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RESEARCH ARTICLE

To write or not to write: the literary strategies of British civil engineers in the late eighteenth century

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Abstract

In the latter half of the eighteenth century, British civil engineers strove to enhance their status and assert the identity of their developing profession. Alongside associational and visual cultures, one means of achieving a sense of community was through the formation of a shared literary culture. As a profession notorious for what Torrens described as 'papyrophobia', it is perhaps surprising that many engineers, in this period, read widely and wrote extensively. John Smeaton (1724–92), for example, valued good authorship and experimented widely with literary form. James Brindley (1716–72), his contemporary, wrote sparingly, but nevertheless generated a literary strategy in support of his projects. Other engineers, such as John Phillips (fl. 1785–1813), made use of their engineering background and of engineering literature to create alternative careers. By exploring how mid- to late eighteenth-century engineers wrote, in order to persuade and to educate others as well as to publicize, record and defend their professional decisions, this paper will show how their reputations were dependent on literary constructions as much as on physical ones.

In the revised introduction to the second edition of *Lives of the Engineers*, published in 1874, Samuel Smiles pointed out that

> one of the most remarkable things about Engineering in England is, that its principal achievements have been accomplished, not by natural philosophers nor by mathematicians, but by men of humble station, for the most part self-educated … Some of them could scarcely write their own names … These men gathered their practical knowledge in the workshop, or acquired it in manual labour.[1]

A doctor, radical journalist, railway company secretary and, most famously, author of the didactic *Self-Help*, Smiles portrayed engineers ordering nature, moulding themselves and shaping their environment through resolute perseverance. Smiles was emphasizing a stereotype about engineers which suited the educational and moralizing aims of his writing, but the idea that engineers are experiential learners, interested in creating works rather than words, has long persisted.[2] It is perhaps as a result of this preconception that historians

[1] Samuel Smiles, *Lives of the Engineers*, 2nd edn, 2 vols., London: John Murray, 1874, vol. 1, p. xvi.

[2] Derek J. de Solla Price argued, in 1965, that technology and technologists are 'papyrophobic', compared with 'papyrocentric' science. See Derek J. de Solla Price, 'Is technology historically independent of science? A study in statistical historiography', *Technology and Culture* (1965) 6(4), pp. 553–68, 561.

have traditionally tended to pay little attention to engineers as writers and have often ignored their literary productions in favour of exploring the tacit knowledge embodied in engineering practice and the training systems of practical apprenticeships.[3] This negligence of the literary dimension seems at best a missed opportunity, since historians do now pay much attention to the literary construction, communication and 'popularization' of scientific knowledge. Recent studies have demonstrated that reading habits, publication and communication circuits played vital roles in the negotiations around credibility, trust, authority, participation and control in science.[4] Much of this scholarship has centred on the biological and earth sciences, especially evolution, with physics, mathematics and chemistry occasionally represented. Engineers rarely appear in these studies.[5] The following paper will demonstrate that the literary strategies of eighteenth-century civil engineers were carefully considered and deliberate efforts which played a crucial role in the developing profession.

In Britain in the second half of the eighteenth century, engineering was beginning to evolve as a profession distinct from that of skilled craftsmen, mechanics, architects and surveyors. The period witnessed a rapid increase in the number, size and complexity of civil engineering projects and consequent changes in the way engineers worked.[6] New large-scale projects, particularly canal and inland navigation schemes, required the employment of administrative clerks of works and on-site 'resident engineers' who reported to consultant or principal engineers contracted to design and direct these projects, often from a distance.[7] Consultant engineers were answerable to companies and shareholders for the progress of projects which often garnered much public attention. As project numbers and sizes grew, demand for capable engineering consultants initially outstripped supply but, as R.A. Buchanan has argued, by 1800 there was a 'small but effective [civil] engineering profession in Britain'.[8]

As a group, British civil engineers strove to assert their professional identity and their status through a variety of means. Avoiding teleology by paying attention to evidence showing how practitioners themselves demarcated their profession and the ways in which

[3] On tacit knowledge see Harry Collins, *Tacit and Explicit Knowledge*, Chicago: University of Chicago Press, 2012; and on the role of tacit and explicit knowledge in expertise see H.M. Collins and Robert Evans, *Rethinking Expertise*, Chicago: University of Chicago Press, 2008.

[4] See, for example, James A. Secord, 'Knowledge in transit', *Isis* (2004) 95, pp. 654–72; Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making*, Chicago: University of Chicago Press, 1998; James A. Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of* Vestiges of the Natural History of Creation, Chicago: University of Chicago Press, 2003; Jonathan R. Topham, *Reading the Book of Nature: How Eight Best Sellers Reconnected Christianity and the Sciences on the Eve of the Victorian Age*, Chicago: University of Chicago Press, 2022; Ralph O'Connor, *The Earth on Show: Fossils and the Poetics of Popular Science, 1802–1856*, Chicago: University of Chicago Press, 2007; Marina Frasca-Spada and Nick Jardine (eds.), *Books and the Sciences in History*, Cambridge: Cambridge University Press, 2000.

[5] Exceptions include Ben Marsden, 'Re-reading Isambard Kingdom Brunel: engineering literature in the early ninteenth century', in Ben Marsden, Hazel Hutchison and Ralph O'Connor (eds.), *Uncommon Contexts: Encounters between Science and Literature, 1800–1914*, London: Pickering & Chatto, 2013, pp. 83–110; Clare Pettitt, *Patent Inventions: Intellectual Property and the Victorian Novel*, Oxford: Oxford University Press, 2004.

[6] Average project values rose from £20,000 per annum in the 1750s to £703,000 per annum by the 1790s. See Peter Cross Rudkin, 'The organisation of civil engineering construction in Britain 1760–1835', in S. Huerta (ed.), *Proceedings of the First International Congress on Construction History, Madrid, 20th–24th January 2003*, Madrid: Inst. Juan de Herrera, 2003, pp. 1765–75, 1767. For a review of the economic history of canals in Britain between 1760 and 1830 see G.W. Crompton, 'Canals and the Industrial Revolution', *Journal of Transport History* (1993) 14(2), pp. 93–110.

[7] See Cross Rudkin, op. cit. (6), p. 1769.

[8] R.A. Buchanan, *The Engineers: A History of the Engineering Profession in Britain, 1750–1914*, London: Jessica Kingsley Publishers, 1989, p. 45.

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they claimed they were professional helps demonstrate how engineering evolved in this period. For example, these men started identifying themselves as 'civil engineers', as distinct from military engineers and artisan inventors.[9] An associational culture developed, particularly from 1771, when the Society of Civil Engineers (later the Smeatonians) was created, encouraging socializing and practical discussion away from business.[10] At the same time, increasing numbers of individual engineers made attempts to enhance their 'social respectability', by purchasing grand country houses or volunteering for political office; William Jessop (1745–1814), for instance, twice took tenure as mayor of Newark.[11] Frances Robertson has also demonstrated that these social and technical negotiations for status were also exemplified in the visual representations of both elite engineers and draughtsmen.[12] However, beyond the adoption of new associational and visual cultures, these engineers also began asserting the identity, status and community of their profession through literary action.

