bright yellow colour—Smith did not utilise this division as it would have required him to add another lithologic unit to his key and he had not distinguished this material in Britain. Smith showed the older rocks of the southeast of Ireland as ‘Killas or Slate’, whereas Weaver subdivided the area into the bipartite ‘Clay Slate’ and ‘Transition Rocks’.

4.3 Weaver and Griffith

Richard Griffith, the noted Irish geologist and public servant, writing in a letter to Charles Hamilton, President of the Geological Society of Dublin, implied that Thomas Weaver may have incorporated details from Griffith’s work in the 1819 map, remarking caustically that although Weaver’s map was different to his as “to the outline and to the relative position of the rocks” his (Griffith’s), he knew “is correct” and that “it cannot be said that Mr. Weaver either originated or completed the Geological Map of the east of Ireland” (Griffith in Hamilton, 1846, p. 176). Griffith and Weaver had history: both had been candidates for the position of Mining Engineer to the Dublin Society, Griffith being appointed in 1812. Since 1810 Griffith claimed to be working on the production of a geological map of Ireland and in his 1814 and 1816 lectures to the Dublin Society exhibited parts of this manuscript work. Thomas Weaver had attended these lectures, and so it is entirely possible that some of Griffith’s work may have been noted by the mine manager and so found its way into the published pages of the Geological Society’s Transactions in 1819. However, comparison of the earliest available Griffith map, dated on the map 1837, but published in 1838 in an Atlas for the Railway Commissioners, shows details between the two maps (compare Figures 1C and 2B) to be rather different, in particular near Balbriggan where, in Griffith’s map, the Carboniferous strata reach the coast and an outlier is not depicted. Unfortunately Griffith’s early manuscript maps are not extant (Herries Davies 1977; 1983), and so the evolution of his ideas from the early versions of his map in 1816 to the published version cannot be discerned. It is certainly possible that Weaver drew on some of Griffith’s ideas and observations, and if this was so, then some of Smith’s Irish geological information could be attributed to Griffith’s research. This conjecture, however, cannot be confirmed.
5. CONCLUSIONS

It would appear that the northern portion of the geology of Ireland depicted on Smith's 1820 geological map was derived from the small-scale map published as Plate 9 in Berger and Conybeare (1816) as stated by Eyles and Eyles (1938), but that little care was given to transcribing the boundaries accurately from the earlier work.

Given the similarities of most geological boundaries depicted in Weaver's 1819 map with those in Smith (1820), it is probable that William Smith consulted Weaver's publication when drawing the lines for the geology shown on his map. Particularly striking is the identical outcrop pattern in both maps of the rocks around Balbriggan just north of Dublin where the older rocks, now known to be Ordovician, are shown to surround Carboniferous limestone. Also, the matching margin of the Leinster granite batholith suggests that Smith consulted Weaver's 1819 map.

While Smith did not make any field observations of his own of Ireland's geology until 1835, when drawing the geological boundaries in Ireland for his 1820 map he utilized the most accurate maps available at the time. Those maps had been published a few years earlier by the Geological Society of London.

ACKNOWLEDGEMENTS

I am most grateful to John Henry, Chair of the History of Geology Group (HOGG) of the Geological Society London for his kind invitation to speak at the William Smith meeting in April 2015 and to John Diemer for assembling papers from this meeting in Earth Sciences History. Paul Ferguson of the Map Library kindly supplied a high-resolution scan of Griffith's 1838 map. For many years Gordon Herries Davies has generously encouraged my forays into the history of Irish geology, and provided much advice in all matters relating to geological cartography of Ireland. I thank him and Matthew Parkes for their constructive reviews.

REFERENCES


Fraser, R. 1801. General View of the Agriculture and Mineralogy, Present State and Circumstances of the County Wicklow, with Observations on the Means of their Improvement. Dublin: Dublin Society.


Smith, W. 1815. *A Delineation of the Strata of England and Wales, with part of Scotland; exhibiting the collieries and mines, the marshes and fen lands originally overflowed by the sea, and the varieties of soil according to the variations in the substrata, illustrated by the most descriptive names by W. Smith.* Scale 5 miles to one inch. London: J. Cary.


