William Smith Meeting 2015

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Abstract Book

PART OF THE WILLIAM SMITH MAP BICENTENARY PROGRAMME OF EVENTS

200 Years of Smith's Map

Private Exhibition at Natural History Museum: 22 April 2015

Conference at the Geological Society, Burlington House: 23-24 April 2015

Field Excursion in Oxfordshire: 25 April 2015

Keynote Speakers

Professor Simon Knell

Professor Hugh Torrens

The William Smith Map Bicentenary (1815-2015)

William Smith 1769-1839

Acknowledgements

This meeting is a part of a number of events that mark the Bicentennial of the first map published by William Smith.

We gratefully acknowledge the support of ARUP for making this meeting possible.

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William Smith Meeting 2015

200 Years of Smith's Map

23-24 April 2015

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12.00	**A Breach Too Far? East Norfolk's place in Smith's search for success** Peter Riches (Independent Scholar)
12.30	**William Smith: The principles of stratigraphy, and their impact on the search for underground water supplies** John Mather (University of London)
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11.30	**William Smith and Ireland: Sources of Irish geological information on his geological maps** Patrick Wyse Jackson (Trinity College, Dublin)
12.00	**New Light on the 1824 William Smith Northumberland County Map** Martyn Pedley (University of Hull)
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14.30	**William Smith Online: The impact of re-curating the William Smith Archive** Kate Santry (Oxford University Museum of Natural History)
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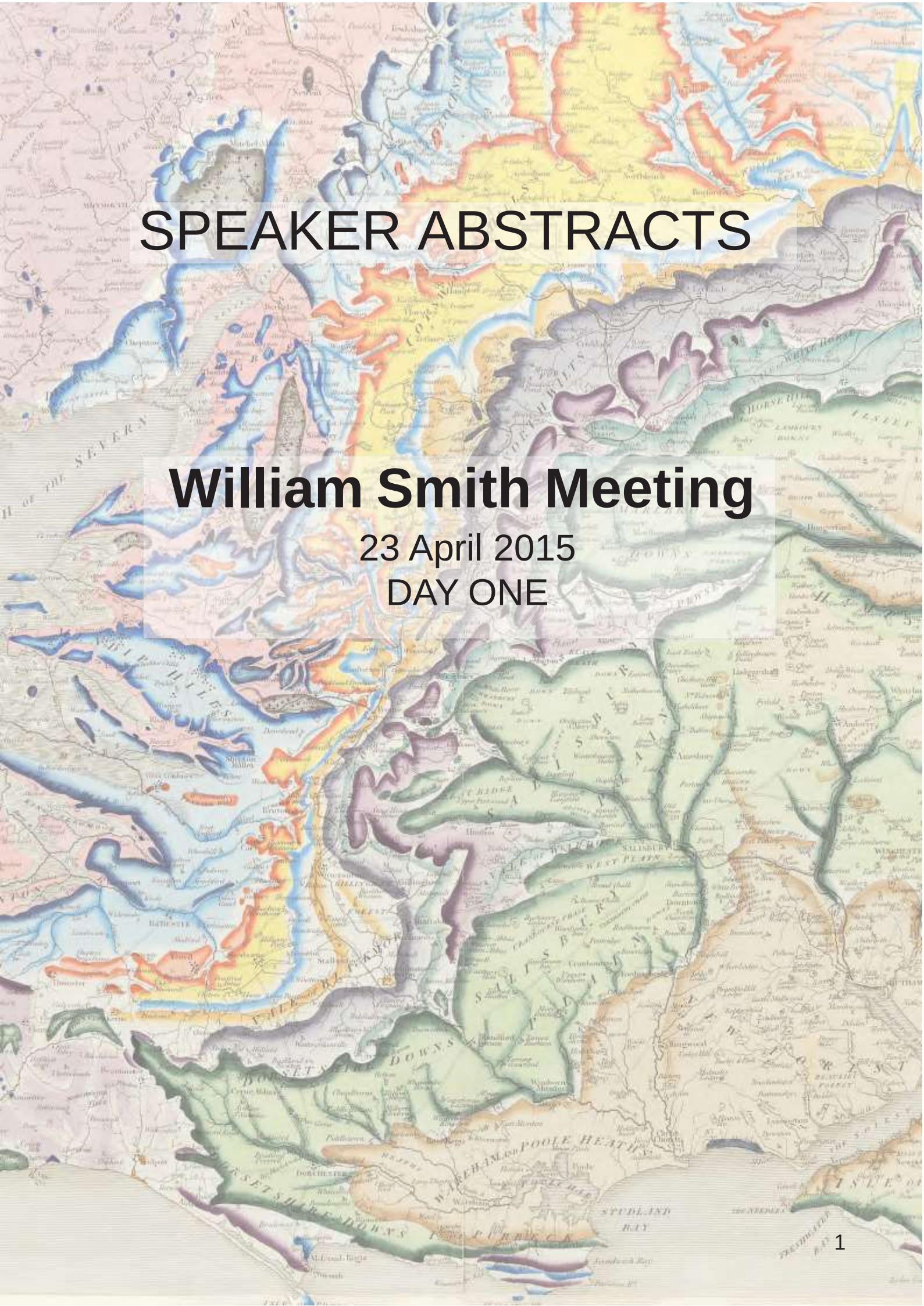
17.00	**Panel discussion** Tom Sharpe (Lyme Regis Museum), Simon Knell (University of Leicester) and Hugh Torrens (Keele University) Chair: John Henry (Chair HOGG/Convenor)
17.30	**Closing Remarks**
18.15	**Drinks on Watergate Walk, beside 15 Buckingham Street (William Smith's address from 1804-1819).**



SPEAKER ABSTRACTS

William Smith Meeting

23 April 2015

DAY ONE

William Smith's (1769-1839) Searches for a Money-earning Career

Hugh Torrens

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This lecture will concentrate on Smith's, highly complex, early 'career paths'. His first employment was as a land surveyor (1). Then in 1793 he became both, canal surveyor (2), and engineer, (3) to the Somerset Coal Canal (SCC). These had guaranteed him a regular, and known, income. But this suddenly changed, when he was successively dismissed, first as surveyor, then as engineer, in 1799. He now had to find some other means of supporting himself, and the geological revelations, which he knew were so important, that he had uncovered in Somerset. In the mid-1790s, he had done some land drainage and irrigation work (4), for the chairman of the SCC, and immediately after his dismissals, was able to generate an adequate living from such work around Bath, during a period of very high rainfall. Some of this work took him to Tytherton in Wilts. Here he first encountered a new rock unit (the Kellaways Rock) and it was here that Thomas Coke of Norfolk was able to study Smith's skills with water. News of this competence quickly passed throughout an agricultural community, then desperate to increase food production, during a long period of wartime crisis. Smith's water drainage, and irrigation work were now widely taken up, first by the Dukes of Manchester and Bedford, in Bedfordshire, and then by Coke and his relatives, both in Staffordshire and Norfolk, and then by Coke himself and his many tenants in Norfolk. On top of this, Smith's skills as an engineer meant he was in high demand also as a Sea Breach Engineer (5), in attempts to keep the German Ocean (now the North Sea) out of The Broads. But war time conditions were harsh, and bills often not swiftly paid (or even paid at all). So Smith now tried new careers as a consultant mineral surveyor (6), or as a failed author (7), on both Irrigation, and on Norfolk. But throughout this period, Smith's obsessive attempts to publish his geological discoveries, or to find support for such a novel publication, were thwarted, by the bankruptcies of others, and proved to no avail.

This lecture will try to survey, for a first time, Smith's complex, and fluctuating, financial situations, over the period 1793 to 1819 (when he entered a debtors prison). His 'knight in shining armour' is undoubtedly the cartographer John Cary (1755–1835) who, in 1812, at last agreed to publish his great 'geological' map. Thus was accomplished by "the enterprise of a private tradesman..., [what] had been in vain expected from princely patronage and the sanction of national boards".

London July 12 1804

Dear Sir

On writing to my Friend Mr Matthews of Bath requesting the Subscription for our Discoveries in the Straits and publication thereof it occured to me that you Sir Joseph and that at Bath (which have liberally offered large Premiums for the Completion of Mineralogical Maps of Districts or Counties) might be inclined to dispose of those Premiums toward the forwarding my Work which embraces much more than may expected to obtain

I am well aware of the great benifit to be derived from the Publick Sanction of such respectable and learned Societies and should be glad of your private opinion how far it would be proper for me to make the application

As there is no patent to be obtained in this Case I should think that the Plan of Publication proposed by Sir Jos. Banks must come within the meaning of your Premiums if the Society be furnished with a Copy of the Work

As my Papers have long since been laid before the

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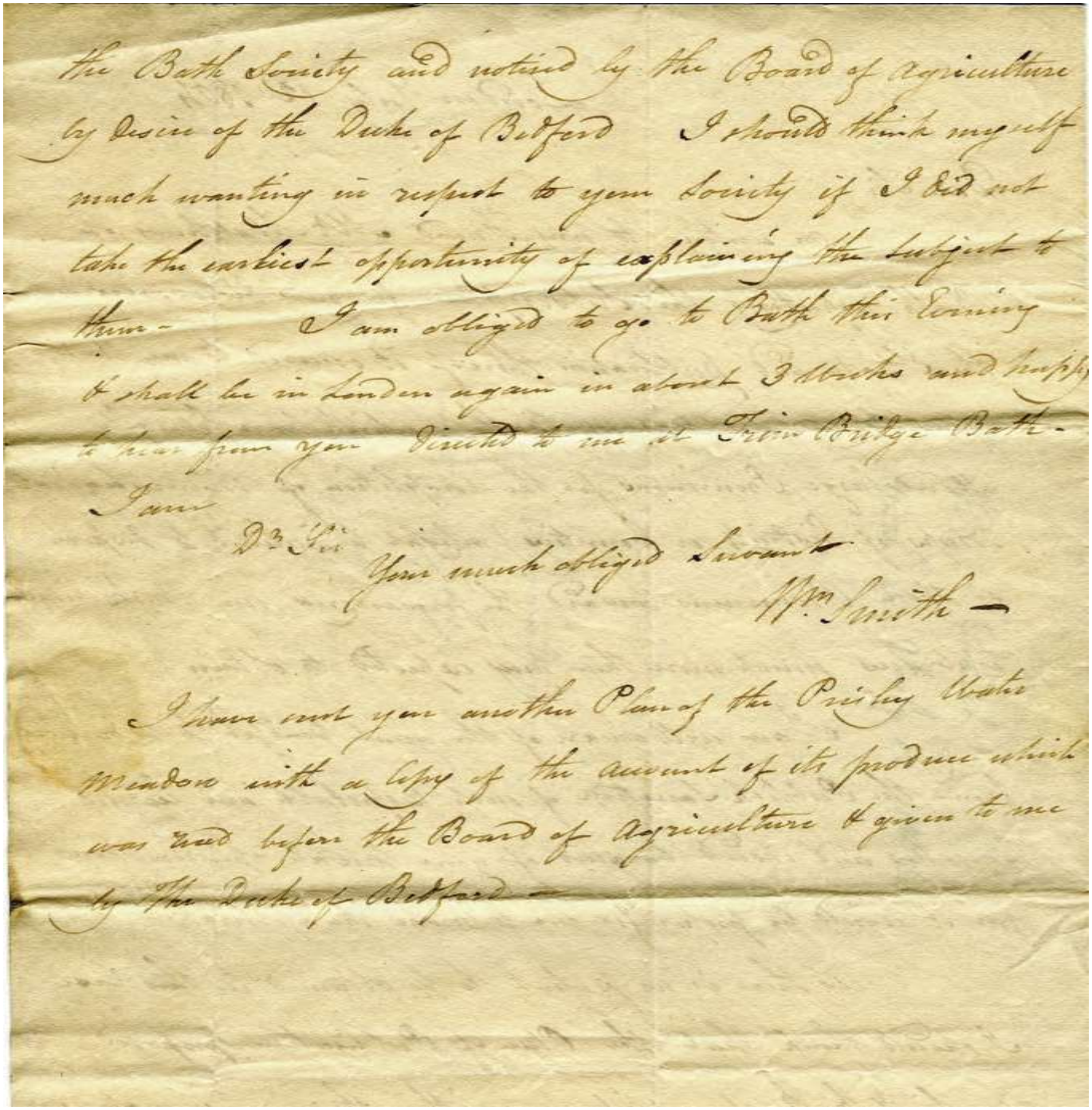

the Bath Society and noticed by the Board of Agriculture by desire of the Duke of Bedford I should think myself much wanting in respect to your Society if I did not take the earliest opportunity of explaining the subject to them — I am obliged to go to Bath this Evening & shall be in London again in about 3 Weeks and hope to hear from you Directed to me at Prior Bridge Bath —

I am

D^r Sir

Your much obliged Servant

Wm Smith —

I have sent you another Plan of the Priory Water Meadow with a Copy of the account of its produce which was read before the Board of Agriculture & given to me by the Duke of Bedford —

Above: This 12 July 1804 letter, from Smith to the Secretary of the London Society of Arts, concerns their 50 guineas premium, offered since 1802 for "a mineralogical map of England and Wales". Smith is seeking advice on whether an advance "toward the forwarding my Work which embraces much more" than they had asked for, might be possible. But Smith received this premium only on completion of his 1815 map, their copy of which was delivered to the SA at the end of May 1815. And, to prove the financial problems Smith then faced, "Mr [William] Matthews [1747-1816]", the then secretary of the Bath and West of England Agricultural Society, who had been the first to record the significance of Smith's results in print, early in 1800, had, by 1815, lost his sight and so was unable to pay for his subscription copy."