For an engineer, writing and sharing processes or practices might seem counterintuitive when commercial value could come from secrecy – but engineers in this period were active authors, and they wrote with a surprising diversity of purpose. They wrote to persuade or to educate, and to explain and defend their professional decisions. As civil engineering projects such as canals and lighthouses drew more public attention, engineers experimented with literary productions designed for a range of different audiences. All consulting engineers were expected to write regular engineering reports for their clients and increasingly these were printed and circulated, forming a crucial aspect of engineering education, public awareness and knowledge transfer. In fact, A.W. Skempton has described the engineering report as 'uniquely characteristic' of civil engineering between 1750 and 1830.[13] However, alongside these reports, engineers were called upon to contribute to legislation, they produced plans and specifications for potential clients, they collated useful information for sharing with other engineers and they experimented with writing for the public. In this period, we can find engineers seeking to create records of their achievements for public attention and contributing to pamphlets and treatises advocating particular projects aimed at potential supporters (but often read more widely). For these civil engineers, literary activity was a crucial element in attempts to claim credibility and authority in their roles.

By refocusing attention on the literary dimension this article aims to shed new light on what constituted engineering practice. Rather than attempt a shallow survey of all engineering literature in this period, this article considers the diverse literary practices of three civil engineers: John Smeaton, John Phillips (fl. 1785–1813) and James Brindley (1716–72). Smeaton and Brindley are well known in engineering histories: as early as 1836,

[9] On the changing use of the term 'engineer' see Ben Marsden, 'Engineer', in J.L. Heilbron *et al.* (eds.), *Oxford Companion to the History of Modern Science*, Oxford: Oxford University Press, 2003, pp. 257–8. See also Eric Robinson, 'The profession of civil engineer in the eighteenth century: a portrait of Thomas Yeoman, F.R.S., 1704 (?)–1781', *Annals of Science* (1962) 18(4), pp. 195–215, 210; Antoine Picon, 'Engineers and engineering history: problems and perspectives', *History and Technology* (2004) 20(4), pp. 421–36; and Peter M. Jones, 'Becoming an engineer in industrialising Great Britain *circa* 1760–1820', *Engineering Studies* (2011) 3(3), pp. 215–32.

[10] Garth Watson, *The Smeatonians: The Society of Civil Engineers*, London: Telford, 1989.

[11] R.A. Buchanan, 'Gentlemen engineers: the making of a profession', *Victorian Studies* (1983) 26(4), pp. 407–31, 418.

[12] See Frances Robertson, '"Mere adventurers in drawing": engineers and draughtsmen as visual technicians in nineteenth-century Britain', in Kate Nichols, Rebecca Wade and Gabriel Williams (eds.), *Art versus Industry? New Perspectives on Visual and Industrial Cultures in Nineteenth-Century Britain*, Manchester: Manchester University Press, 2016, pp. 120–39.

[13] A.W. Skempton, *British Civil Engineering 1640–1840: A Bibliography of Contemporary Printed Reports, Plans and Books*, London: Mansell Publishing Ltd, 1987, pp. vii, x–xii.

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the Institution of Civil Engineers was describing them as 'the fathers of British engineering'.[14] Phillips is less well known and was less successful as an engineer, claiming a role as a consultant engineer, but not quite managing to attach himself to successful projects. However, his case study demonstrates an alternative literary strategy, in that he ultimately made use of his credentials as an engineer to support a career as an author. These three engineers approached their literary endeavours in very different ways, but the case studies will show that just as civil engineering, as a profession, sought to improve communications through roads, canals, and lighthouses, engineers were also developing and experimenting with literary constructions to enhance their own communications, careers and status.

Knowing the audience: John Smeaton (1724–1792) and the engineer as author

The well-known civil engineer John Smeaton was a particularly prolific author who consciously adopted different literary strategies for different audiences. Initially, he trained as an attorney, but by 1750 was an established philosophical instrument maker in London. Smeaton's engineering career stemmed from his investigations into the power of water and wind, which were awarded the 1759 Copley Medal by the Royal Society of London (RSL). In fact, his first major public work, the design and construction of a new lighthouse on the Eddystone Rocks, was a result of having been recommended for the role by the then president of the RSL, the Earl of Macclesfield.[15] Eventually, Smeaton had eighteen papers published in the RSL's *Philosophical Transactions*, his printed engineering reports filled three volumes and his self-published *Narrative* describing for the public the building of the Eddystone lighthouse remained in print long after his death. As we shall see, Smeaton's engineering practice and reputation were affected by his authorship in multiple ways during his career.

Smeaton's printed engineering reports were deemed exemplary of that literary form and were published posthumously, in three volumes, by a committee of the Smeatonian Society, which believed they 'would be of the greatest use to the profession, to teach actual and practical knowledge'.[16] Smeaton's career coincided with an increase in the number, length and circulation of such reports, which, whilst written for clients, were then used to garner support for (or protest against) particular projects, were examined during Parliamentary proceedings, and were often discussed and reprinted in newspapers and periodical publications.[17] In some cases, multiple reports from different engineers commissioned by different parties appeared in print.

Published reports put engineering plans and consultant engineers' opinions into the public domain, where they were open to debate. Hence, in 1768, the committee of the Forth and Clyde Canal requested that their consultant engineer, Smeaton, respond to three reports by other engineers (James Brindley, Thomas Yeoman and John Golburne) which had been commissioned to contest his suggested route, already approved by Parliament, and to halt progress on the canal.[18] Smeaton used his twenty-two-page *Review of Several Matters Relative to the Forth and Clyde Navigation* to defend his route and justify his own previous

[14] 'Introduction', *Transactions of the Institution of Civil Engineers* (1836) 1, p. ix.

[15] Rowland Mainstone, 'The Eddystone Lighthouse', in A.W. Skempton (ed.), *John Smeaton, FRS*, London: Thomas Telford, 1981, pp. 83–102.

[16] John Smeaton, *Reports of the late Mr. John Smeaton, F.R.S., Made on Various Occasions in the Course of his Employment of an Engineer*, 3 vols., London: Longman, Hurst, Rees, Orme, and Brown, 1812, vol. 1, p. x. For details about the publication and reception of these see A.W. Skempton, 'The publication of Smeaton's reports', *Notes and Records of the Royal Society* (1971) 26, pp. 135–55.

[17] Skempton, op. cit. (13), p. 7.

[18] For a detailed history of the Forth and Clyde Canal see T.J. Dowds, *The Forth and Clyde Canal: A History*, East Linton: Tuckwell Press, 2003.

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reports.[19] He criticized the other engineers' plans, pointing to errors in judgement over river depths and geological strata as well as misunderstandings relating to the original criteria proposed for the route, and concluded that the work on the canal could still be completed in a timely manner. However, he emphasized that if other engineers were to 'be constantly brought down to inspect and see how the pot boils', then neither he, nor anyone else, could get on with the venture. If he was to be employed 'answering papers and queries' rather than 'coolly and quietly' progressing the project, then he would like to be dismissed from it.[20] Smeaton's expertise, as the consultant engineer on the project, had became open to question through these additional reports and he had, therefore, little choice but to engage with the dispute and defend his reputation and authority.[21] The threat to quit seems to have worked. In November 1768, the proprietors resolved (by a vote of 142 to 12) to follow Smeaton's opinion.[22]

Despite Smeaton's clear objections to being forced to compose unnecessary reports, he valued, and was known for, his writing skills. Smeaton consciously modelled his role as a consultant engineer after that of a consultant physician and he was aware of the professional limitations that accompanied a lack of literacy. He explained, for instance, that although one of his resident engineers, John Gwyn (*c.*1733–89) was a 'most accomplished Mechanical Executioner', he would never recommend him as a writer or a speaker because his 'knack of misapplying a whole heap of fine words and phrases' did no justice to his mechanical ability.[23] The example of the Forth and Clyde Canal reveals Smeaton's confident use of literary skills, both in gaining business and in maintaining authority in the face of competing interests from clients.

