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## ARTICLES

John Phillips (1800–1874): The introduction of lithography in geological mapmaking in Great Britain 10  
John Henry

Mapping Nauru: A microcosm of imperialism 28  
Alice Tonkinson and Robert Clancy

## REGULAR ITEMS

A Letter from the Chairman 3

Editorial 5

New Members 5

IMCoS Matters 6  
ICHC 2019, Amsterdam  
IMCoS September trip to Oxford

Mapping Matters 40

Cartography Calendar 46

Exhibition Review: *Imaginary Cities* 48

Book Reviews 51

*Shanghai chengshi ditu jicheng* 上海城市地图集成 (Complete atlas of Shanghai antiquated maps) ed. by Sun Xun 孙逊 and Zhong Chong ♦ *Scotland Defending the Nation, Mapping the Military Landscape* by Carolyn Anderson and Christopher Fleet ♦ *The Diaries of William Lloyd Holden, 1829 and 1830* ed. by Jonathan Pepler ♦ *Atlas – A World of Maps From the British Library* by Tom Harper

Library Book Sale 61



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Front cover Detail of 'Geological Map of the E. Part of Yorkshire' by John Phillips published in Part I of *Illustration of the Geology of Yorkshire* [...]. Courtesy of the Geological Society of London.



Fig. 2 Portrait of John Phillips, aged 51. Lithograph by Thomas Herbert Maguire (1821–1895) issued on the occasion of the 1851 meeting of the British Association for the Advancement of Science in Ipswich. Reproduced by permission of the Geological Society of London.

### Phillips's early lithography

Phillips, during his year with Benjamin Richardson in 1814, may have met David Redman in Bath; a John Phillips, esquire, and Rev. Joseph Townsend were listed as subscribers to Thomas Barker's *Forty Lithographic Impressions of Rustics* printed in Bath by David Redman in 1813.<sup>12</sup> Certainly, Redman printed a map for Phillips in 1818, as discussed below.

Arriving at 15 Buckingham Street, Phillips found himself in the neighbourhood of the Strand, a centre for book and map selling, engraving and printing in London.<sup>13</sup> Aware of his uncle's financial insecurity, he looked for ways not only to be useful to his uncle but to learn a skill that might earn money. Lithography presented an opportunity. He was not unfamiliar with the concept and his new neighbourhood presented examples. Until Senefelder's publication, the recipe for the inks had to be discovered by experimentation. Phillips began experimenting in 1817 and his notebook shows that he was careful and observant in his trials. His comments indicate that he referred to the 1816,

second revised, edition of Banks's work, retitled *Lithography; or, The Art of Taking Impressions from Drawings and Writing Made on Stone*.<sup>14</sup> He referred to contemporary articles in the *Annals of Philosophy*,<sup>15</sup> regarding recipes for inks and crayons. Lithographic ink was a mixture of warmed Marseille soap, pure mastic, shellac, slowly added to soda and water, mixed and added to lampblack and water. Lithographic crayon was composed of soap, tallow, wax and lampblack.<sup>16</sup> After completing his experiments, Phillips wrote in the introduction to his notebook: 'it is apparent from its [ink's] composition that great room is afforded for minute mistakes which will have the most dangerous effects'.<sup>17</sup> To avoid the need to write in reverse, Phillips experimented with transfer papers, including Redman's transfer paper<sup>18</sup> which enabled a drawing on the paper to be turned over and transferred to the stone.

From this period three similar maps survive drawn by Phillips for consulting reports on a proposed canal south of Leeds by William Smith.<sup>19</sup> Figure 3 shows a 'Plan of the Navigable Rivers and Canals connected with the proposed Air [sic] and Don Canal' dated 1818 and printed by Redman who had located back to London. Phillips drew a second similar but redrawn and extended map in 1819, entitled 'Proposed Aire & Dunn [sic] Canal to drain the contiguous Lands and to shorten and connect the present Navigations'. The second map includes levels and distances, more place names but does not name the printer. However, entries in Smith's diary for 16 and 20 October 1819, later annotated by Phillips, reveals that they collected stone at Womersley, near the canal, and at Dunchurch, Warwickshire for printing.<sup>20</sup> These are both sources of White Lias limestone. Phillips's note reads 'NB 500 Plans Printed from Dunchurch Stone 200 from a Womersley [sic] Stone'. On a rough draft of the map in Figure 3 Phillips wrote in pencil, 'Womesesley [sic] Oct 1818 J.P. The best'.<sup>21</sup> Evidently his experimentation was extending to comparison of lithographic limestones.