William Smith's Visits to East Anglia: The legacy of a sea defence and drainage engineer

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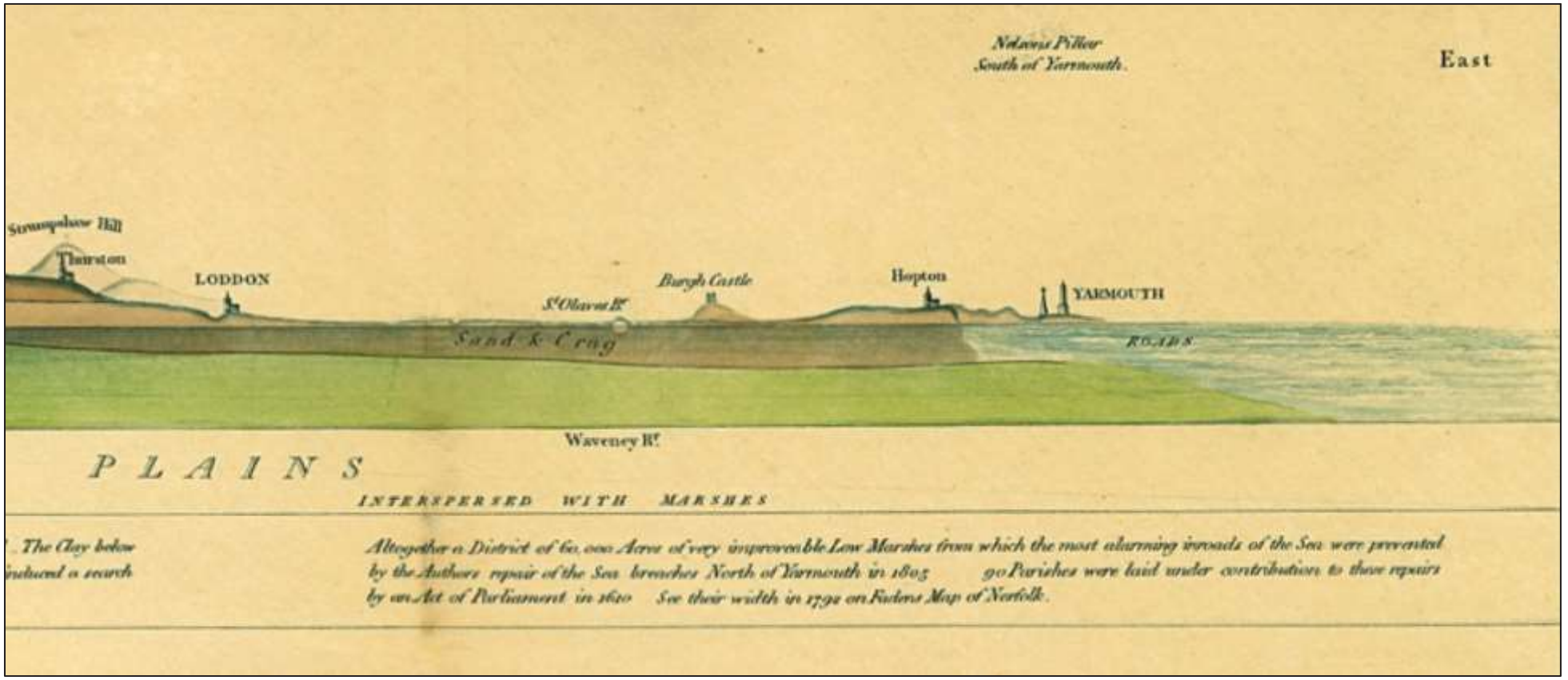
William Smith is known to have been a frequent visitor to East Anglia during the first two decades of the nineteenth century. His visits provided an opportunity to extend his geological knowledge of surface and sub-surface features. His field observations formed the basis of his geological sections (published in 1807), the large scale map of England (1815) and the County map series (Norfolk January 1819, Suffolk September 1819, Essex February 1820, and Huntingdonshire in 1822) covering East Anglia. Fossils collected from the Chalk and Crag deposits of East Anglia were illustrated by Smith in *Strata Identified by Organized Fossils* (1816), and then catalogued and listed systematically in *A Stratigraphical System of Organised Fossils* (1817).

Opportunities for employment within the area helped finance his explorations, commencing in 1800 when he was contracted by Thomas Coke (First Earl of Leicester and Holkham, seventh creation) of Holkham Hall, the British politician and agricultural reformer, to assist in land drainage. The following year he visited the Duke of Bedford at Woburn to offer advice on the drainage of his estate. Smith returned to Norfolk in 1802, and was a frequent resident of Norwich until 1807. During this time he was commissioned as a civil engineer to repair the sea defences along the east Norfolk coast where flooding and the encroachment of the German Ocean (North Sea) was a common occurrence during the eighteenth and early Nineteenth centuries. His careful observations of the composition and modification of natural dunes during the seasons was fundamental in influencing Smith on the construction of natural sea defences, abandoning the established practice of clay banks reinforced with stone and timber.

Smith's initial simple plan was ridiculed and almost rejected, until he pointed out how ineffectual solid constructions had been. The sea-defences between Winterton and Happisburgh were completed during 1805, resulting "in the expulsion of the sea from 74 parishes in Norfolk and 16 parishes in Suffolk" and fulfilled "The Norfolk and Suffolk Sea Breach Act" of 1610 passed under James I. Further down the coast at the Minsmere Levels, south of Dunwich in Suffolk Smith was initially consulted in 1808, and eventually reported in 1812, recommending the construction of a new sluice. Work commenced in May of that year with the construction of mills for pumping the water into the adjacent rivers. His novel methods of sea-defence engineering complemented those of nature.

A further legacy is from his unpublished manuscript (circa 1807) on *Norfolk, its soil and substrata* which provides a rare insight into early nineteenth century life into the county whose principal city (Norwich) was slowly going into decline as the manufacturing industries associated with the industrial revolution centred on London, the midlands and the north of the country.



Above: West-East geological section from Thurston Hill to Yarmouth, extract from William Smith's Geological View and Section of Norfolk, 1817.

A breach too far? East Norfolk's place in Smith's search for success

Peter Riches

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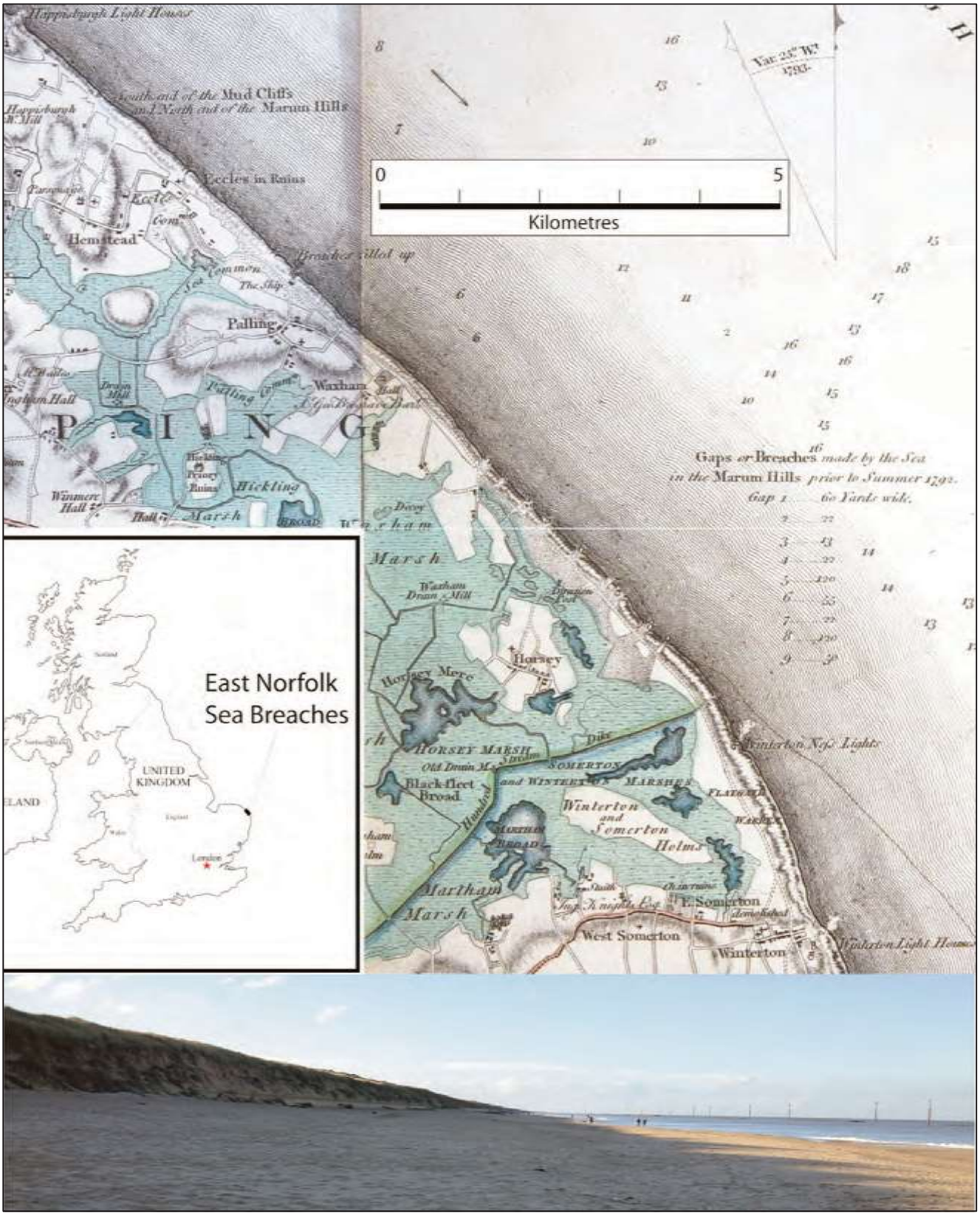
At the end of the Eighteenth Century many Norfolk landowners were seeking to implement enclosures and improve the agricultural productivity of their land. It was in this climate of agricultural revolution that Thomas Coke of Holkham, a celebrated agricultural reformer, brought William Smith to Norfolk in 1801 to implement water meadows on his estate. Smith was much in demand by landowners across the county as a result of Coke's patronage, private recommendation and public praise. He spent much of his time between 1803 and 1809 working on marsh drainage and the repair of sandbanks that protected the east Norfolk marshland from North Sea encroachment.

Two issues will be examined using material from the archives in: the Norwich Record Office, the Oxford Museum of Natural History and contemporary newspaper reports.

The first topic to be covered will be Smith's involvement with and influence on landowners, Inclosure Commissioners and the Commission for Sewers (informally termed 'Sea Breaches') who initiated and funded his work on sea bank repair. Smith's work, his reports and responsibilities will be discussed in relation to the procedures and politics of the Commission for Sewers. His responsibilities included: the design of the sea bank repairs and the technical and contractual management of this work. Smith also determined the criteria used for the assignment of rates levied on landowners to cover the cost of the sea bank repairs.

The second area of this talk will be an evaluation of how successful his work was in the prevention of further flooding of the marshes. This section which will include an outline of the structure of Smith's design for his sea bank repairs. Smith's nephew, Phillips and others have eulogized about his success in the prevention of further flooding of these marshes. Detailed study of the records call into question both the accuracy of Phillip's description of Smith's work in *Memoirs of William Smith* and the extent of his achievement in preventing further flooding. Despite claiming to have solved the flooding problem in 1805, Smith continued to work on Sea Bank repairs until 1809. Smith's design for the slope of the banks facing the sea was a valuable innovation in mitigating, but not preventing, the erosion of the sea banks. However, his design for the internal structure of the banks was not perpetuated in later repairs.

During the Nineteenth century, there was progressive erosion of the east Norfolk coast and some sea banks migrated landwards. The records of the sea breaching the sand banks and flooding the marshes indicate that such occurrences are infrequent extreme events related to the state of the tides and weather rather than the quality of Smith's engineering. However, Smith's high reputation and his sea breach repairs undoubtedly gave landowners sufficient confidence to proceed with inclosure and marsh drainage in order to create productive and valuable land valuable land.



Above: East Norfolk sea breaches – Location map, map of breaches in 1792 extracted from Faden's Map of Norfolk (courtesy of Andrew Macnair,*ww.fadensmapofnorfolk.co.uk* and photograph looking north-westwards along the beach at Waxham with sand dunes and modern sea defences at both the base of the dunes and offshore
(note people on beach for scale).

William Smith. The principles of stratigraphy, and their impact on the search for underground water supplies

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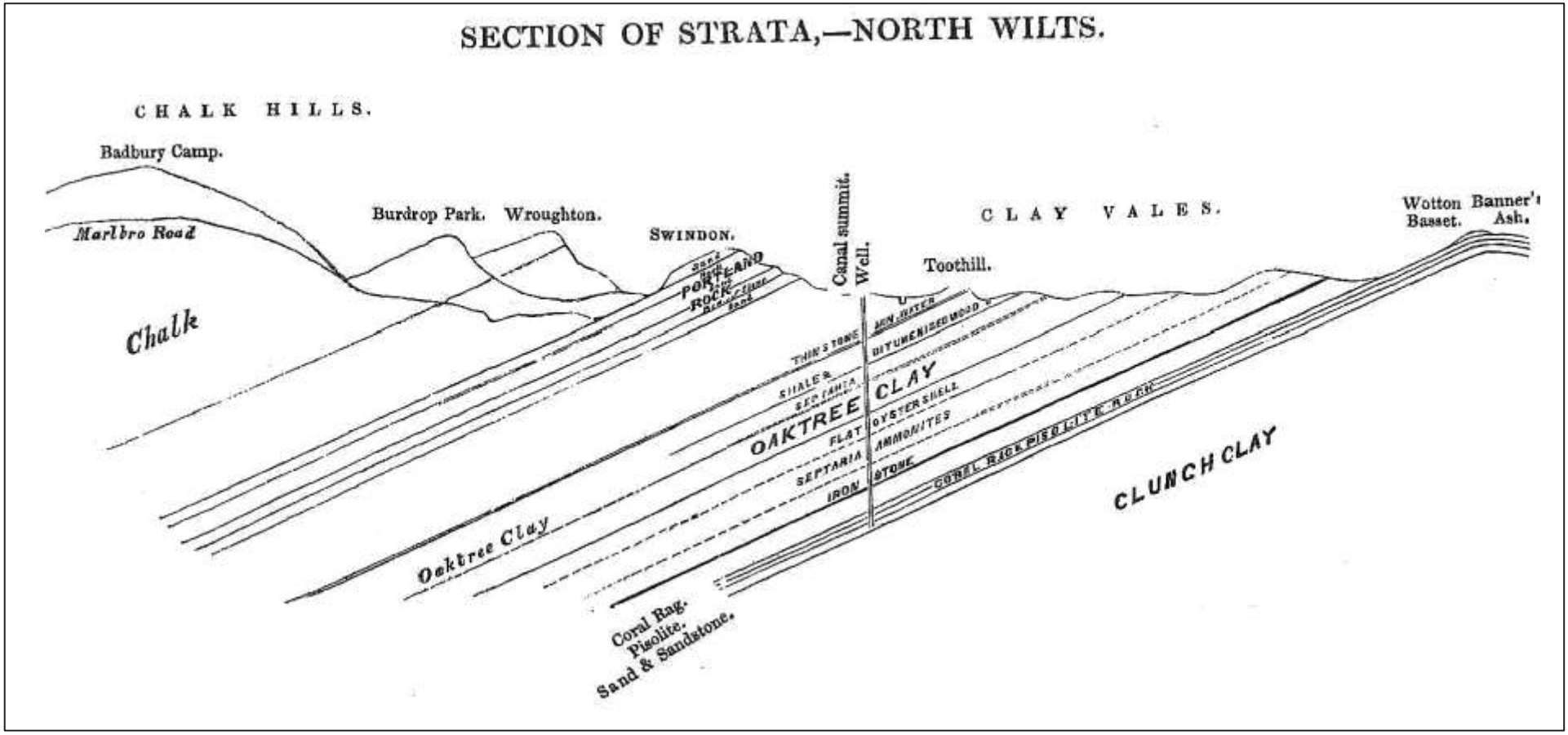
In antiquity, groundwater was generally extracted from dug wells, the construction of which was an expensive and time consuming task. Boring technology was introduced from continental Europe by the Sixteenth Century, when the method used consisted of raising and lowering a chisel, suspended by a rope. By the 18th century, iron or wooden rods had replaced the rope and a variety of augers and chisels were used. 1723 saw wells in the London Clay deepened to 85m, into underlying sands, using an auger, and later in the century methods used in Flanders were publicised in England by the French industrial spy Le Turc and equipment manufactured in London. Thus technology was available by the end of the Eighteenth Century but exploration for potable water was hampered by archaic ideas on the origin of groundwater. Although shallow wells were considered to be sustained by rain and snow melt, many still believed that the origin of groundwater deeper beneath the surface was the sea, and that, by some process of distillation and subsequent condensation in the bowels of the earth, sea water could be filtered and transferred by passages and cavities to sustain the flow of deep wells and boreholes. Thus boreholes were drilled to find these underground waterways through which water flowed and the layers of sand and limestone into which it had spread on its passage from the sea.