Smeaton's published works and archives also demonstrate his awareness that he needed to write differently for different audiences. For example, he separated and classified his incoming correspondence on natural philosophy from his other correspondence.[24] He was an active member of the RSL and had many papers published in the *Philosophical Transactions*, but he made conscious efforts to separate his authorship as an engineer from those writings designated for the RSL, especially in regard to mentioning his own views and assessments. In his papers for the *Philosophical Transactions*, he mentions his own 'opinion' only twice, and his profession not at all. In contrast, his printed engineering reports frequently refer to his 'opinion' and, occasionally, his 'opinion as a professional man'.[25] Moreover, Smeaton did not designate himself 'engineer' in any of his *Philosophical Transactions* papers, despite the deliberate and unusual adoption of the term 'civil engineer' on all his printed reports after 1758 (and the regular use of 'engineer' prior to that date). Instead, he described himself either as a 'philosophical instrument maker' or simply

[19] James Brindley, Thomas Yeoman and John Golburne, *Reports Relative to a Navigable Communication betwixt the Firths of Forth and Clyde, with Observations*, Edinburgh: Balfour, 1768. See also report on the arrangements in the *Scots Magazine* (1768) 30, pp. 505–8.

[20] Smeaton, op. cit. (16), vol. 1, p. 120.

[21] Marsden demonstrates how Brunel had similar difficulties in the 1850s, trying to avoid engaging in a 'wordy war with all comers' rather than concentrating on the construction of the *Great Eastern*. See Marsden, op. cit. (5), pp. 101–4.

[22] *Scots Magazine* (1768) 30, pp. 680–84. Smeaton left the project when the canal had reached its summit in 1773, and the canal was only completed in 1790. See Charles Hadfield, 'Rivers and canals', in Skempton, op. cit. (15), pp. 103–29, 123.

[23] Quoted in Denis Smith, 'The professional correspondence of John Smeaton: an eighteenth-century consulting engineering practice', *Transactions of the Newcomen Society* (2014) 47, pp. 179–89, 182.

[24] The archive of Smeaton's papers held at the Institution of Civil Engineers includes two volumes entitled 'Philosophical letters, sent & received'. Volume 1 is dated 1770–1778 and Volume 2 is dated 1778–. The catalogue is available in A.W. Skempton, 'Papers, reports and drawings', in Skempton, op. cit. (15), pp. 229–45, 236.

[25] On Smeaton's professional practice see Denis Smith, 'Professional practice', in Skempton, op. cit. (15), pp. 217–27.

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by name.[26] This separate branding is not unusual; David Philip Miller has pointed out that James Watt (1736–1819) was keen to present himself sometimes as a chemist and at other times as a philosopher – but that he was unusual, and provocative, in deliberately designating himself 'James Watt, Engineer' in his papers for the RSL.[27] Smeaton's decision to omit the title 'engineer' suggests a deliberate attempt at authorial self-fashioning, separating his role as author for the RSL from his literary efforts as a professional consultant engineer.[28]

In addition to the need to report on progress, explain designs to clients and present expertise in particular ways, Smeaton was keen that engineers should record and publish accounts of their works for educational purposes and for public audiences. He claimed that on completion of the Eddystone lighthouse, the curiosity of the public had been so great that he had had to deputize his wife to show and explain the model of the lighthouse in order not to be distracted from his other work. At the time, he had been requested to draw up an account of the building by the owners and by members of Trinity House, the corporation responsible for lighthouse management.[29] Trinity House wanted a history of the previous lighthouse buildings and a record of the new one, in case the construction itself did not survive. Nevertheless, it was not until thirty-two years after he had finished the building that his account of that process was finally published as *An Illustrated Narrative of the Building of the Edystone Lighthouse* (1791).[30] The success of this *Narrative* spurred Smeaton on to explain his withdrawal from the profession in the same year as a result of his wish to 'dedicate the chief part of his remaining time to the description of the several works performed under his direction'.[31] Effectively, he retired from engineering to concentrate on his career as an author and to record his physical structures as literary constructions.

Frances Robertson has suggested that the illustrated format of the *Narrative* is a natural extension of a consulting engineer's usual mode of working, through which reports are created, including plans and other illustrations.[32] However, textual elements in the *Narrative* demonstrate a different style of authorship relative to Smeaton's engineering reports. Smeaton explained that he had initially believed that the writing project would be easily accomplished by breaking it down into a series of essays of various operations, comparable to the style of essays he had written earlier for the *Philosophical Transactions*.

[26] Smeaton, op. cit. (16), vol. 4, *passim*.

[27] David Philip Miller, *James Watt, Chemist: Understanding the Origins of the Steam Age*, London: Pickering & Chatto, 2009, pp. 60–1. On Watt's papers for the RSL see David Philip Miller, *The Life and Legend of James Watt: Collaboration, Natural Philosophy, and the Improvement of the Steam Engine*, Pittsburgh: University of Pittsburgh Press, 2019, pp. 132–43. Miller and other scholars have analysed Watt's self-fashioning as a philosopher and an engineer and his posthumous canonization as a heroic inventor. See especially David Philip Miller, '"Puffing Jamie": the commercial and ideological importance of being a "philosopher" in the case of the reputation of James Watt (1736–1819)', *History of Science* (2000) 38(1), pp. 1–24; Christine MacLeod, *Heroes of Invention Technology, Liberalism and British Identity, 1750–1914*, Cambridge: Cambridge University Press, 2007, esp. pp. 125–52; and Ben Marsden, *Watt's Perfect Engine: Steam and the Age of Invention*, Cambridge: Icon Books, 2002, esp. pp. 183–7.

[28] This attitude was probably reinforced when Sir Joseph Banks (1743–1820) became president of the RSL (1778). Banks was suspicious of engineers (as well as physicians and surgeons), whom he believed might damage the reputation of the society by attempting to use their connections with the RSL to promote private trade and profit. See David Philip Miller, 'The usefulness of natural philosophy: the Royal Society and the culture of practical utility in the later eighteenth century', *BJHS* (1999) 32(2), pp. 185–201, 186.

[29] On Trinity House see Rebekah Higgitt, Jasmine Kilburn-Toppin and Noah Moxham, 'Science and the city: spaces and geographies of metropolitan science', *Science Museum Group Journal* (2021) 15, at https://doi.org/10.15180/211506 (accessed 3 September 2024); and Richard Woodman and Andrew Adams, *Light upon the Waters: The History of Trinity House*, London: Corporation of Trinity House, 2013.

[30] John Smeaton, *A Narrative of the Building and a Description of the Construction of the Edystone* [*sic*] *Lighthouse with Stone*, London: for the Author, 1791, p. 8.

[31] Trevor Turner and A.W. Skempton, 'John Smeaton', in Skempton, op. cit. (15), pp. 7–34, 34.

[32] Frances Robertson, 'Ruling the line: learning to draw in the first age of mechanical reproduction', unpublished PhD thesis, Glasgow School of Art, 2011, p. 229.