The stones were heavy. They had to be a minimum of 50 mm (2 inches) thick to avoid cracking under the pressure of the press and to allow for a certain amount of grinding off of images to enable re-use. There was much experimentation with the design of presses. Phillips drew sketches of the presses of H. Bank[e]s, Mr. Smith [his uncle], Redman[']s and improvements of his own press 'Aug 1 . . . 1819 now in use'.<sup>22</sup> With financial assistance from Richardson, the press was intended to help Phillips survive while his uncle was in



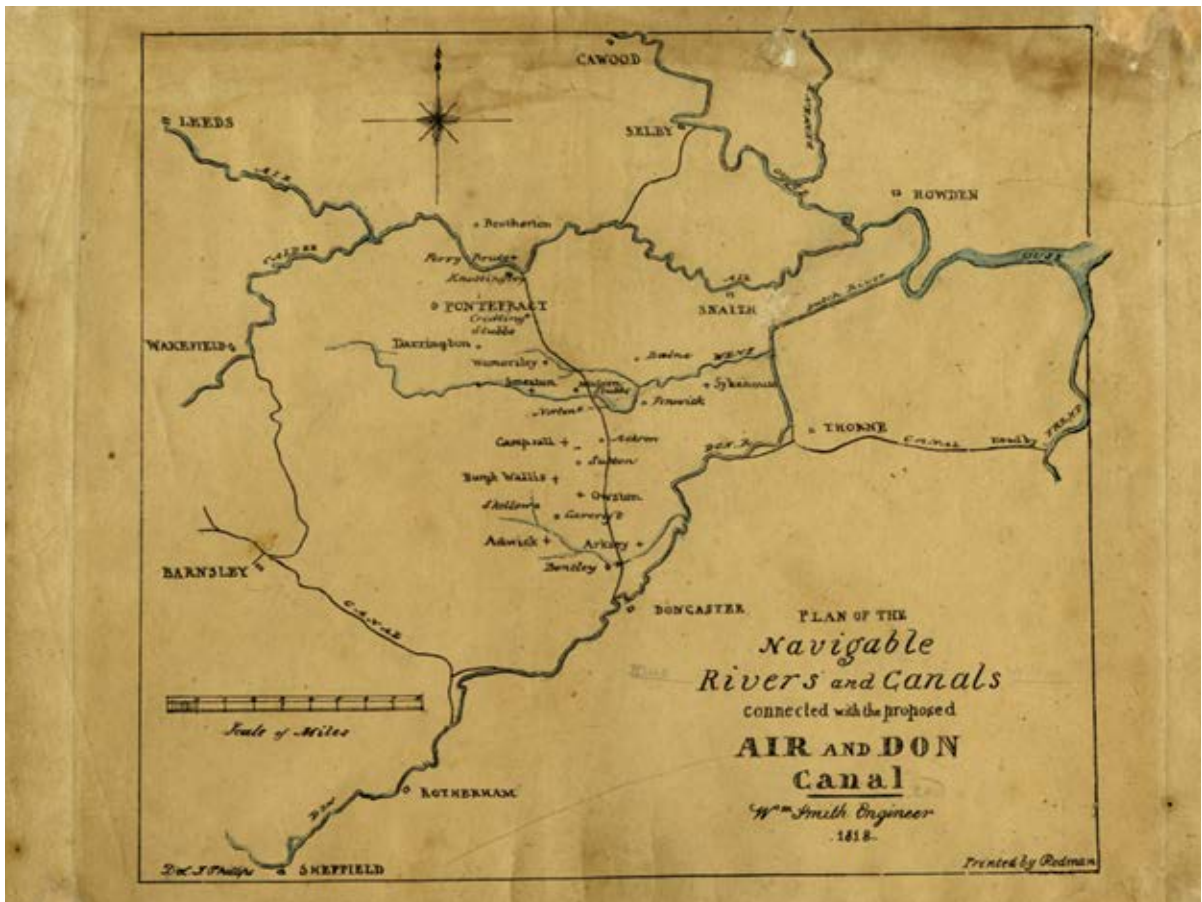


Fig. 3 'Plan of the Navigable Rivers and Canals connected with proposed Air and Don Canal', the first known map drawn by John Phillips in 1818. It is a lithograph drawn on English White Lias stone, the drainage has been hand-coloured. Two other variations issued exist. Courtesy of Oxford University Museum of Natural History. Shelf mark WS/H/2/0/022.

debtor's prison.<sup>23</sup> An advertising bill, the Aire and Don project maps, two sections and several fossil diagrams survive from this period.

Smith's calamitous financial situation forced him and Phillips to leave London in February, 1820. Smith lost his leased house, furniture and most of his books and maps. Although it is not mentioned anywhere, Phillips must have lost his press. They led a peripatetic life of no fixed address moving from job to job in the North of England for several years. Phillips was unable to pursue active lithography, but his experiments:

*gave him direct experience of the technical difficulties and possibilities of lithography. In later life, when he wrote scientific works, he was frequently his own sketcher and draughtsman and he knew what was technically feasible when he drew illustrations for others to lithograph. At least Phillips' enthusiastic teenage*

*venture into lithography, which endured for over a decade, heightened his awareness of the visual language of science and encouraged him in the future to give full expression to his remarkable visual imagination. The lithographic adventure confirmed his mania for gadgets. Indeed in 1819 the teenaged Phillips became the first in Britain, subsequently distinguished in science, to devise, construct, and use a lithographic press.*<sup>24</sup>