It was John Farey, William Smith's pupil, writing in 1807, who pointed out that Smith's as yet unpublished work showed that every stratum, which is penetrated in sinking a well, forms an extended inclined plane which, at some distance from the well, crops out at the surface. The porous strata are recharged at their outcrops with water which then percolates down dip. He used as an example the deep wells beneath London, where the thick stratum of sand supplying wells north of the River Thames could be traced to their outcrop some 15 miles away. Thus knowledge of the stratification could be used to predict the likelihood of finding water at a particular place, the depth at which it might be found and the expense likely to be involved. The search for underground water supplies was immediately given a scientific framework and no longer relied on seeking bodies of water fed by hypothetical streams originating from the sea.

Smith applied his stratigraphic principles in his own practice, advising on groundwater supplies in towns and villages such as Newton Longville (Buckinghamshire), Swindon (Wiltshire), Bath (Somerset) and Scarborough (Yorkshire). The latter study, published in 1827, has been quoted by historians as one of the early applications of geology to the solution of hydrologic problems. However, his description of a method for supplementing Scarborough's summer water supply, is of minor importance in comparison to the enormous benefits which led from the application of his work on stratigraphy. In 1877, his successor Joseph Lucas, who in 1874 first used the term hydrogeology in its modern context, commenting on those qualified to undertake hydrogeological work, noted that "William Smith knew more than any geologist who has followed him". In contrast in the modern world, where the hydrogeological contributions of the engineers Henry Darcy and Oscar Meinzer are justly celebrated, the seminal contributions of William Smith and his pupils are largely forgotten.



Above: Section across North Wiltshire showing the location of a well, sited to feed the summit level of the Wilts and Berks Canal, from Memoirs of William Smith by his nephew and pupil John Phillips (1844)“

William Smith and Combe Down: The story of a geologist and his ‘Cherished’ home

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Tucking Mill, the ‘cherished property’ where William Smith lived when his geological survey was published in 1815, is today located in the village of Combe Down. Although 2015 marks a year for celebration of his map, and other achievements, associations with Combe Down tend to bring reminders of a time in his life when things went badly wrong. Smith held title to Tucking Mill from 1798 to 1819 – almost a third of his lifetime. Although he did not live there all those years the quarrymen and quarrywomen of Combe Down provided the inspiration for his ambitious attempt at ‘stone manufacture’, and Tucking Mill was the focal point of this dream. Inevitably this talk must describe the real story of his venture, and the reasons for its failure. It will seek a balance, however, with presentation of the very positive achievements made by Smith in his attempt to quarry, transport, shape, and ship Bath stone to London and the national market. The talk will argue that William Smith played a crucial role in making Bath stone accessible to the nation, taking forward the dream of Ralph Allen, and setting a course for the ultimate success of Combe Down quarrymaster and builder Philip Nowell to follow in the 1820s.

Above: Although this photograph of Tucking Mill (with the Coal Canal and the wharf for loading stone in the foreground) was taken in the 1890s, William Smith would certainly have recognized the scene. The two stacks of stone plates leaning against the Mill are intriguing, for they are exactly the type of item that would have been produced on Smith's water-powered saw frame.

David Mushet, John Farey and William Smith: Geologising in the Forest of Dean

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A recently discovered, hand drawn and coloured geological cross-section of the Forest of Dean has proved to be the work of the ironmaster David Mushet (1772-1847). Probably created in 1811-12, he gave a copy to the Geological Society in 1815, and it was reproduced by Buckland and Conybeare in their paper *On the South-Western Coal District of England* (*Transactions*, 1824).

Famous for his assaying experiments with iron, in 1801 Mushet identified the 'Black-band Ironstone' as an excellent iron ore which revolutionised the Scottish iron industry. Having established its stratigraphic position as being in the Upper Carboniferous, Mushet further demonstrated his knowledge of geology by leasing large tracts of land where he knew the ore could be readily accessed. Such was his knowledge of geology that in January 1808, he was one of the 42 gentlemen invited to become an Honorary Member of the newly-formed Geological Society.

While working as manager of the Alfreton Iron Works in Derbyshire (1805-1810), Mushet met William Smith's pupil, John Farey (1766-1826). Mushet performed many assays for Farey's work on the *Agriculture and Minerals of Derbyshire* (1811), and it seems likely that Farey introduced Mushet to William Smith's principles of geology during this period. In 1808 Mushet was approached by a London stockbroker, Thomas Halford, who required Mushet's advice regarding the Whitecliff Iron Works that Halford owned in the Forest of Dean. Halford was keen for Mushet to bring his superior smelting techniques to the works, so early in 1810 Mushet moved with his family to Coleford.

In October that year Farey visited 'his able friend' in the Forest and they spent two days together examining the Dean's geology. Mushet had already compiled a stratigraphic column of the area, a copy of which he gave to Farey, eventually presenting a fair copy to the Geological Society in 1812.

Meanwhile in London, Halford frequently consulted William Smith regarding his various investments, and in December 1811 Smith spent a week in the Forest of Dean evaluating Halford's collieries. Here he met Mushet who gave him a copy of his stratigraphic column of the Forest's coalfield. Halford and Mushet also owned the Bixslade colliery which Halford was anxious to sell in order to recoup some of his very considerable investment in the Whitecliff Iron Works, which had proved disastrous, and he charged Smith with finding a buyer. Mushet's remarkable geological cross-section traverses the main Forest of Dean coal basin in an east-west direction. It features the Bixslade mine and was probably compiled as a prospectus for potential buyers being approached by Smith, thus it is highly likely that Smith also owned a copy.

This paper will explore how, during the first decade of the Nineteenth Century, William Smith's ideas about geology spread 'virus-like' through the geological community, due largely to the efforts of his 'bulldog', John Farey. But just how much was this a two-way process, with individuals such as Mushet also enlightening Smith and Farey?

Above: David Mushet's geological cross section of the Forest of Dean, with an enlargement showing the location of his Bixslade coal mine.

Smith’s 1815 Map: Its production, distribution and survival

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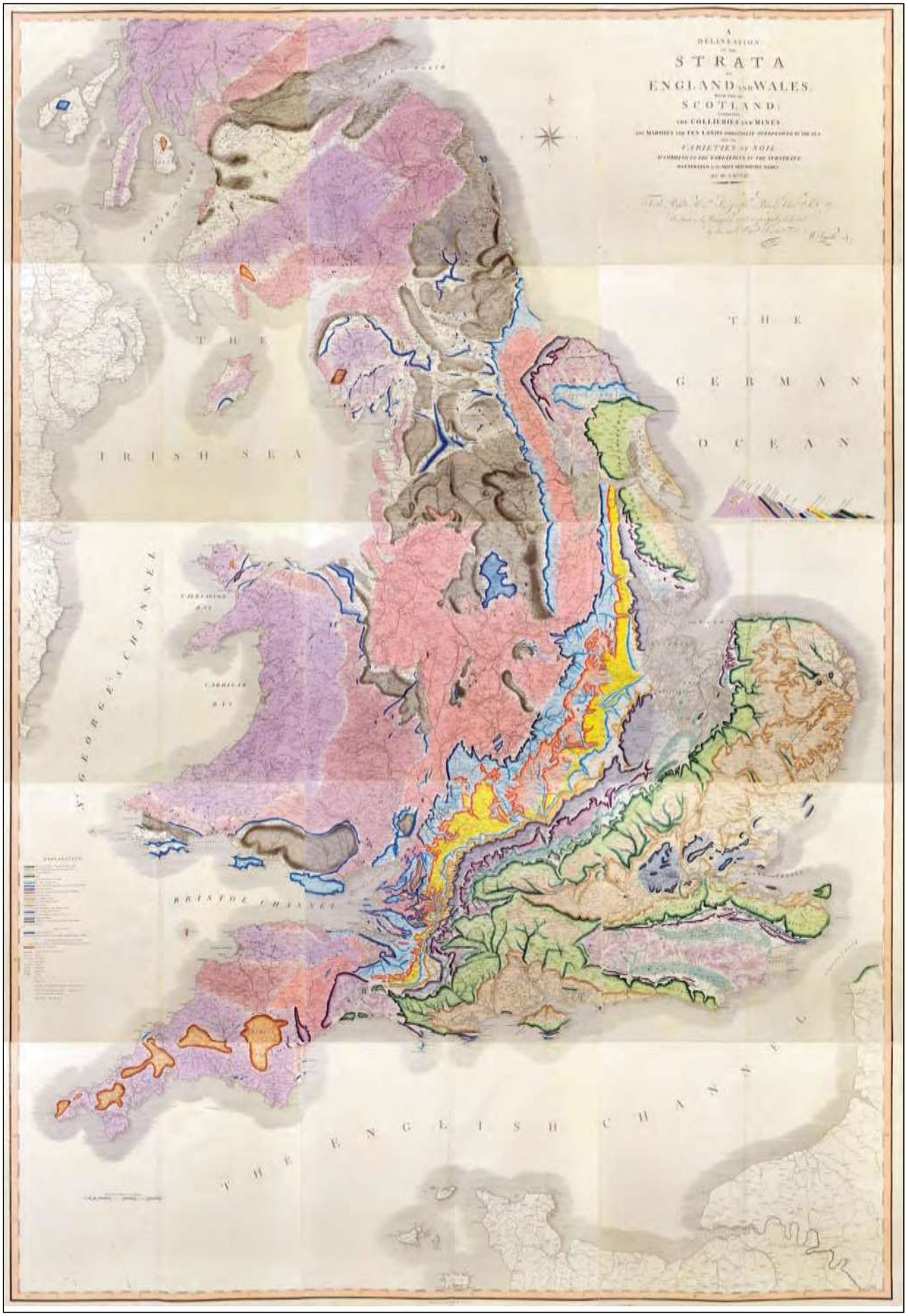
William Smith’s 1815 great map, *A Delineation of the Strata of England and Wales*, with part of Scotland, is rightly regarded as an icon of geology. Its attractive colouring demonstrating Smith’s clear understanding of the subsurface geology of much of southern Britain and bearing comparison with the modern ten-mile map of the British Geological Survey. As such, it is now highly collectible and much sought-after, with good copies commanding prices well in excess of £50,000. Despite this, its rarity has never been clearly defined; we know neither how many copies were originally produced, nor how many survive.

In September 1815, Smith indicated to his publisher, John Cary, that he envisaged a print run of 750 copies, despite having subscribers for only 414 copies as of 20 August 1815 when the subscription list, as published in Smith’s *Memoir* accompanying the map, was apparently finalised.

The map itself carries in its title a publication date of 1st August 1815, although copies had been produced early in 1815 for presentation to the Society of Arts and for demonstration to the Board of Agriculture, the first maps became available for distribution only in late September 1815 when Smith examined thirteen copies, and a further five copies a month later. At some point soon after this, Smith decided to begin numbering the maps as he received them from Cary. Between 2nd November 1815 and 23rd February 1816, Smith examined and numbered 246 maps in three numbered series (1 to 100, a1 to a100, b1 to b46), and at least a further 29 ‘b’ series maps, probably later in 1816. An examination of 27 copies of Smith's 1815 map by Joan and Victor Eyles in the 1930s recognised that, in addition to the three numbered series and the early unnumbered series, there was an additional unnumbered series of maps which, although postdating the last of the numbered maps, were likely to date from no later than January 1819. They also classified the five series of maps into four issues, based on changes to the geology shown on the map.

A recent survey of a larger sample of the 1815 map confirms the Eyles’ recognition of five series and suggests a fifth issue. It also shows that, contrary to expectation, production of the late series of the map continued until at least 1836. The latest known being that which has been on display in the Geological Society’s apartments in Burlington House since 1932. From 1 May 1820, Smith’s great map faced competition from that edited by G.B. Greenough, on behalf of the Geological Society. In the early 1820s Smith’s and Cary’s focus seems to have been on the production of the county geological maps and on a reduced scale map, *A New Geological Map of England and Wales*…, so it seems surprising that *A Delineation of the Strata of England and Wales, with part of Scotland*… either continued in production or was reissued at some point.

The complexities of the geological colouring meant that production of Smith’s great map was slow, and although Cary employed additional colourists to expedite the job, the quality of work of some of them did not meet with Smith’s approval. Although he numbered the maps whose colouring he considered to be ‘inferior’, it appears that Smith did not lend his signature to them. The absence of any numbering or signature on the late issue maps raises the question of the extent of Smith’s involvement in their production.