However, pressure of business and 'unavoidable hindrances' delayed the publication until 1791. Eventually, the large imperial folio production was printed, with twenty-four plates, for the author, by H. Hughes, and sold by G. Nicol. Smeaton explained that, because he had not published when interest was still high immediately following the construction, he had only produced a small run of the book, but he had not compromised on the size, which he believed would display the drawings to best effect, nor on the quality of the paper, and he explained the consequent price by assuring readers that even if the entire run was sold, it would not reimburse his own expenses.[33]

From the *Narrative*'s preface it is clear that, despite his initial thoughts on the project, Smeaton had found the difficulty of writing the work far greater than expected. He claimed to have spent more time and a greater 'application of the mind' on the writing of the *Narrative* than on the building itself, arguing that although he was neither 'bred to letters' nor to mechanics, his mind had a greater facility for the latter. The *topos* of modesty is taken further, later in the preface, when Smeaton applies it to his engineering work as well, claiming that his *Narrative* was not a 'fine piece of writing' but a 'plain account of a plain and simple building'.[34] At this point, almost thirty years after the building was completed, it had stood the test of time and perhaps some of the earlier fears of those at Trinity House had been alleviated. Given the interest and acclaim which it had received in the years following completion, Smeaton could afford to be modest about the building itself in this preface. Such self-effacement is not unique to engineering authors, but the application of that *topos* to both the narrative and the physical structure is an early example of a type of rhetoric (later picked up by Thomas Carlyle and others) where a building acts as a mute literary work.

Despite the numerous published engineering reports and papers for the RSL, plus his unpublished reports, diaries, letters and estimates, Smeaton described the *Narrative* as his first work as an author, commenting, 'how I am to succeed as a writer, is yet to be tried, and I shall readily submit to the decision of the impartial public'.[35] The 'plain' style 'in the nature of a commentary' that Smeaton chose for his *Narrative* would not use specialized language and would be accessible to general readers. However, for engineers, the format reflected the 'exact accounts' of existing buildings that Smeaton admired as being much more instructional than '*systematical* writings'.[36] This emphasis on producing an accurate account of the means by which a specific artefact was produced reflects the format of reports on scientific experiments which had long utilized literary techniques, such as emphasizing plain language and confident assertions, to enable 'virtual witnessing' in order to build trust and assent for 'matters of fact'.[37] The *Narrative* was popular, both among engineers and with the public. The first edition sold out, later editions followed and the 'singularly entertaining and splendid work' was extensively reproduced in many periodicals.[38]

[33] Smeaton, op. cit. (30), pp. v–vi. The first edition consisted of 250 copies, priced at £3 3*s*. See 'Advertisements and notices', *Gazetteer and New Daily Advertiser*, 28 January 1791, p. 5.

[34] Smeaton, op. cit. (30), pp. iv–vi.

[35] Smeaton, op. cit. (30), p. v.

[36] Smeaton, op. cit. (30), p. 7, original emphasis. Smeaton notes, as exemplary, Francis Price's account of Salisbury Cathedral and Wren's *Parentalia*. See Francis Price, *A Short Description of That Admirable Structure, the Cathedral Church of Salisbury*, Salisbury: R. Wilks, 1753; and Christopher Wren, *Parentalia: or, Memoirs of the Family of the Wrens*, London: T. Osborn, 1750.

[37] Steven Shapin, 'Pump and circumstance: Robert Boyle's literary technology', *Social Studies of Science* (1984) 14(4), pp. 481–520, 484.

[38] 'Smeaton's account of the Edystone lighthouse &c.', *Monthly Review* (1791) 5, pp. 250–60, 260. See also, for example, *European Magazine, and London Review* (1791) 19, pp. 174–6 and 286–8. For a list of editions see Skempton, op. cit. (24), p. 234.

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Unfortunately, Smeaton's desire to produce more narrative accounts in this genre as a 'service to the Public' never came to fruition due to his death in 1792.[39] Yet the format of the *Narrative*, a heavily illustrated, factual but entertaining account of the process and practicalities of a particular project, remained popular both for educating engineers and for creating public attention. In 1813, reviewing a reprint, the *Gentleman's Magazine* was 'at a loss whether to commend it most for its modesty, perspicuity or candour', claiming that even despite the time passed since the erection of the lighthouse, 'nothing can be more interesting or amusing' than the contents of this book.[40] For Robert Stevenson (1772–1850) the *Narrative* acted as a 'kind of text-book' for his own work on the Bell Rock lighthouse and as a literary model for his account of that project.[41]

Smeaton's literary forays draw attention to the ways in which engineers became authors conscious of their audience, employing diverse literary strategies for a range of purposes. Consultant engineers, like Smeaton, assumed expertise in the technical reports written as part of the consulting business (even if the report was later contested). Publications such as the *Philosophical Transactions* provided an opportunity to demonstrate expertise in broader terms and among the influential audiences associated with learned societies. Writing the *Narrative* meant constructing a suitably prestigious literary record of his most prestigious engineering work. For an engineer in this period, demonstrating expertise was crucial for achieving social status and for gaining business. In a literary sense, Smeaton's case demonstrates that status as an engineer could be garnered through a publication strategy that emphasized appropriate expertise, but it required careful conformity to different literary codes for different purposes.

Overcoming the pitfalls of publishing: John Phillips

Smeaton had seen the benefits of overcoming the trials of the competitive and precarious publishing market to make his *Narrative* available to the public. His renown as an engineer no doubt supported the publication. However, some hopeful engineers struggled to join projects or build careers as consultants and sought alternative routes to success. One example of this is John Phillips (fl. 1785–1813), trained as an engineer but better known as the author of *A General History of Inland Navigation, Foreign and Domestic* (1792), which became one of the main sources of information on British canals.[42] As the role of civil engineering became better known, through large-scale, visible public works, it became possible for men like Phillips to adopt a literary strategy that used their credentials as engineers and existing engineering reports to support careers as authors.

Phillips's first book, *A Treatise on Inland Navigation*, was published anonymously in 1785 in support of a planned canal between London and Norwich. The *Treatise* was not an engineering report commissioned from a consultant and carrying the authority of its author and his profession. Rather it was intended to educate the landowners and manufacturers of the region and inspire them by means of demonstrating the advantages and practicalities of the scheme it supported. Nevertheless, in the preface, Phillips anonymously described himself as having been brought up 'in the building and surveying

[39] Smith, op. cit. (25), p. 34.

[40] 'Review of new publications', *Gentleman's Magazine* (1813) 114, pp. 241–59, 247.

[41] Robert Louis Stevenson, *Records of a Family of Engineers*, London: Chatto & Windus, 1912, p. 93. See also Robert Stevenson, *An Account of the Bell Rock Lighthouse, Including the Details of the Erection and Peculiar Structure of That Edifice*, Edinburgh: Archibald Constable, 1824, pp. 116, 201.

[42] Mike Chrimes, 'John Phillips', in A.W. Skempton *et al.* (eds.), *Biographical Dictionary of Civil Engineers in Great Britain and Ireland*, 2 vols., London: Thomas Telford, 2002, vol. 1, pp. 523–4.

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branches' and as having his curiosity roused by a trip to visit the Duke of Bridgewater's canals.[43]

Phillip's *Treatise* was published through Hooper in London, not unusually, by subscription. This process meant that orders were collected in advance, offsetting the up-front costs of production and mitigating the risk associated with publication.[44] In the case of the *Treatise*, the list of subscribers, printed by county, was appended after the title page – the 350 names, including a significant number of MPs, senior military officers and landowning gentry, were undoubtedly intended to add weight to the proposed scheme, as well as to the publication.