### Phillips in Yorkshire

In 1824, while based in Kirkby Lonsdale and working on assignments<sup>25</sup> in Yorkshire and the Lake District, Smith received an invitation to give a course of lectures on geology in York to the recently formed Yorkshire Philosophical Society (YPS). Smith seized the opportunity. Phillips helped his uncle prepare the lectures and gave one himself on fossil shells. After York, literary and philosophical societies in

Scarborough, Hull and Leeds commissioned lectures series. It became apparent that as much as Smith was popular and well liked, Phillips was the better lecturer. In October 1825 he was engaged by the YPS as keeper of its museum to curate the fossils and as a draughtsman. Initially, the position required him three days a week for nine months of the year.<sup>26</sup> The lodge of the Yorkshire Museum became his permanent home. YPS records show that his interest in lithography re-surfaced with the design of a modified press with a small, strong inexpensive frame. He had room and time for other inventions. He developed an improved barometric altimeter for his fieldwork, a new lathe, a blowpipe for chemical analysis, a precise balance, and a hairspring hygrometer. He ground an achromatic lens for his telescope. Throughout his life Phillips was noted for his interest in gadgets.<sup>27</sup> In 1829 he met his sister Anne whom he hadn't seen for fourteen years, and invited her to join him as his housekeeper and companion. She was an accomplished hostess and geological assistant. Neither married, and they lived together until her death in 1862.<sup>28</sup> When the British Association for the Advancement of Science (BAAS) was founded by the YPS in 1831 in York, Phillips became its secretary, a position he held for nearly forty years.

Settled in York, with his uncle secure as land steward at Hackness near Scarborough, the estate of YPS stalwart Sir John Johnstone, Phillips researched and explored all of Yorkshire. He published *Illustrations of the Geology of Yorkshire; or a Description of the Strata and Organic Remains; Accompanied by a Geological Map, Sections and Diagrams, and Plates of the Fossil Plants and Animals*. It was published in two volumes: Part I. *The Yorkshire Coast* (1829) and Part II. *The Mountain Limestone District* (1836).<sup>29</sup>

Plate one of *The Yorkshire Coast*, first edition was a hand-coloured lithograph 'Geological Map of the E. Part of Yorkshire' drawn by Phillips and printed in Leeds by Thomas Inchbold (?-1832) 'for the Author' (Fig. 4a overleaf). In the second edition of 1835, published by John Murray,<sup>30</sup> the map was engraved by John Wilson Lowry and repositioned to be the frontispiece (Fig. 4b on page 17). It was hand-coloured. All of the fossil figures and geological sections were noted as drawn by Phillips but had been engraved and printed by Dawson and Brown of York. The sections were hand-coloured.

A comparison of the two editions of volume one and its geological map reveals a major shift in John Phillips's progress. The first edition was self-published in York

and all the figures are lithographs drawn by Phillips. The lettering of the map, sections and fossil plates are all drawn by hand, apparently by Phillips while the same in the second edition, published by a major London house, were engraved by John Wilson Lowry (1803–1879), a prominent engraver in the geological world. From Murray's decision to take on Phillips it is clear that Phillips's initial work was widely valued professionally. By having the illustrations engraved, Murray was making an investment to improve the appearance of all the figures, although the content remained the same. The actual production remained in York with Thomas Wilson and Sons for the text and Dawson and Brown for the map and figures.

The difficulties for printers dealing with colour printing of geological maps were the number of colours and difficulty of registering the colours on separate lithographic slabs given the intricacies of geological boundaries separating the colours. Hand-colouring of geological maps persisted when less demanding colour work had progressed to printing. It took time and quality colouring had a cost. In his second volume, *The Mountain Limestone District*, published in 1836 by John Murray, the colour problem was avoided entirely by using engraved patterns instead for the map and sections. The fine line work and choice of patterns meant that the map was just about geologically legible with, in effect, various shades of grey for the different rock units. It was graphically legible since the text, drainage lines and geological dip and strike symbols were clear against the patterns. This is cartographically difficult to get right, and the avoidance of colour meant that the larger fold-out map was affordable to publish. Nevertheless, it made for a dull map (see Fig. 5 on page 18).

In the next twenty years, Phillips developed his geological career through academia, the new Geological Survey of England and Wales, and as secretary of the BAAS and organiser of its annual week-long conferences in provincial cities outside of London. His output of academic papers was prodigious. His next book, however, falls into the category of, in today's jargon, outreach.

Increasing literacy, railway travel, and shorter working hours (free Saturday afternoons!) created a wider audience which Phillips was interested in reaching. In 1853, again with Murray, he published *Rivers, Mountains and Sea-Coast of Yorkshire. With Essays on Climate, Scenery, and Ancient Inhabitants of the County*. It was intended to be popular, but by modern standards it is not light fare. In it, Phillips pioneered a colour-



Fig. 4a 'Geological Map of the E. Part of Yorkshire'. Hand-coloured lithograph in 1829 first edition of volume 1, *The Yorkshire Coast*, privately published by Phillips. Scale 1 inch to 9 miles / 1:570,000 approximately. Area within the neat line, 23.5 x 18.2 cm. The pencil annotations appear to be by George Bellas Greenough, founder member of the Geological Society, a major map collector and inveterate annotator. Courtesy of Geological Society of London.