Above: William Smith's 1815 great map, *A Delineation of the Strata of England and Wales, with part of Scotland*, 1815, Daniel Crouch Rare Books. *crouchrarebooks.com*

Cartographic Innovation and Tradition William Smith's Geological Maps

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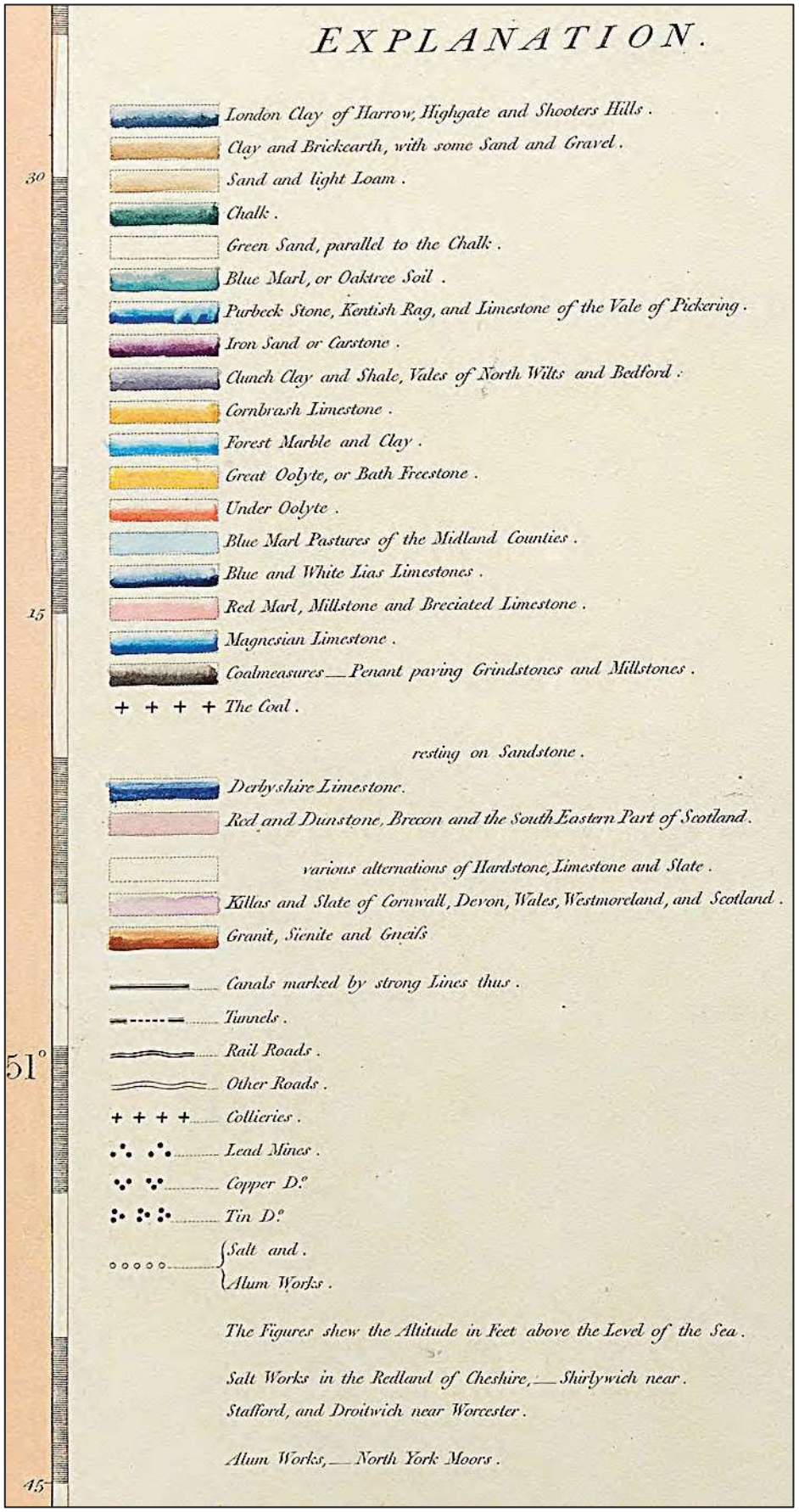
William Smith's innovative colouring of geological formations in different hues, each graded darker to indicate the base of the formation, has been generally accepted as his unique invention. Could Smith's treatment have been inspired in part by Abraham Gottlob Werner's recommendations for colouring rock types on geognostical maps, as published by Robert Jameson in the *Memoirs of the Wernerian Natural History Society* in 1811 (vol. 1, 149-161)? My suggestion is that the origins of this and other cartographic features of Smith's geological maps merit closer scrutiny.

Although he stands out as a pioneer of geological science, Smith and his publisher, John Cary, were also the beneficiaries of centuries of cartographic design, production and publishing in Europe as well as of more recent practices of depicting information about rocks and soils on maps. The first half of the Nineteenth century was a period of great innovation in thematic symbolization on varied types of maps. It is important to understand how their work reflected these precedents and trends in order to fully appreciate the respects in which they departed from tradition.

The cartographic features of their joint map products are hidden in plain sight as it were, having become so customary that the modern viewer takes them for granted. I propose to place the Smith maps under the cartographic microscope, examining their various features and the techniques employed to create them. My discussion will place them in the context of the history of cartography by seeking to answer the following questions: What, if any, were their sources for doing this? and to what extent was their treatment traditional or innovative? as well as evidence of independent invention, the adoption of new methods innovated by others and the innovative adaptation of traditional methods will be considered.

Cartographic features discussed here will include the base map, title cartouche, legend, profile views and cross sections, lettering and labels, and point, line, and area symbols. Production techniques considered will be copper engraving and associated intaglio printing techniques, as well as hand colouring using watercolours. The history of map publication in sheet versus atlas formats will also be considered.

Innovative aspects, such as the following, will receive particular attention: Findings about the representation of geological formations by area symbols, mentioned above, may question the accepted view. The significance of the use of the aquatint intaglio technique to indicate coal formations will be pointed out. Lastly, the question whether Smith's body of cartographic publications can be considered to be an early geological atlas, in spirit if not in fact, will be explored. Concluding comments will relate William Smith's achievements to patterns of innovation in nineteenth-century cartography.



Above: Legend of *Delineations of the Strata of England and Wales with part of Scotland,* 1815. Daniel Crouch Rare Books - *crouchrarebooks.com*

William Smith: The maps supporting his published maps

John Henry

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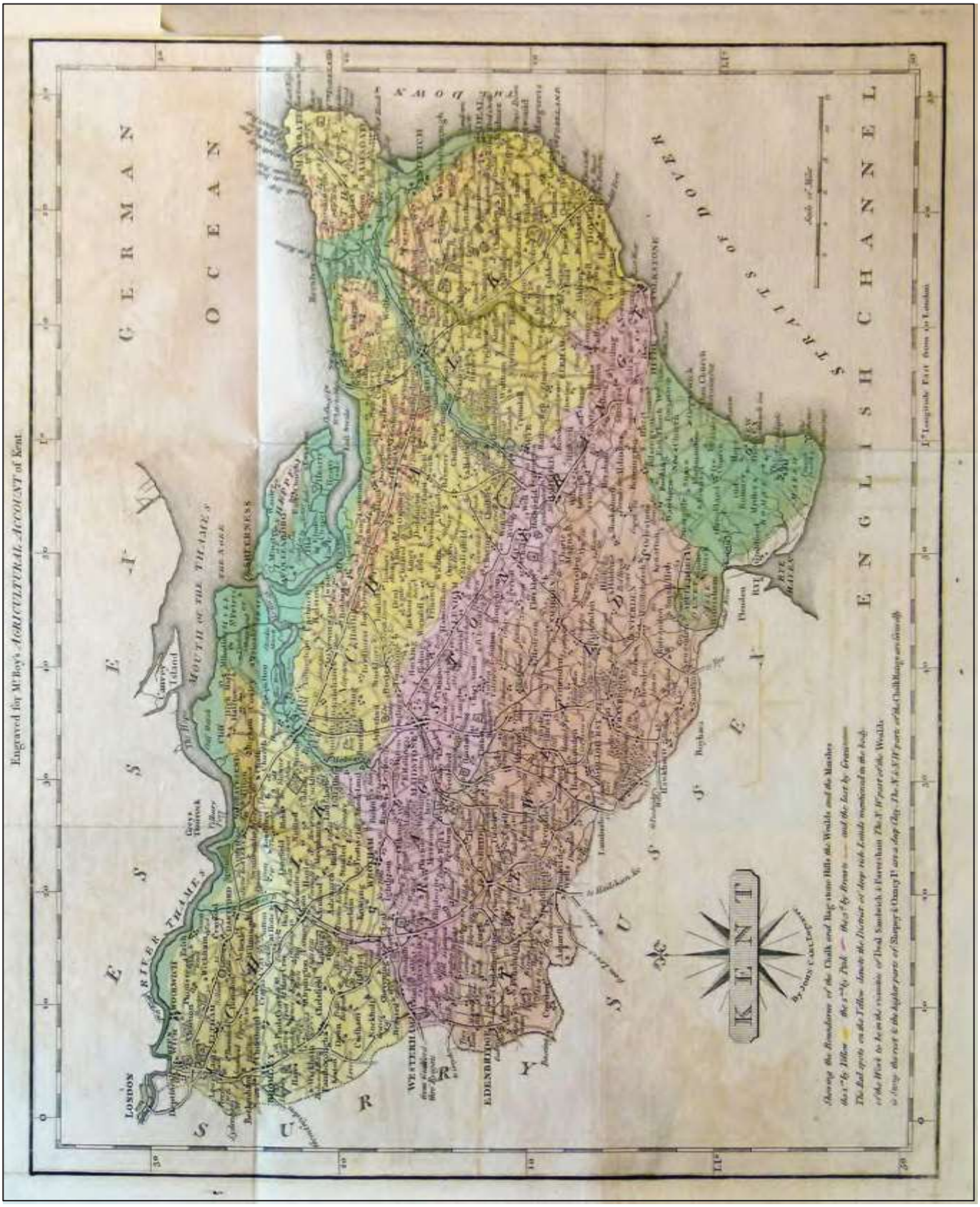
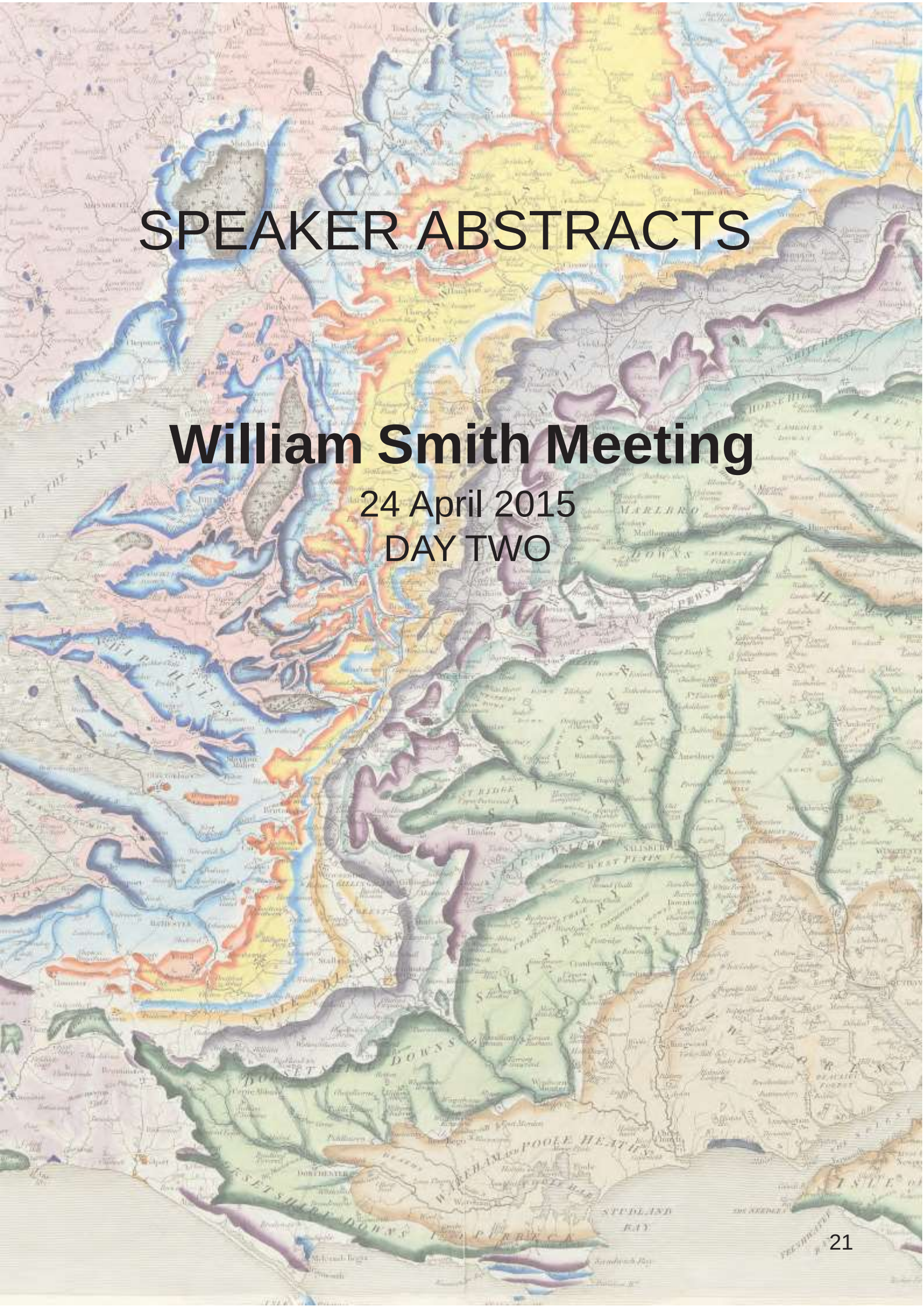
We are familiar with William Smith published maps, but how did he arrive at the finished product? Two aspects to this question are considered: the large scale mapping available to Smith for his field work, and John Cary's fundamental contribution. Smith wrote that he realised very early on that it was vital to record on a large scale in order to draw accurately on a smaller scale map of the whole country. Smith worked before the advent of the highly accurate maps of the Ordnance Survey; yet, over 80% of England had one inch to the mile scale county mapping of variable quality by several independent surveyors and publishers. This talk looks at Smith's options. In 1812, John Cary offered to assist Smith in the realisation of his ambition to publish a map of *The Geology of the England and Wales*. The early probable connections between John Cary and Smith and Cary's contribution to Smith's 1815 map and his continuing support afterward with the county geological maps and the 1820 map are explored.