Despite the appearance of a healthy subscription list, and a willing publisher, as Smeaton had found with his *Narrative*, Phillips's publication was riddled with problems and delays. After several notices of delays, the following advertisement appeared in various provincial newspapers in the autumn of 1785:

> This work would have been published agreeably to the proposals, on the 1st of February last but the engraver, who engaged to execute the Plans, did them so ill, that, in justice to the subscribers, the author was obliged to have them entirely re-engraved … Owing to the inattention of the printer intended to be employed, the names, and places of residence of many subscribers are lost, which the author hopes will not be attributed to disrespect.[45]

Whether this last comment is true, or was intended to imply an even longer subscription list than that printed, is not clear. It is clear, however, that while the canal scheme the *Treatise* proposed did not come off, by 1792 Phillips had reworked and expanded his publication into a new book, *A General History of Inland Navigation*.[46]

Phillips's new book covered canals of antiquity, overseas projects and detailed reports on British canals. It included ten pages of practical observations deemed useful to those about to embark on such projects, but was aimed at non-specialized readers – at least those who could afford the twenty-one shillings for the large quarto volume with a coloured map.[47] It was published, seemingly far less problematically, through Taylor's Architectural Library, a leading architectural bookseller, gradually expanding its interests to include engineering works, plans and reports. In 1793, Taylor's used their advertisement for Phillips's republished book to inform the public that in addition to their publication and bookselling business, they would also 'act as agents for buying or selling interests or shares in canals, where gentlemen wishing to buy or sell may generally soon be accommodated'.[48] Hence

[43] John Phillips, *A Treatise on Inland Navigation: Illustrated with a Whole-sheet Plan, Delineating the Course of an Intended Navigable Canal from London to Norwich and Lynn, Through the Counties of Essex, Suffolk, and Norfolk, Denoting every Town and Village Through Which it is Proposed to Pass*, London: S. Hooper, 1785, pp. 2–3. On the Bridgewater Canal see Hugh Malet, *Bridgewater, the Canal Duke, 1736–1803*, Manchester: Manchester University Press, 1977.

[44] See Brian Findlay, 'Subscription publishing', in Michael F. Suarez, S.J. and H.R. Woudhuysen (eds.), *The Oxford Companion to the Book*, Oxford: Oxford University Press, 2010, at www.oxfordreference.com/view/10.1093/oi/authority.20110803100540286 (accessed 15 April 2023).

[45] *Chelmsford Chronicle*, 2 September 1785, p. 3; *Norfolk Chronicle*, 5 November 1785, p. 4.

[46] Charles Hadfield, 'Introduction' to 1970 reprint of John Phillips, *A General History of Inland Navigation*, 5th edn, London: B. Crosby and Co., 1805, p. vi. See also John Phillips, *A General History of Inland Navigation, Foreign and Domestic*, London: I. & J. Taylor, 1792.

[47] Or those who could gain access by other means, for example, through libraries or book clubs, personal contacts, or via excerpts and reviews in periodicals. Notably, several of the subscribers to Phillips's previous volume had been book societies.

[48] See, for example, *Gloucester Journal*, 1 July 1793, p. 4; *Reading Mercury*, 1 July 1793, p. 4.

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the publication of engineering works could act as a useful entry into speculation on the business of engineering too.[49]

A General History was widely reviewed and excerpted in periodical publications. The *London Review* claimed that it was of 'great public utility' and the *Analytical Review* pointed out that Phillips was 'a professional man' covering a 'curious and interesting subject', summarizing the content over twelve pages and concluding that it ought to be read 'with attention by the legislator, the landholder, and the merchant'.[50] The *General History* sold successfully, despite the *Monthly Review*'s warning that 'the greater part of this entertaining and instructive volume ... [is] more interesting to the engineer than to the general reader'.[51] Reviews such as this hint at some of the challenges that authors like Phillips were grappling with in creating literary works which demonstrated their professional credentials and yet were accessible to a wider public.

Phillips continued to republish and update the book in the following years. The fourth edition, in 1803, was published by C. & R. Baldwin in a cheaper, smaller octavo size, without the coloured map, aiming to be affordable to 'almost every reader'. At 10*s* 6*d*, it was far from affordable for many, at a time when a London-based carpenter, for instance, earned an average of eighteen shillings per week.[52] Phillips claimed that this new version was for those involved in agriculture or commerce, seemingly targeting those seeking to establish canal projects. He abridged the historical element but included detailed descriptions of recent schemes and abandoned projects along with practical suggestions which he hoped would be 'of service to future projectors'.[53] In this edition, Phillips emphasized his engineering credentials even more clearly, perhaps to add weight to the practical tips he was supplying since the intended audience had now been widened to include those involved in the practicalities of canal building as well as gentlemen and landowners interested in its history and economic possibilities. For instance, here Phillips claimed to have been 'employed by the great Brindley', and he described himself, on the title page, as 'sometime surveyor to the canals in Russia under Mr Cameron, architect to the late empress Catherine II'.[54] Clearly, by 1803, Phillips was advertising, and probably exaggerating, his engineering and surveying skills and credentials in order to raise his status as an author.[55]

Phillips was, by this stage, making a living as an author, having seemingly abandoned practical engineering. As such he had to address other pitfalls of publishing, among which were the hazards of plagiarism. In 1795, a pamphlet appeared in Newcastle promoting a new navigation to Carlisle. The author was the projector and civil engineer Ralph Dodd (1756–1822), who claimed to have 'thrown together a few summary remarks on the Canals of the ancients ... compressing into a small compass the sentiments of others on his favourite

[49] The bulk of the financial speculation on canals, the so-called canal mania, occurred in Britain between 1792 and 1794, during which time thirty-seven canals and £6.6 million of capital were authorized. See Charles Hadfield, *British Canals: An Illustrated History*, Newton Abbot: David & Charles, 1979, pp. 107–8; and David S. Jacks, 'Foreign wars, domestic markets: England, 1793–1815', *European Review of Economic History* (2011) 15(2), pp. 277–311, 280.

[50] 'Reviews', *European Magazine, and London Review* (1792) 22, pp. 46–47; *Analytical Review, or History of Literature, Domestic and Foreign, on an Enlarged Plan* (1792) 13, pp. 361–72.

[51] *Monthly Review, or, Literary Journal* (1792) 9, pp. 319–21, 321.

[52] Arthur L. Bowley, *Wages in the United Kingdom in the Nineteenth Century*, London: C.J. Clay and Sons, 1900, p. 84.

[53] John Phillips, *A General History of Inland Navigation, Foreign and Domestic*, 4th edn, London: C. & R. Baldwin, 1803, p. iii.

[54] Phillips, op. cit. (53), p. iv.

[55] Chaloner suggests that the differing examples of autobiographical snippets between the editions of 1792 and 1803 indicate that little credence can be attached to these later claims, and describes Phillips's 'fiasco in Russia'. See W.H. Chaloner, 'John Phillips: surveyor and writer on canals', *Transport History* (1972) 5(2), pp. 168–72, 168. Charles Cameron (1745–1812) was a Scottish architect who served at the court of Catherine the Great. See Dmitri Shvidkovski, *The Empress & the Architect: British Architecture and Gardens at the Court of Catherine the Great*, New Haven, CT: Yale University Press, 1996, pp. 11–40.