Above: William Smith's cartographer, John Cary, was already aware of connection between soils and underlying rocks; his soil map of Kent, 'engraved for Mr Boy's Agricultural Account of Kent', may be considered a proto-geological map 'showing the boundaries of the Chalk and Rag-stone Hills, the Wealds and the Marshes'.



SPEAKER ABSTRACTS

William Smith Meeting

24 April 2015

DAY TWO

The First Detailed Geological Maps of France: Between individual plans and national plans

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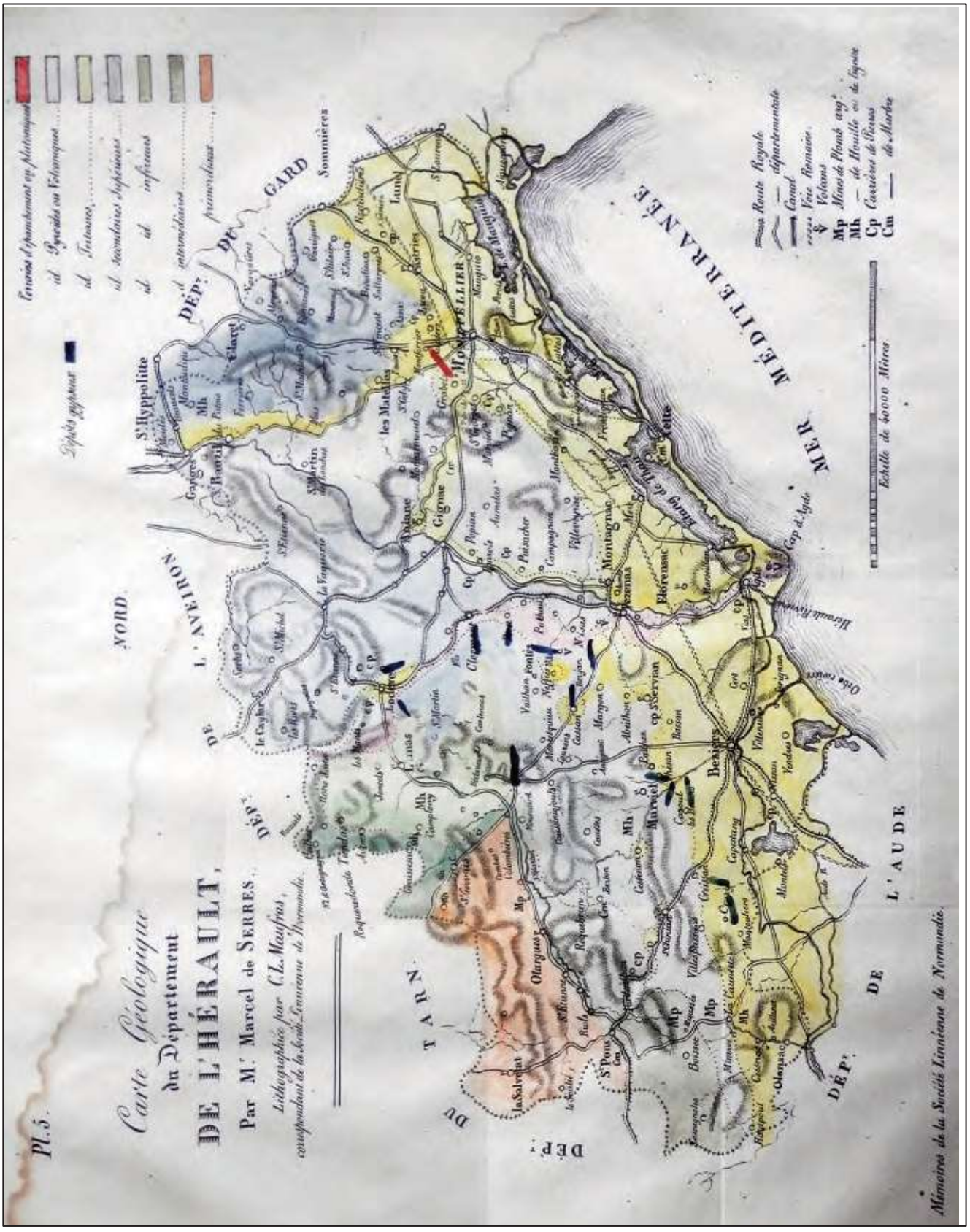
When Smith's map was published in 1815, France had only the geognostical map of Paris of Georges Cuvier and Alexandre Brongniart published in 1811. But, if it marked the beginning of modern French geological cartography, by its break with mineralogical type of map of Guettard and its introduction to a new stratigraphical dimension, it remained limited to a small surface of France. Sketch map of Basin of Paris, at 1:1 800 000, published in 1816 by Omalius d'Halloy in the Annales des mines, suffered the same limits. France at the end of 1810 didn't have whole geognostical map of its territory.

In 1811, Brochant de Villiers presented a first project aiming to establish a geological map of France to the Count of Laumond, general manager of the French mines, but the project was dropped. It was just after the reception of Greenough's map in 1820, that Becquey, general manager of the Department of Civil Engineering and Mining, decided to support the map making project of Brochant de Villiers and set him in charge to do it. This project was particularly ambitious both intellectually and materially. Expressed in a few ground lines, a whole program of geological map-making of the French territory was launched. It consisted in a two sections plan: at first to carry out a general geological map of the French territory and then to be followed by a detailed geological map-making of the eighty three French administrative divisions, called "départements". Two other mining engineers Armand Dufrénoy and Léonce Elie de Beaumont were appointed to help Brochant. In the beginning of 1823, the three men travelled to England to become acquainted with the English Jurassic and Cretaceous formations and to get in contact with Smith and Greenough. The English example was a great source of inspiration regarding the outstanding work done on secondary formations.

The French territory was mapped during five campaigns lasting from 1825 to 1829 and the first geologic observations were published as soon as 1827 in the *Annales des Mines*. The drawing of the map was completed in 1835, but it was finally published only in 1841. Detailed geological maps were supposed to be drawn after the general map was issued as it was meant to be some kind of large triangulation to which each local geologic map could later be joined. But, this second part of the original project did not have to wait until after the general canvas was established, to be started. The first geologic maps of French "counties" (départements) were surveyed in parallel to the project carried by the general management of the mines by scientists better known on a local level rather than on a national plan and with very strong local settings.

These geological maps published from 1820s are the first geological French maps after those of Guettard, Cuvier and Brongniart. Their studies allow us to discuss of the emergence of a geological cartography of details in France and, to discuss their intellectual origins and links with the previous French maps or the maps of Smith and Greenough.



Above: Geological map of the Herault Department, Southern France in 1826 by Marcel de Serres (1780-1862) in "*Mémoire de la Société Linéenne de Normandie*".

The 'Practical' Roots of Stratigraphy and Geological Mapping in Italy During The Early Decades of the 19th Century

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Towards the end of the Eighteenth Century the heritage of mineral investigations in the Italian northern regions, well represented by the work of Giovanni Arduino (1714-1795), also allowed the development of mineralogical, lithological and early stratigraphical original research in the field. The awareness of the complexities of a new science based on the analytical study of rocks, strata and their content was therefore increased and enriched. Besides the personal investigations of individual scientists, by the possibilities offered by the statistical mining investigations promoted in the early Nineteenth century by technical state bodies such as the Council of Mines of the Napoleonic Kingdom of Italy *(Regno Italico*), established in 1808 in Milan and modelled on the French '*Corps des Mines*'. Some of the best geologists and mineralogists of the early decades of the 19th century, mainly from Lombardy and Veneto - Ermenegildo Pini (1739-1825), Carlo Amoretti (1741-1816), Giambattista Brocchi (1772-1826), Giovanni Maironi da Ponte (1748-1833), Giuseppe Marzari Pencati (1779-1836) and others were employed and trained as officials in the Council of Mines, which remained active until 1816.

The geological research of these scientists was thus stimulated and facilitated by the practical activities of the institution. These were focused on a 'statistical' investigation of the territory (which included a first concept of geological survey) in order to add to the knowledge about the mineral resources and also determined various attempts at producing a litho-mineralogical map on a regional scale. Memoirs and accounts of travels to the various Departments of the Italian Kingdom were also drafted. The new geologists were in fact able to utilize the need to organize the particular data collected in the mineralogical and mining fields to add new wedges to the great mosaic of reconstruction of the geological history of the terrains which were ever vaster and ever more correlated among themselves. Although in the first half of the Nineteenth Century only occasional references to the work of William Smith may be found in the writings of Italian scientists (in particular academic geologists interested in the study of fossils within strata and formations),Little is still known of the knowledge of Smith's works on surveying and mapping within the 'practical' milieu of mining and geological surveyors who contributed to the development of early stratigraphical researches in Italy.

Above: *Physical map of the Soils of Rome in the Early Days of the Founding of this City*, 1819, by G. Brocchi

William Smith and Ireland: Sources of Irish geological information on his geological maps

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William Smith visited Dublin in 1835 when he was conferred with a doctoral degree by the University of Dublin (Trinity College). Subsequently, his nephew and geological protégé John Phillips was appointed by this institution to the Chair of Geology in 1843. 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. This presentation will discuss the state of Irish geology and geological cartography in the first two decades of the 1820s and will attempt to determine the sources of the Irish geological information that Smith utilized for his geological map of 1820.

Right: Two views of the east coast of Ireland; the left side showing the 1815 map without geological information and the right side, showing geological information acquired by 1820.

New Light On The 1824 William Smith Northumberland County Map

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Smith's geological map of Northumberland was part of the sixth issue of his county map series published in 1824. The map represents a considerable improvement on Smith's original 1815 geological map of England and Wales in that it marks 'trap' outcrops including parts of the Great Whin Sill and the Cheviots igneous complex. It also subdivides the Carboniferous strata and indicates mineralisation within the Carboniferous Limestone.

Significantly, however, neither the 1815 map nor the 1824 Northumberland County map record inland outcrops of the Whin Sill between the Roman Wall near Hexham and the coastal outcrops east of Belford and at Dunstanburgh. This is unexpected, as the 1820 (second) edition of Smith's map of England and Wales shows inland continuations of the Whin Sill outcrops between those areas, this information probably being obtained by Smith from Winch (1816) according to Eyles and Eyles (1938). There is, however, established evidence that much of the Northumberland map had been compiled by Smith's young nephew and field assistant John Phillips.

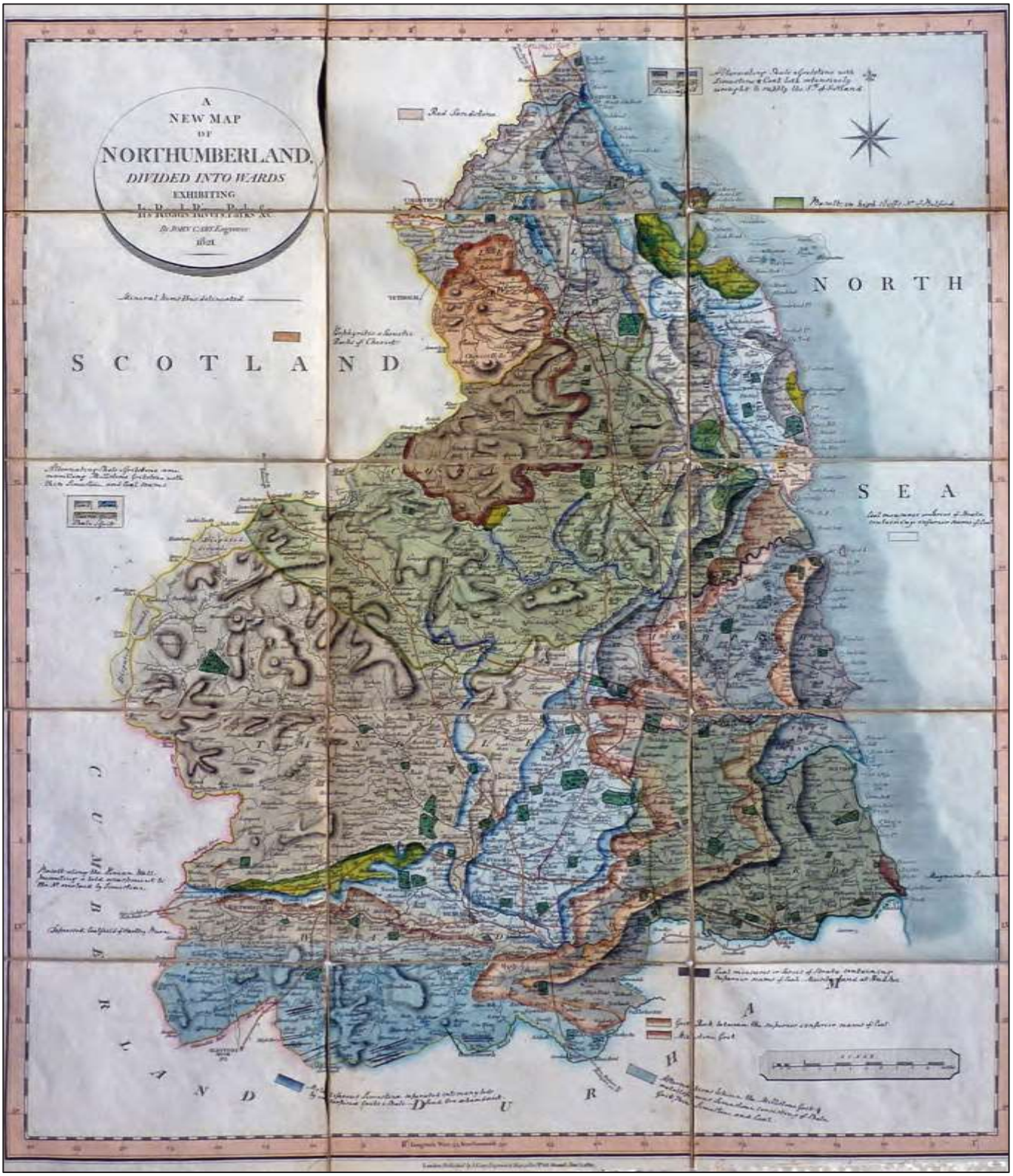
New light on the development of the Northumberland map comes from a manuscript geological map of Northumberland, in an unknown hand, which was drawn onto a previously mounted and folded Cary Northumberland map dated January 1st 1821. This shows an interim version of the 1824 Northumberland geology, which is complete in central and eastern areas but lacks details of the Coal Measures 'containing inferior seams of coal' in the west and north. Significantly, the locations of the geology missing on the 1821 map conform closely to Phillip's field mapping route of 1821 which is outlined in Phillips (1836-1844). There are also differences in the coastal limestone outcrop patterns in the vicinity of Belford and Holy Island on the 1824 published map. This map was to become the first geological map containing a significant contribution by Phillips.

Evidence derived from the 1821 manuscript map suggests that it may be an accurate copy of an unknown earlier Smith manuscript map. It was drawn up between January and September 1821, possibly to provide Phillips with a reliable guide while traversing Northumbrian field lines later that year.

1. The new find of an 1821 manuscript map confirms that Phillips rather than Smith compiled the published version of the 1824 Northumberland County map which was close to completion by late 1821.

2. Phillips route during his 1821 field visit did not traverse the inland outcrops of the Great Whin Sill, consequently, they are absent on the published 1824 Northumberland map.

3. The omissions of inland Whin Sill outcrops on the manuscript map suggest that Smith did not proof read this map although geological text captions on the 1821 manuscript map have been modified and extended on the published 1824 map.



Above: Cary's A New Map of Northumberland divided into Wards, of 1821 used as base map for Smith's (and Phillips') annotated manuscript for his published Geological Map of Northumberland of 1824.

William Smith's Error in South Wales

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The geological map produced by William Smith has often been remarked upon as a notably close match to the modern-day geological map of England and Wales: a fact made even more remarkable by it being the first to be attempted at this scale and detail. However, it is also acknowledged that areas in the far west of England and in Wales are the least accurate regions on his map.

More particularly, Smith made a significant error in charting the strata of South Wales, which was sustained in subsequent editions of his map. Smith is known to have traversed across South Wales on at least two occasions to undertake substantial coastal surveying and improvement works at Laugharne and Kidwelly in 1803 and 1811. However, he misjudged the geology in the Vale of Glamorgan and on Gower, mistaking 'Derbyshire Limestone' (Carboniferous, Dinantian Limestone), for 'Magnesian Limestone' (Permian, Zechstein Group, Dolomoitised Limestone) and failed to observe, note or gain intelligence on the presence of 'Red Marl, Millstone and Brecciated Limestone', (Triassic, Mercia Mudstone Group) and 'Blue and White Lias Limestones' (Triassic/Jurassic, Lias Group). This is a particularly surprising error or omission as these strata are readily exposed on the South Glamorgan coast. Finally, Smith marked the junction between the 'Derbyshire Limestone' and the 'Magnesian Limestone' strata in the Vale of Glamorgan as an abrupt abutment of one against the other, with apparent disregard for or understanding of the relationship between the two strata.

An analysis and field examination of exposures that Smith might have encountered, or very similar locations to those he likely observed on his visits or travels through the district together with a consideration of contemporary studies, sources and accounts of the character and distribution of strata and soils in the region enable a discussion of how and why Smith made such a misinterpretation and throws light on his working methods and understanding. The study also suggests how Smith made possible compromises, in South Wales and elsewhere in England, in order to ensure his map was published in 1815, albeit not accurately completed to his full satisfaction.

Above: Smith's map of the areas bordering the Severn Estuary. Daniel Crouch Rare Books - c*rouchrarebooks.com*

William Smith Online: The impact of re-curating the William Smith Archive

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In March 2014, ahead of the bicentenary the Oxford University Museum of Natural History launched *William Smith Online*, an interactive online catalogue and website illustrating the William Smith archive held by the Museum.
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The project saw the majority of the William Smith collection digitised and catalogued, to be made available online, including all of his maps, geological sections, diaries, correspondence and some of his personal papers. In spite of some technical hiccups in the launch of the project, the impact of its availability online and the production of an archival catalogue, which provides a hierarchical view of the collection, have opened the William Smith archive to a significantly wider audience than it has ever been accessible to.

The re-curation of Smith's collection is proving to have a significant impact on the research conducted on William Smith and his work. The breadth of his observations on topics, such as palaeontology and economic geology, are more apparent now that they have been included in the catalogue, and offer the potential for developing a more in-depth understanding of Smith's role in the development of geology as both an academic discipline and as an industry. Contributions beyond the geological importance of Smith's archive are also being recognised; including the influences of his professional work on the industrial revolution and social history more broadly, as well as the influence of the times on Smith himself, including his attempts at creating poetry with clear Romantic nuances.

The talk will include an in-depth comparison of the collection, both before and after re-curation, particularly focusing on the potential gaps in research which were caused by the lack of archival catalogue. It will also highlight some of the new research which has developed since the project's completion, and identify potential areas of the collection which may prove worthy of further study.

Above: William Smith's *Geological Map of Oxfordshire*, 1820. From the collection of the Oxford University Museum of Natural History.

William Smith: From Fullers Earth to Google Earth

Peter Wigley

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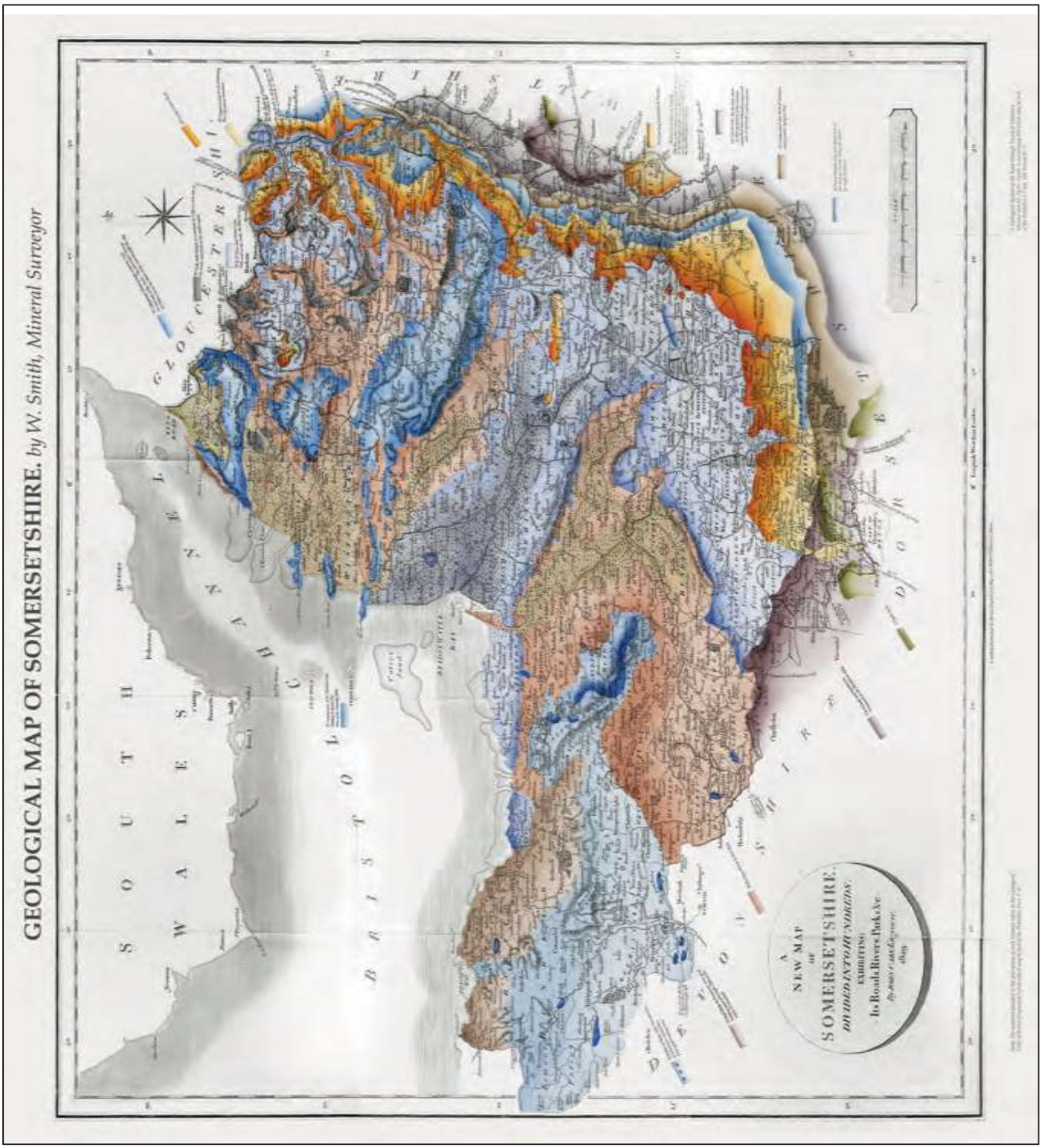
William Smith's geological mapping of England and Wales provided a remarkable geological legacy which is still relevant two hundred years after the publication of his first map. Over the past decade I have used modern digital cartographic techniques to view Smith's maps in the modern world. Only limited numbers of projections were available for late 18th century and early 19th century maps; Smith's maps were compared against these projections and best-fits were obtained for those of Bonne and Cassini. Using these projections, together with georeferenced locations of towns and villages, Smith's maps (which used John Cary's bases) were converted into modern coordinates. This process allowed several contemporaneous examples of the maps to be compared with one another and also to be overlain on modern datasets including BGS geology and Google Earth.

To students of William Smith's maps it is apparent that he had an incredible ability to visualize the geology and stratigraphy of the English countryside in three dimensions. By using digital elevation data it has been possible to drape his maps on an elevation model and to view them in 3D, possibly giving an impression of English geology and stratigraphy as originally seen and conceived by Smith. The culmination of these recent studies has been the establishment of a permanent website dedicated to the maps of William Smith.



Above : This *Geological Map of Somersetshire* was completed and tinted, on behalf of William Smith Esq., by Peter Wigley of Wells Park, Devonshire, based on his interpretation of W.Smith's original engraved geological lines © Peter Wigley & Hugh Torrens, 2015

William Smith: The coming of the Father

Simon Knell

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Almost immediately upon leaving debtor' prison in 1819, everything for William Smith changed. Escaping to the north, to Yorkshire, the last twenty years of his life were a period of approbation. Far from being a tragic figure, this 'happy farmer', as John Phillips once described him, now set about converting aspiring communities across the north of England to Smithian geology. With the help of Phillips, his young, sociable and eloquent nephew and ward, Smith would reveal in the field and in public lectures a concealed geological logic and pattern that local audiences had failed to observe. Composed of men hoping for fame and for social elevation, these audiences were converted overnight. Smith and Phillips were a sensation. Understanding that Smith's reputation was his greatest inheritance, Phillips would in 1829 prove the unrivalled power of his uncle's ideas. These ideas had already began to seep into more resistant minds in London, where a group of self-appointed gentlemen were thought to be inventing English geology.

Eventually, Smith would be admitted into this world as a political pawn, not just in the internal politics of the Geological Society but also as a defence against the encroachments of the French. From 1815, chauvinistic commentators had warned against French appropriation of British discoveries. One discovery that seemed rather muddled in the late 1810s, concerned that claim by Smith. It was challenged by earlier British work and by those who believed Smith's geology as actually French.

In the last decade of his life, Smith's life became historicised, a history shaped into a national myth by Adam Sedgwick, who sought to make Smith the inventor and mascot of English Geology. Smith became immortalised as the Father of English Geology. In time, however, this notion would be misunderstood by historians who had come to think of the very notion of scientific parentage as ridiculous. But in their attempts to adopt greater historiographic rigour, they failed to observe that 'English Geology' did not refer to the national practice of this science but to something quite particular.

'English Geology' described what we might understand today as fossil-based stratigraphy, though even this is a reductive notion; Smith's method was not limited to the use of characteristic fossils. A more precise definition is: English Geology = Smith's Geology. When geologists referred to English Geology in the 1830s and beyond they were applying this term in this narrow sense. By definition, then, if we understand the term correctly, Smith was and is the Father of English Geology.

NOTES

POSTER ABSTRACTS

William Smith Meeting

23-24 April 2015

William Smith and the Trans-Wealden Extension of the Upper Ouse Navigation

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East Sussex Records Office holds an historic document of considerable significance to the History of Geology: a large-scale, meticulous survey of the proposed Trans-Wealden extension of the Upper Ouse Navigation, undertaken in summer 1810. It is recorded in volume 87 (2003) of the Sussex Record Society, with 'Surveyor not stated', it is believed that William Smith supervised the surveying of this project.

During the opening decade of the Nineteenth Century, William Smith had to earn his living as a freelance, itinerant Surveyor. Upon the death of the previous Surveyor of the Upper Ouse Navigation, reputable and experienced William Smith was appointed, in May 1808, to the position on a retainer basis, and visited Sussex regularly over the next 4 years. One of his early duties was to prepare plans to link the Upper Ouse Navigation with Sir John Rennie's grandiose Grand Southern Canal, from the Medway to the Arun.

Although William Smith explicitly wrote, in a 1839 Letter to John Phillips, that he 'took the levels for a line to connect this [Rennie's Canal] with the Ouse navigation up the Balcombe Valley, by a tunnel through the forest ridge, and spent some time unprofitably in preparing a plan of it, which was deposited with the Clerk of the Peace at Lewes', (which is confirmed on the document itself), it would appear, from his correspondence of the time, that he only masterminded the surveying and later verified the details and draughtmanship of the Plan before submission. William Smith was, nevertheless, responsible for this legal document.