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pursuit'.[56] A large part of Dodd's pamphlet was copied directly from Phillips's *General History* and this blatant plagiarism prompted an angry response in the local papers. Dodd, accused of plagiarism, felt it necessary to announce that the pamphlet was 'professedly a compilation' and that he intended to treat this and 'any other similar attack of malevolence' with the 'supreme contempt they merit'.[57] Unsatisfied with this response, an anonymous author published a new pamphlet: the *Engineering Plagiarist: or Dodds from Phillips Exposed*, which, following a scathing introduction, reprinted the whole of Dodd's pamphlet with corresponding extracts from Phillips's *General History*.[58] Tilar Mazzeo has shown that whilst borrowing, improving and assimilating texts and even styles was acceptable in Romantic-era Britain, 'culpable plagiarism', worthy of moral condemnation, required the borrowing to be 'simultaneously unacknowledged, unimproved, unfamiliar and conscious'.[59] Dodd had argued that his was a compilation of various texts, implying that it had therefore been improved, but the *Engineering Plagiarist* contested that it was actually copied, deliberately and without acknowledgement, almost entirely from Phillips. Worse, there was no judgement shown in the compilation such that although the original constituted 'a mine profuse with gold', Dodd had presented only 'unprofitable dross'. The *Engineering Plagiarist* contested that the public had a right to expect a 'professed compilation' by a civil engineer to be the result of 'extensive reading and scientifical investigation', not copied inaccurately and with 'bold indifference' from elsewhere.[60]

It is fairly safe to assume that Phillips was the anonymous author of the *Engineering Plagiarist* and that one reason he was so concerned about Dodd's pamphlet was that he was in the midst of promoting a third edition of his own *General History*. The two Newcastle pamphlets attracted wider attention, with the *European Magazine and London Review*, for instance, reviewing them together and concluding that 'J. Phillips, whose work is borrowed from, but whose name is not mentioned by Mr Dodd, as we think it ought to have been ... has not been fairly dealt with.'[61]

Little seems to have come of Dodd's pamphlet, or of the canal scheme he was advocating, but the allegation of plagiarism does not appear to have adversely affected his career. He went on to project a wide range of other schemes, including a tunnel under the Thames, a railway engine and a product to prevent dry rot in timber.[62] There is also no evidence that the publicity of Dodd's pamphlet harmed Phillips's career as an engineering author, yet Phillips could not resist one more swipe at Dodd. The next edition of *A General History* contained a new section, which claimed to stray from canals just once, in order to discuss the Gravesend–Tilbury tunnel under the Thames. Having summarized the 1799 Parliamentary Act authorizing the tunnel, Phillips deviated from his usual impersonal style and attacked Dodd, 'who calls himself a civil engineer', denigrating his plans and the 'egregious mistake' of his estimates for the tunnel over several pages.[63] For Phillips, the act of plagiarism by Dodd was more than an issue about acknowledgement of authorship. Phillips's credibility as the author of a *General History* hinged on his status and authority as an engineer. Dodd was potentially damaging that status by his plagiarism and hence Phillips attacked Dodd's

[56] Ralph Dodd, *A Short Historical Account of the Greater Part of the Principal Canals in the Known World, with Some Reflections on the Utility of Canals*, Newcastle: W. Charnley and J. Bell, 1795, p. 1.

[57] *Newcastle Courant*, 18 April 1795, p. 1.

[58] Anon., *The Engineering Plagiarist: Or, Dodds* [*sic*] *from Phillips Exposed*, Newcastle: J. Whitfield, 1795.

[59] Tilar J. Mazzeo, *Plagiarism and Literary Property in the Romantic Period*, Philadelphia: University of Pennsylvania Press, 2006, pp. 2–3.

[60] Anon., op. cit. (58), p. 2.

[61] *European Magazine: And London Review* (1795) 28, pp. 106–7, 107.

[62] Mike Chrimes, 'Dodd, Ralph (1756?–1822)', in *Oxford Dictionary of National Biography*, September 2004, at https://doi.org/10.1093/ref:odnb/7740 (accessed 15 April 2023).

[63] Phillips, op. cit. (53), pp. 427–30, 593.

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engineering competence, seeking to undermine his legitimacy both as an author and as a civil engineer.

Phillips had trained and started his career as a civil engineer. Unlike Smeaton, he did not have the connections, nor had he built a reputation, that enabled him to create and maintain a role as a consulting engineer. As a consequence, having involved himself in schemes and projects around the world with little success, he seemingly abandoned engineering in favour of building a career as an author. Phillips was obviously not afraid of controversies and he learned to negotiate the London publishing and bookselling sphere and to handle the subtleties around ownership of knowledge, plagiarism and the possibility of legal redress. He carved out a niche which did not rely on practical engineering skills, but did involve him in carefully establishing his credentials as an engineer and surveyor in order to build his reputation as an author. Nevertheless, he clearly struggled to make a financial success as an author – his daughter, Anne Ker (1766–1821), herself a struggling author, had, at one point, to appeal to the charity for impoverished authors, the Royal Literary Fund (RLF), explaining that her father had 'expended a very handsome competency, and left his family much embarrassed'.[64]

Choosing not to write: the reputation of James Brindley

The two case studies above have demonstrated that engineers in the late eighteenth century used publication and authorship for a wide variety of purposes, sometimes as a means to raise status, to gain business or to defend their expertise and record the success of their engineering projects. However, the diversity of background and the skills of those who entered into civil engineering as a career in the eighteenth century allowed for even further variety, and included engineers who could write, chose to write very little, but nevertheless had a literary significance which was largely constructed by others.

James Brindley was born within eight years of Smeaton and, like him, became one of the most renowned civil engineers of the eighteenth century. Brindley had little formal education and, following an apprenticeship as a millwright, established his own business repairing and designing machinery. Later, like Smeaton, Brindley took on a wide variety of civil engineering projects across the country, from canals and drainage schemes to mill work, mines, harbours and bridges. However, the two engineers' literary habits have been described by historians as being at extreme ends of the literary spectrum. In contrast to Smeaton, there are very few publications attributable to Brindley. Nevertheless, the success and novelty of Brindley's canal work, particularly his design and execution of the Bridgewater Canal (opened in 1761), led to a flurry of printed pamphlets and treatises advocating the advantages of inland navigations and supporting and advertising newly proposed schemes. Brindley was unlikely to have been involved in producing these pamphlets, but often the writers took special pains to applaud his work and character. For example, the anonymous author of *The History of Inland Navigations* (1766) concluded his pamphlet by singing Brindley's praises as both a mechanic and a teacher who 'opens new veins of treasure to Great Britain … making [rivers and mountains] subservient to his will'. The author eventually admitted that to describe that engineer's talents further would require 'the pen of a Plutarch and the skill even of a Brindley'.[65] The account presented Brindley as

[64] Transcription of Anne Ker's correspondence with the RLF (21 August 1820) in R.A. Howard, 'Anne Ker (1766–1821): A biographical and bibliographical study', *Cardiff Corvey: Reading the Romantic Text* (2003) 11, pp. 75–101, 97.

[65] Anon., *The History of Inland Navigations, Particularly those of the Duke of Bridgewater, in Lancashire and Cheshire; and the Intended one Promoted by Earl Gower and Other Persons of Distinction in Staffordshire, Cheshire and Derbyshire*, 2nd edn, London: T. Lowndes, 1769, p. 96.

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harnessing God's creations for the public good and linked his physical constructions with the classical literary constructions of Greek philosophers.

It did not go unnoticed, at the time, that both the text and the illustrative plan in *The History of Inland Navigations* were 'pirated' from another pamphlet, *A View of the Advantages of Inland Navigations* (1765).[66] This second pamphlet, supporting the proposed Trent and Mersey Canal, was also anonymous, but has been traced to Thomas Bentley (1731–80), a close friend and later business partner of the potter Josiah Wedgwood (1730–95).[67] For Wedgwood, the proposed Trent and Mersey Canal was vital for his business. He recruited Bentley to 'draw his quill in the service of his Country' by 'reviewing, or rather new-framing and modelling', a pamphlet to support the scheme.[68] Brindley worked with both in promoting the new canal, by attending campaign meetings and giving parliamentary evidence, but he took no part in its literary aspects. Wedgwood was enthusiastic about Bentley's talents as an author, describing the letters he received regularly from his friend as 'my magazines, reviews, Chronicles and I had almost said my Bible'.[69] However, the process of producing the pamphlet was fraught with problems, and Bentley spent considerable time soothing and placating the canal's proprietors as well as defending his own writing style and accuracy.