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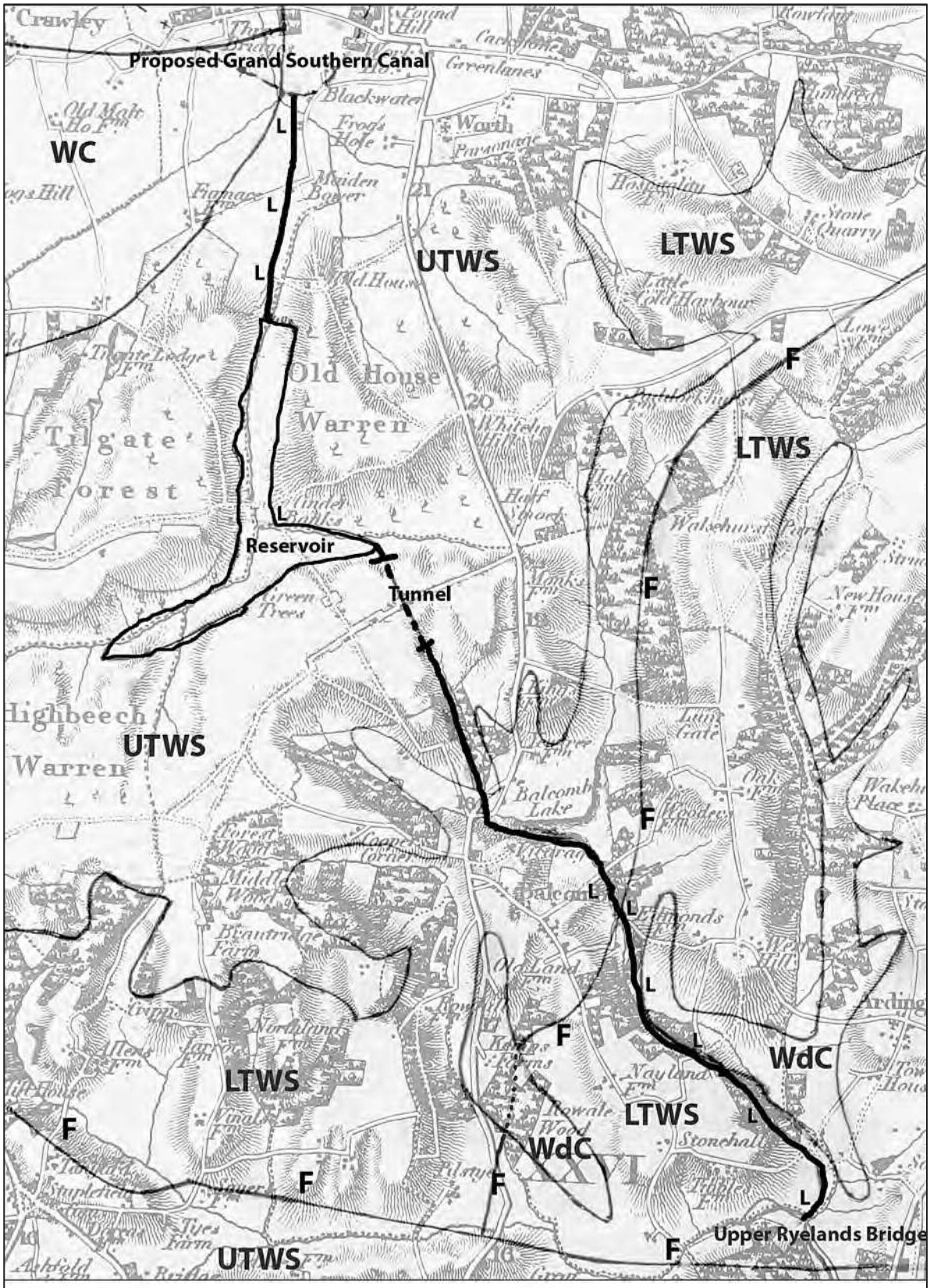
his 1810 Survey lists riparian landowners along the 22 miles of the proposed canal, which would have needed 18 locks, a long tunnel and an extensive watershed reservoir. The route is marked on a modern version of contemporary maps for 1813-19.

William Smith relinquished his role as surveyor in April 1812, just when John Cary, accomplished mapmaker, indicated his willingness to proceed with Smith's grand project.



Above: Transwealden Extension of the Upper Ouse Navigation Route, topography and geology.

William Smith Collections of Fossils and Rocks at The Natural History Museum, London

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It is not widely known that much of William Smith's collections of more than 1600 fossils and 107 rock samples now reside in the collections of the former Department of Palaeontology, recently incorporated into the new Department of Earth Sciences, at the Natural History Museum, London. The Collections were acquired by the Museum (then part of the British Museum) between 1816 and 1818 when Smith sold them to help pay off his debts. Unlike most of the NHM collections, which are stored taxonomically, the William Smith Collections, as with a number of other historically important collections, are kept intact, under the collector's name. Smith's fossils are stored stratigraphically, according to his 'Order of Strata'.

One particular aspect of interest is Smith's Cataloguing System. He marked many of his fossils in black ink with a code of Roman capitals for genera, followed by numbers for species, and then by lower case letters for localities. Hugh Torrens has suggested to me that Smith's System, devised with the help of his nephew John Phillips, and was the first to use a numbering system that signified scientific attributes of the specimens. We have also had access to the manuscript of Smith's never published part 2 of his Stratigraphical System of Organised Fossils, which Hugh Torrens discovered had survived in Oxford. This has allowed us to properly catalogue his specimens.

Above: Images and sketches of fossils from the Smith Collection, Natural History Museum, London.

15 Buckingham Street and its Environs in William Smith's time

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William Smith leased 15 Buckingham Street from 1804 to 1819. He had lodged nearby frequently in the previous year and so knew the neighbourhood well. Buckingham Street was on the west edge of the area then known as the Adelphi. It was a smart residential and professional neighbourhood recently developed by the Adams brothers and occupied by architects, engineers, surveyors, engravers, draftsmen, printers, cartographers and map sellers. It was between and within a short walk of the City and Whitehall. No.15 overlooked the river at York Water Gate where boatmen waited to ferry clients along and across the river. This where his nephew, John Phillips joined him aged 15. Smith chose the location for its professional support, proximity to clients and its prestigious address. Following Smith's bankruptcy and the termination of his lease, the subsequent lessee of 15 Buckingham Street was the newly formed Institution of Civil Engineers taking up its first official home.

Smith lived here before the advent of railways, and the construction of the Embankment Gardens, Charing Cross Bridge and Station and Trafalgar Square. However, apart from the modern building presently at number 15 the immediate neighbourhood, the rest of Buckingham Street, the steps down to the narrow terrace and the water gate remain very much as they were in Smith's time. With reproductions of a contemporary street plan, and paintings, sketches and photographs, this poster will show the location of supporting professions and images of the riverside environs and the exterior and interior of the house that was William Smith's base and home for 15 critical years.

On 23rd March 2015, a plaque was unveiled at 15 Buckingham Street by Sir David Attenborough to memorialise William Smith and launch the bicentenary of his 1815 map, Delineation of the Strata of England and Wales with Part of Scotland. The original building was demolished c.1906.

Above: 15 Buckingham Street from the Thames at York Water Gate, c.1830. Also known as York House, this was William Smith's home from 1804 to 1819. With Permission of London Metropolitan Archive.

William Smith Meets Thomas Sopwith: The 1837 Harrogate Sulphur Wells Case

Susan Turner

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Sopwith as a young man.

Thomas Sopwith (1803–1879) of Newcastle upon Tyne was virtually a self-taught geologist. Trained as a surveyor and civil engineer, his career encompassed the pioneer steam age and he specialised in 3D geological modelling. From early training in the family cabinet-making firm he developed an interest in drawing, planning, land surveying and mechanical engineering. In this time he came under the influence of Westgarth Forster and John Farey Snr, and undoubtedly therefore William Smith. Sopwith was almost certainly inspired by Smith's and Farey's ideas, but ultimately had a greater practical understanding of the formation of underground structures. Sopwith began professional practice as assistant and then partner in 1826 to Joseph Dickinson in the local lead mines. The busy early years mirroring those of William Smith were spent measuring royalties, planning mining operations, and surveying for projected roads and railways, giving him valuable experience.

In the mid-1830s, Sopwith began to plan and design his masterful series of 3D models to show particular and general geological structures. One of those models was the geological structure of the Harrogate sulphur wells. This formed part of a notable trial heard at York, on March 14th 1837 when Sopwith gave evidence with other witnesses including his friend John Buddle, John Dalton, John Phillips, local and academic chemists, and William Smith, then 67/8 years of age. This was the first meeting of the two.

Following an "act of vandalism" in 1835 by Joseph Thackeray, manager of the Crown Hotel who intended to build a well that would yield the sulphur water, that was popular with those wanting to 'take the waters', and drain the flow of the public well, the Harrogate court case brought by aggrieved locals who saw their income literally draining away into the new well. Using his geological, architectural and isometrical skills, Sopwith made the model of deposits to explain geological structure of the sulphur wells to advocate Mr Cresswell. The latter was used in his recommendation to the judge and thus Sopwith's advice contributed to a compromise with the new well given over to free public use.

Following the Harrogate meeting, William Smith visited Sopwith and they carried out a geological survey around Newcastle to see the new lines of railway then springing up, especially on the far end of the Newcastle to Carlisle Railway. It was a great joy to Sopwith to escort and discuss with Smith on this Northumbrian tour.

Smith and Scarborough; a happy co-incidence

Will Watts

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The Rotunda museum in Scarborough opened in 1829, built by the newly formed Scarborough Philosophical Society (SPS). It is widely recognised that William Smith provided advice and suggestions about the design of the building and the exhibitions. These were included in the plans drawn up by York based architect Richard Sharpe (who also provide the initial designs for the Yorkshire Museum). Smith was also employed as site foreman during the building work.

In addition to the Rotunda, and his work as Sir John Johnstone's land agent at nearby Hackness (where he made an exquisite geological map of the estate), Smith also played a key role in modernising the Scarborough's aging water supply. He spent large amounts of time along the coastline determining the geology, including Scarborough Castle Headland, later described by his nephew John Phillips as '...the finest spot for a geologist the whole Earth contains.'

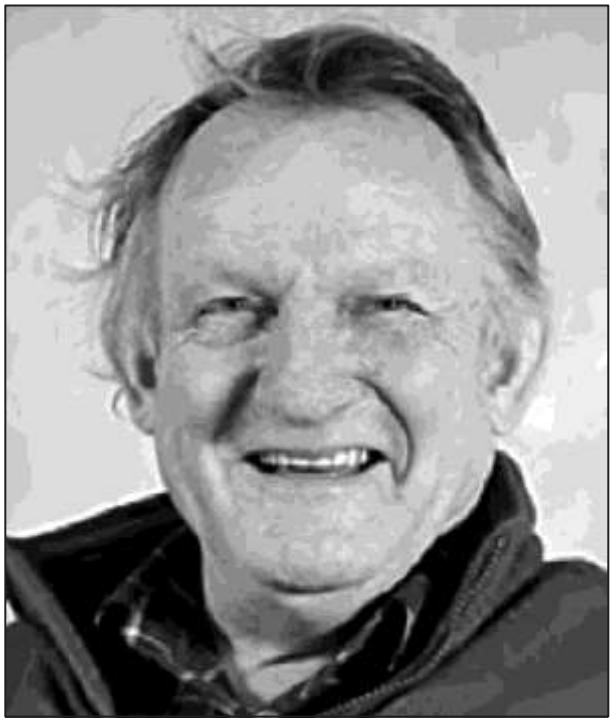
Smith's influence whilst in Scarborough should not be underestimated; from encouraging local individuals who began collecting in a systematic way following his lectures with Phillips in the Town, to the formation of the SPS and the building of the Rotunda, onto mentoring future famous geologists, Smith left his mark on succeeding generations. Among those who Smith mentored, using the coastline at Scarborough to demonstrate, were John Phillips, Roderick Murchison (via a boat trip with Smith along the coast), William Crawford Williamson (son of the first Keeper of the Rotunda, John Williamson whom Smith boarded with for a period of time) and George W Fe

NOTES **Above:** The Rotunda Museum, Scarborough. Photo by Tony Bartholomew

William Smith Meeting

23-24 April 2015

SPEAKER BIOGRAPHIES



Hugh Torrens

Hugh has been Emeritus at Keele University, U.K., since 2000 and took over as 'a Smith expert', from his friend Mrs Joan Eyles, after her death in 1986. Since then, he has published a number of Smith related items, and lectured on Smith's work all over the world. He gave the Geological Society of London's first William Smith Lecture, on the man himself, in June 2000 (which Simon Winchester was able to attend) and a much enlarged edition of John Phillips' 1844 Memoirs of William Smith followed in 2003.

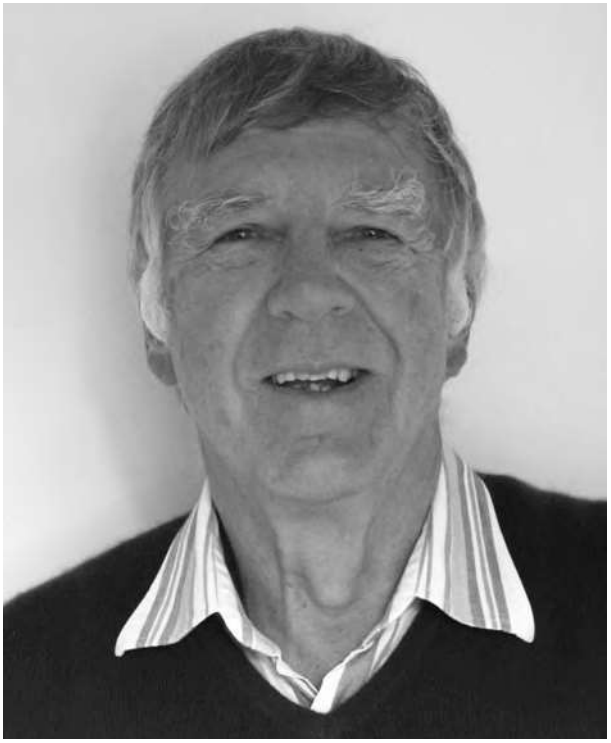
Owen Green

Owen has worked in the Department of Earth Sciences at the University of Oxford for the past 26 years, and is currently the Geological Facilities Manager. His specialist interests include sample preparation techniques and protocols, and he is author of A manual of Practical Laboratory and Field Techniques in Palaeobiology (2001). Other published research interests include studies on the world's oldest (3.5 billion years old) putative fossils from Western Australia, early Ediacarian sponge spicule clusters from southwestern Mongolia, and the last marine shallow carbonate-platform foraminifera of the Tethyan Ocean recorded in rocks of the NW Himalayas. He has served on the committee of the Geological Curators Group, and currently, is on the Physical Sciences and Outreach committees of the Royal Microscopical Society. As chair of the Oxfordshire Geology Trust he worked closely in support of the Churchill and Sarsden Heritage Group on all things related to William Smith.

Peter Riches

Peter's enthusiasm for geology was fired by searching for fossils along the East Anglian coast where he grew up as a young boy. After a geology degree from King's College London and time at the Field Studies Council and the Open University he spent most of his working life in the oil industry. Following a Masters in Quaternary Science he gained his PhD for work on the Crags of East Anglia from Royal Holloway, University of London. He is a Fellow of the Geological Society, former Vice President of the Geologist's Association, former editor of the Proceedings of the Geologists' Association and a current member of the committees of the Geological Society of Norfolk and of GeoSuffolk. He is also a member of HOGG (History of Geology Group) and the Society for the History of Natural History. In his spare time, he collects antiquarian publications on East Anglian geology.

John Mather



John is a graduate of Liverpool University, where his Ph.D. was on the Lower Greenschist facies rocks of the Dalradian, John joined what is now the British Geological Survey (BGS) in 1966. Somewhat to his surprise he was assigned to the Hydrogeology Unit where he was soon rewarded with a two-year posting to the Caribbean. Research on groundwater pollution and waste disposal followed, before he was seconded to NERC headquarters for three years. He became Chief Hydrogeologist in 1986 and an Assistant Director the following year. Moving to Royal Holloway University of London in 1990 as Lyell Professor, he continued his research on groundwater quality and pollution and began to work on the history of hydrogeology, which he recognised as sadly neglected. This has continued into his retirement resulting in some 30 historical papers. Particular interests have been spas and mineral springs and the pre-1900 development of ideas on the origin, prospecting for and development of groundwater supplies. As a member of HOGG he has edited two Geological Society Special Publications arising from their meetings. Now living in Devon, he continues to write and throws functional stoneware pots in a shed in his back garden.

Dick Irving

Dick is Professor at the School of Policy Studies, Kwansei Gakuin University in Japan. He is also co-founder and Hon. President of the Combe Down Heritage Society. The newly opened 'Cornerstone', a study centre for Combe Down heritage on the site of the original Ralph Allen quarry for Bath stone, will hold an exhibition celebrating William Smith's various connections to the village in April/May 2015. Dick is a geographer, but history is a passion also. He is author of "William Smith and his Venture into 'Stone Manufacture'" (2010), Combe Down Heritage Society, 80pp.

Cherry Lewis

Cherry is an Honorary Research Fellow of the University of Bristol's Earth Science Department. She is author of *The Dating Game* (2000), a biography of Arthur Holmes and a history of dating the age of the Earth. She also edited, and contributed to, *The Age of Earth: 4004 to 2002* (2002) and *The Making of the Geological Society of London* (2009). In 2012 she was awarded the Sue Tyler Friedman Medal for excellence in research into the history of geology, and the following year gave the Geological Society's Founders' Day lecture. She was Chairman of the Geological Society's History of Geology Group from 2004 to 2007. Cherry has just completed a new biography of James Parkinson (1755-1824) and has a particular interest in the emergence of modern geology at the end of the eighteenth and beginning of the nineteenth centuries. Living as she does in the Forest of Dean, with its rich industrial history, she has recently started to research the great industrialist David Mushet, arguably the 'father' of the iron and steel industry, who also lived in the Forest of Dean.

Tom Sharpe

Tom was formerly Curator of Palaeontology and Archives in the National Museum of Wales which houses the largest single collection anywhere of various issues of William Smith's 1815 map, accounting for nine copies. For over fifteen years he has been trying to locate all extant copies of the map to understand its production, distribution and evolution, and has examined over sixty copies of the map in collections in the UK and elsewhere. His interests, apart from Smith and his maps, include the life and work of Henry De la Beche, founder of the British Geological Survey, and the history of geological exploration of the Antarctic. He teaches geology classes in Cardiff University Centre for Lifelong Learning, is a Trustee of Lyme Regis Museum and works as an expedition cruise lecturer and guide, particularly in the polar regions.

Karen Severud Cook

Karen is a Special Collections Librarian in Kenneth Spencer Research Library at the University of Kansas. She holds a BA degree in Art History from Barnard College, Columbia University; MS and PhD degrees in Geography (specializing in cartography and its history) from the University of Wisconsin-Madison; and an MLS from Emporia State University. She recently directed a three-year National Endowment for the Humanities-funded project to digitize the library's collection of John Gould's large-format ornithological books and over 2000 preparatory drawings, watercolors and proofs. From 2008-2011 she was associate editor of *The History of Cartography, vol. 6, The Twentieth Century*, a NEH-supported book being published by the University of Chicago Press in April 2015. Earlier experience as a cartographer, especially of geological maps for the State of Alaska Geological and Geophysical Survey, continues to inspire and inform her research and publications about the history of map design and reproduction

John Henry

John graduated as a Geomorphologist from University of Waterloo, Ontario and completed a Dip.ITC at the International Institute of Aerial Surveys and Earth Sciences, Netherlands. He established ARUP's air photo interpretation unit in 1973 and headed it for thirty years. His unit produced engineering geological maps and terrain evaluations for major projects, development plans and route selection studies in the UK and throughout the world. While at ARUP he built up large corporate collections of geological and topographic maps and survey photographs. In 1998, he started Nineteenth Century Geological Maps to acquire and sell antique geological maps, illustrations and books. In 2003, he established APIC - Air Photo Interpretation Consultancy – to interpret satellite imagery and aerial survey photography for geological and site history applications, particularly to identify potential hazards to engineering projects. Currently, John is chair of the History of Geology Group of the Geological Society.

Pierre Savaton

Pierre is Associate Professor of History of sciences in the University of Caen (Normandy, France). He teaches Geology, Field geology, History of sciences and History of French Teaching. His works cover the birth of geological cartography and experimental petrography (XVIIIth, XIXth centuries), and the teaching of sciences in the French secondary schools since the Revolution.

Ezio Vaccari

Ezio graduated in Arts from the University of Florence and received his PhD in the history of science at the University of Bari. His research deals with the history of earth sciences and in particular the relationships between geology and mining techniques in modern and contemporary art, the historical development of scientific-technical forms of communication and history of material culture in the mountain area. He has researched on contracts and scholarships at University of Rostock, Bergakademie Freiberg, Trinity College, Dublin, Geologische Bundesanstalt, Vienna, Cité des Sciences et de l'Industrie, Paris and MIT, Boston. He has published over 100 papers and articles in journals, books and conference proceedings on the history of Italian and international geosciences between 1700-1900, with particular attention to Italy. Currently he is Professor of the History of Science and Technology and Director of the Centre for Research on the history of the mountain, material culture and earth science at the Department of Theoretical and Applied Sciences, Università dell'Insubria, Varese, Italy.

Patrick Wyse Jackson

Patrick is Associate Professor of Geology, Curator of the Geological Museum and Fellow at Trinity College, Dublin. Aside from his research interests on Palaeozoic bryozoans, he is interested in the history of geology, particularly that relating to Ireland, and is currently engaged in a long-term biographical study of the geologist John Joly (1857–1933). Patrick is a past-Chairman of the Geological Curators' Group and former editor of The Geological Curator and Earth Sciences History. He is a member of the International Commission for the History of Geological Sciences, and a past-Chair of the Royal Irish Academy Committee for the History of Irish Science. His books include *The Chronologers' Quest: episodes in the search for the age of the Earth* (Cambridge, 2006) and *Four Centuries of Geological Travel: the search for knowledge on Foot, Bicycle, Sledge and Camel* (Geological Society, London, Special Publications, 287, 2007).

Martyn Pedley

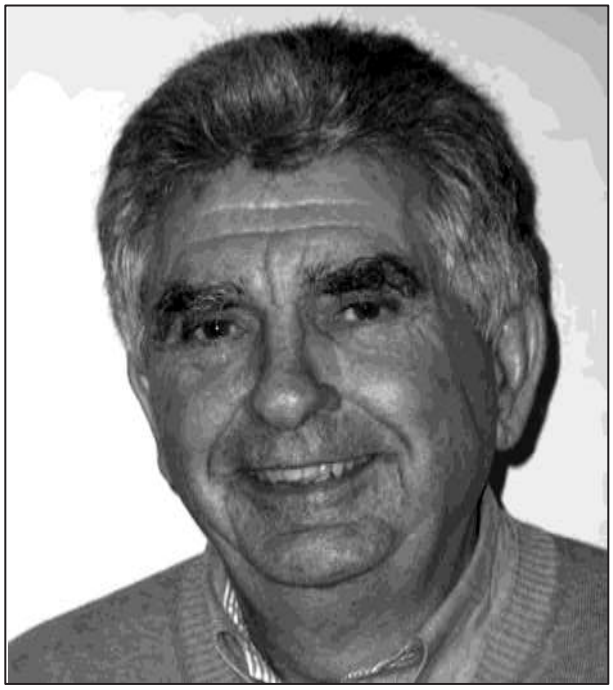
Martyn holds an honours degree in geology at Leicester University (1968-1971). His PhD at Hull University (1974-1975) was on 'The Oligo-Miocene sediments of the Maltese Islands'. Since 1974 he has held academic posts at North London and City of London Polytechnics before returning to the Geology Department at Hull in 1985 as a carbonate sedimentologist. Consequent to the Earth Science review he held a joint position at Hull and Leicester Universities. He retired in 2012 and is now Emeritus Reader in the Hull Department of Geography Environmental and Earth Sciences. In addition, he holds a DSc from Leicester University, and Chartered Geologist status within the Geological Society. He is an international authority on marine Cenozoic carbonates, freshwater limestone genesis and microbial tufa biofilm process and product. His publications include books, journal articles and 6 geological maps.

Duncan Hawley

Duncan is a geology graduate from UCL with post-graduate qualifications from Aberystwyth and Oxford. He is a Fellow of the Geological Society and a member of the Geologists' Association. He has enjoyed a varied career in education with time spent teaching geography and geology in state and independent schools, a field study centre, in teacher education and higher education. He currently works as an independent educator and consultant in geography education, particularly physical geography. A well-known leader of field excursions in Breconshire and Herefordshire, Duncan has researched the Old Red Sandstone, with particular knowledge of the Black Mountains and Wye Valley area where he also works on the significance of that area in Murchison's fieldwork in establishing the Silurian. Duncan also has a strong interest in the early development of geological maps and fieldwork, in Britain and other areas of the world.

Kate Santry

Kate is Head of Archives and Library at Oxford University Museum of Natural History, has been re-curating the William Smith archive since 2013. This work has seen the collection catalogued, conserved, digitised, and made available online at www.williamsmithonline.com. Her professional interests include women in the history of natural history and botanical and entomological artwork.



Peter Wigley

Peter is a Cornishman; he received a BSc in Geology from University College London and later a PhD in Carbonate Sedimentology. In 1973 he joined ERICO, a geological consulting company and worked on numerous geological projects in the North Sea, Africa, the Mediterranean, China and the Middle East. He left ERICO in 1991 to become an independent consultant working on a number of limited partner's projects in Africa and the Middle East. In 1995 he joined Lynx Information Systems, a company he jointly founded and is currently a Non-Executive Director of the company. He is a Board Member of AAPG-Datapages and the Director of the Datapages DEO-GIS Project.

Simon Knell

Simon is Professor of Museum Studies at the University of Leicester. His research has explored the wider culture of geology and particularly those negotiations that involve fossils. His *The Culture of English Geology 1815-1851* (2000) discusses the impact of Smith's practice on amateurs and professionals, and how it was used by his nephew, John Phillips. Knell's '*The road to Smith: how the Geological Society came to possess English geology*' in Lewis and Knell's *The Making of the Geological Society of London* (2009) looks in great detail at the controversy surrounding Smith's and Greenough's maps, and at the social controversies and debates that led to Smith being referred to as 'The Father of English Geology'. The precise meaning of English geology is explained here. More recently he published *The Great Fossil Enigma: The Search for the Conodont Animal* (2013). He is also produces research in Museum Studies and is currently completing a global study of national galleries and national Art.

PART 2 OF THE WILLIAM SMITH MEETING 2015

The Geological Society
serving science & profession

PART OF THE WILLIAM SMITH MAP BICENTENARY PROGRAMME OF EVENTS

William Smith Meeting 2015

200 Years and Beyond: the Future of Geological Mapping

5 November 2015 — The Geological Society, Burlington House, London

In 1815 William Smith published the first edition of his Geological Map of England and Wales.

Smith's map made a seminal contribution to the understanding of the ground beneath our feet and, by showing the location of coal, iron ore, clays and other raw materials, helped fuel the industrial revolution. Two hundred years on, the demands for spatial knowledge about our geological environment and its resources and hazards become ever more pressing.

The first William Smith Meeting in April 2015 chronicles the history and development of the geological map from its earliest beginnings to the digital maps of today. This second William Smith Conference will look to the future of geological mapping, and will open with a keynote by Professor Iain Stewart on the grand challenges for geoscience that will motivate the 'William Smiths' of tomorrow. It will showcase the new science, technologies and information systems that are changing and broadening the whole concept, purpose and impact of geological mapping. A concluding panel discussion will focus on the skills and roles of the field geologists of the future.

The Conference will be followed by a drinks reception and an evening lecture that takes geological mapping to the next frontier – planetary geology.

Themes and topics will include:

- What is 'geological mapping' in the modern age of digital information and geological models?
- What are the future demands for spatial geological data and knowledge? How will these vary across emerging and developing economies?
- What will the geological map of tomorrow look like? How will the digital revolution shape how we present, visualise and communicate geological knowledge?
- What new technologies are emerging in digital mapping, geophysics, earth observation and modelling? How do we integrate these with field-based geological observations and interpretation?
- What skills will be needed by the field geologists of the future? Do we still need to teach students how to map, and why?

Convenor

Andy Howard
(British Geological Survey)

Further information

For further information about the conference please contact:
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Burlington House, Piccadilly,
London W1J 0BG
T: 0207 432 0983
E: jess.aries@geolsoc.org.uk
W: www.geolsoc.org.uk/wsmithNov15
Follow this event on Twitter #wsmith15

Call for Abstracts

We welcome oral presentation contributions for this meeting.
If you would like be considered for a slot in the programme, please send an abstract of no more than 400 words to Jess Aries (jess.aries@geolsoc.org.uk) no later than Sunday, 31 May 2015.

The William Smith Map Bicentenary (1815-2015)