Bentley received extensive criticisms from the poet, doctor and natural philosopher Erasmus Darwin (1731–1802), which accused him of haste in rushing the pamphlet and causing the managers of the canal to appear 'bad Writers'.[70] Bentley responded suggesting that the patchwork nature of the pamphlet was a result of using several authors, including Darwin, who had not had the opportunity of consulting together, and he explained that finding a proper author for the publication was extremely difficult because 'those who can write best, seldom know much of such subjects and no man can ever write well upon a Subject that he does not understand'. Bentley suggested that since he had not judged Darwin's 'manner of writing' from his part in the pamphlet, he expected the same courtesy in return, but he also made clear that 'barely two paragraphs' belonged to him, and that Darwin was expecting too much from his review, pointing out that 'everyone knows there is a great deal of difference between writing a Piece, and endeavouring to mend one'.[71] Despite Darwin's criticism that the pamphlet was too 'flat and tame', Bentley echoed Smeaton's opinion on the style of his *Narrative*, emphasizing the need to be 'plain and concise' because the readers (potential investors, supporters or critics) would be 'looking out for Deceit & Artifice in every line of it', and Bentley aimed to disappoint them with the 'manly simplicity of Truth'.[72]

Others, however, recognized Bentley's talents for writing or editing. The pamphlet sold over a thousand copies with reviews across the periodical press, meaning that it reached

[66] Richard Gough, *Anecdotes of British Topography*, London: W. Richardson & S. Clark, 1768, p. 236. See also Anon., *A View of the Advantages of Inland Navigations: with a plan of a Navigable Canal, Intended for a Communication Between the Ports of Liverpool and Hull*, London: Becket and Co., 1765.

[67] Alison Kelly, 'Bentley, Thomas (1731–1780), porcelain manufacturer', in *Oxford Dictionary of National Biography*, September 2004, at https://doi.org/10.1093/ref:odnb/2175 (accessed 15 April 2023). See also Neil McKendrick, 'Josiah Wedgwood and Thomas Bentley: an inventor–entrepreneur partnership in the Industrial Revolution', *Transactions of the Royal Historical Society* (1964) 14, pp. 1–33.

[68] Wedgwood Museum Archive, Etruria Factory Letter Archive (hereafter 'Etruria Archive'), E25–18085, p. 2; and 'To Dr Darwin: particulars of trade in Cheshire; canal literature (transcript)', 04/1765, p. 2.

[69] Quoted in McKendrick, op. cit. (67), p. 12.

[70] Etruria Archive, 'Dr. Darwin to Mr. Bentley: danger of haste in navigation scheme', 10/1765, p. 1. Erasmus Darwin's writings have been studied more broadly; see, for example, Geoffrey L. Scott, 'The scientific poetry of Erasmus Darwin', *Technical Communication* (1982) 29(3), pp. 16–20.

[71] Etruria Archive, 'Mr. Bentley to Dr. Darwin: reply to criticisms on Navigation Pamphlet (transcript)', p. 2, original emphasis.

[72] Etruria Archive, E25–18091, p. 1; and 'Mr. Bentley to Dr. Darwin: second reply to criticisms on Navigation Pamphlet (transcript)', p. 2.

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an even broader audience. The *Monthly Review* sang the praises of the 'little treatise', its 'perspicuous and intelligent manner' and the author's 'perfect and comprehensive knowledge', claiming that there had 'not for many years been a more interesting publication'.[73] The pamphlet succeeded in helping the proprietors of the Trent and Mersey raise necessary support so that the Act of Parliament authorizing the canal was duly passed in May 1766 and Brindley was appointed surveyor general to oversee the construction.

Although Brindley was not directly involved in this publication, he did, in fact, write regularly, if idiosyncratically. Like most other engineers, Brindley kept diaries or notebooks that contained details of his clients, accounts, travels, plans, memoranda and observations.[74] Brindley's four surviving notebooks are much shorter, more terse and sporadic than those of many of his colleagues. More wordy examples include Smeaton's thorough and articulate 1755 account of his *Journey to the Low Countries* and the founder of the Scottish dynasty of lighthouse engineers Robert Stevenson's extensive 'travelling diary', described by his grandson, Robert Louis Stevenson, as containing 'monuments of misdirected literary energy'.[75] Brindley, unlike Robert Stevenson, could never be accused of attempting 'to impart that which cannot be imparted in words', but as Victoria Owens has shown, as Brindley became more practised at writing, through necessity he became more eloquent.[76]

Bentley's praise for Brindley's methods of working continued in the biographical sketch that he compiled after Brindley's death for the *Biographia Britannica*. He praised Brindley's remarkable memory and his ability to imagine and then execute a design without the need for plans or drawings, claiming that Brindley would only produce either if he was obliged to by his employers. Bentley put this down to a lack of necessity, rather than a lack of literacy, and although he did stress Brindley's 'total want of education' it was in the context that Brindley therefore missed out on the 'agreeable reliefs' of 'the polite and elegant arts', which led to the shortening of his life due to overwork.[77] With supporters and friends like Bentley, to write about his projects, campaign for them, and immortalize his talent, Brindley's lack of literary accomplishment was no impediment in his lifetime.

However, Bentley's sketch of Brindley's character was much reused by later biographers, who lost much of the nuance in attempts to emphasize Brindley's lack of literacy as indicative of his natural genius.[78] Samuel Hughes's 1844 biography of Brindley, for example, begins by describing his 'contempt for authorship'.[79] For the Scottish historian and biographer Thomas Carlyle (1795–1881), the 'rugged Brindley … the ineloquent Brindley' represents the 'seemingly opaque, perhaps sulky, almost stupid Man of Practice' who often triumphs over the 'adroit Man of Theory'. Brindley exemplifies Carlyle's characterization of the English as a 'dumb people' who can 'do great acts, but not describe them'.[80] Carlyle

[73] *Monthly Review or Literary Journal* (1765) 33, pp. 468–73, 468.

[74] On engineering diaries see Marsden, op. cit. (5), p. 87.

[75] John Smeaton, *John Smeaton's Diary of his Journey in the Low Countries*, Leamington Spa: Newcomen Society, 1938; and R.L. Stevenson, op. cit. (41), pp. 87–8.

[76] Victoria Owens, 'James Brindley's notebooks, 1755–63: an eighteenth-century engineer writes about his work', *International Journal for the History of Engineering & Technology* (2013) 83(2), pp. 222–52.

[77] Bentley provided a 'short but masterful sketch of Mr. Brindley's character' for the *Biographia Britannica*. See Andrew Kippis, *Biographia Britannica: Or, the Lives of the Most Eminent Persons who have Flourished in Great Britain and Ireland, from the Earliest Ages, to the Present Times*, 2nd edn, 2 vols., London: C. Bathurst, W. Strahan, J. Rivington and Sons, 1778, vol. 2, pp. 591–604 (see editor's notes on 591 and 603–4).

[78] Boardman claims that 'the only particulars of the life of that distinguished man are from Mr Bentley's pen'. See James Boardman, *Bentleyana: Or, a Memoir of Thomas Bentley Sometime of Liverpool with Extracts from his Correspondence*, Liverpool: Wareing Webb, 1851, p. 8.

[79] Samuel Hughes, 'Memoir of James Brindley, by Samuel Hughes, CE', *Quarterly Papers on Engineering* (1844) 1, pp. 1–50, 1.

[80] Thomas Carlyle, *Past and Present*, London: Chapman & Hall, 1843, p. 197. Although a Scot, Carlyle included himself in this description of the English people.

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admired the English engineers' 'mute but undeniable' deeds, equating their works to grand poetic gestures: 'thy Epic, unsung in words, is written in huge characters on the face of this Planet, – sea-moles, cotton-trades, railways, fleets and cities, Indian Empires, Americas, New-Hollands; legible throughout the Solar-System!'[81]

Thirty years later, Samuel Smiles also wrote extensively about both Brindley and Smeaton in his *Lives of the Engineers*, and the contrast in his descriptions of their literary habits is striking. According to Smiles, Smeaton 'frequented the society of educated men' and in later life became 'inordinately impressed with a sense of the importance of literary composition', but Brindley could 'scarcely read, and was … thus cut off from familiar intercourse with cultivated minds, living and dead'.[82] Smiles's descriptions imply criticism of both men, neither of whom had a literary strategy that fulfilled Smiles's ideal for a self-made, industrious, practical man. For Smiles, Smeaton cared too much about his literary pursuits and Brindley represented a lack of awareness of the importance of self-cultivation. Clearly, Brindley was by no means illiterate, but the heroic notion of the 'illiterate genius' who could tame nature for the benefit of an industrializing nation is consistently reinforced in his biographies up to the present day.[83] This stereotype is rooted in the earlier biographies from Hughes, Carlyle and Smiles, but the evidence uncovered here shows that among his contemporaries Brindley's choices about writing were not interpreted as a handicap or as a representation of illiteracy. It is clear that the Romantic-era discourse on which those later claims to illiteracy are based were more nuanced. Hughes, for instance, echoing Bentley, points out that Brindley, 'not having recourse to books', retired to bed when he had a complex problem to solve, but John Aikin explained this habit as demonstrative of 'true *inspiration*, which poets have almost exclusively arrogated to themselves, but which men of genius in every walk of life are actuated by'.[84] Like Carlyle, Aikin was linking Brindley's decidedly non-literary habits with poetic writing.

Francis Henry Egerton (1756–1829), the 'Canal' Duke of Bridgewater's nephew, had a different motive for describing Brindley as an 'unlettered genius' in his curious *Letter to the Parisians*.[85] The *Letter* was intended to address supposed mistakes in Rees's *Cyclopaedia* with regard to the Duke of Bridgewater's role in the development of the canal that bears his name.[86] Egerton downplayed the agency of the engineers, including Brindley, who worked on various aspects of the canal, emphasizing Brindley's lack of literacy to help demonstrate that it was the duke, not Brindley, who planned and devised the canal.[87] In contrast to the illustrations of Brindley as a self-made, practical man, succeeding in producing works (if not words) that were poetic, Egerton highlighted Brindley's illiteracy to emphasize his lowly status and ensure that he was not given undue credit for the noble works of Egerton's uncle.

[81] Carlyle, op. cit. (80), p. 201.

[82] Smiles, op. cit. (1), vol. 1 pp. 93, 172, and vol. 2, p. 289.

[83] See, for example, Nick Corble, *James Brindley: The First Canal Builder*, Cheltenham: The History Press, 2005.

[84] John Aikin, *A Description of the Country from Thirty to Forty Miles around Manchester*, London: J. Stockdale, 1795, p. 144, original emphasis.

[85] Francis Henry Egerton, *A Letter to the Parisians, and the French Nation, upon Inland Navigation, Containing a Defence of the Public Character of His Grace Francis Egerton, Late Duke of Bridgewater. And, Including Some Notices, and, Anecdotes, Concerning Mr. James Brindley*, Paris: privately printed by P. Didot, 1820.

[86] The extremely long article on 'Canals' in Rees's *Cyclopaedia* was written, and first published in 1805, by the prolific author John Farey Sr, with illustrative plates by his son. See Abraham Rees, *The Cyclopaedia; or, Universal Dictionary of Arts, Sciences, and Literature*, 39 vols., London: Longman, Hurst, Rees, Orme & Brown, 1819, vol. 6, pp. 111–246.

[87] Egerton, op. cit. (85), pp. 47–56, 57–67. Egerton claimed that 'Mr Brindley could neither read nor write. He drew with chalk upon a floor'. Egerton, op. cit. (85), p. 64. See also Jonathan R. Topham, 'Egerton, Francis Henry, Eighth Earl of Bridgewater (1756–1829)', in *Oxford Dictionary of National Biography*, September 2004, at https://doi.org/10.1093/ref:odnb/8586 (accessed 15 April 2023).

Compared to some of his professional contemporaries, Brindley chose to write very little, but nevertheless had a long-lasting effect on engineering literature. His lack of literary output has been underscored for different reasons by historians. Romantic and Victorian efforts to accentuate the natural genius of British mechanics emphasized his lack of articulacy, but found ways of linking his physical works with poetical, epic or classical literature. Later historians largely ignored these literary or poetic analogies and focused solely on his lack of literacy, seeing Brindley as an extreme example of the inarticulacy allegedly characteristic of the engineer. However, Brindley's lack of literary accomplishment had little consequence on his career at a time when civil engineers were testing out different ways of forming a professional group, and when literary accomplishment, beyond engineering reports for clients, was not yet an obligation for the professional engineer.

Conclusion

In the latter half of the eighteenth century, British engineers could be situated within a broad spectrum of scholarly capabilities, with literary habits which might mirror those of traditional artisans or those of natural philosophers. As the engineering profession developed through the nineteenth century, and as communities of engineers coalesced around institutions, educational systems and practices, the literary cultures of engineers consolidated around new forms, such as periodicals, which developed alongside the profession to represent British engineers' distinct and diverse communication needs.[88] However, the three engineers examined in this paper demonstrate that in this period, when engineering communities were newly evolving, engineers could approach their literary endeavours in very different ways.

Smeaton recognized the need for good writing skills among engineers, and was adept at producing large numbers of written communications in different styles to suit different needs. He aimed to leave a literary legacy, as well as a physical one, intending to educate, in plain language, those who were interested in his constructions. At the same time, he objected to having to write unnecessary reports to justify his expertise or authority. Phillips used his engineering background to build an alternative career as an author, emphasizing his credentials and defending the reputation of civil engineers as authors in order to maintain his own legitimacy. Brindley, on the other hand, chose to write very little. His reputation depended on his physical constructions alongside the literary representation of his works and his character by others.

The period covered by these case studies witnessed the evolution of engineering as a profession and the emergence of the civil engineer as a recognized figure. The case studies show that engineering literature played an important part in that development, from the characteristic literary form of engineering reports to experiments with literary cultures that could represent the emerging profession. For those engineers willing or able to navigate the complex systems of patronage, networking and publication in societies like the RSL, the right literary strategy could generate business and confer prestige. Similarly, the literary depictions of individual engineers could influence representations of the figure of the engineer. Hence exaggerated claims of Brindley's illiteracy perpetuated the trope of the engineer as an untutored genius.

Together, these case studies demonstrate that authorship mattered for engineers in the mid- to late eighteenth century. Whether writing to support a business and a reputation, choosing not to directly engage with authorship at all or making use of engineering

[88] See, for example, Ellen Packham, 'Literary constructions: British engineers and their journals, *c.*1760–*c.*1860', unpublished PhD thesis, University of Aberdeen, 2023.

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credentials to support a career as an author, literary strategies were integral to the development of a professional identity as a civil engineer.

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