

APPENDIX 4

THE SUBSEQUENT CAREERS OF GRAVATT AND HIS ASSOCIATES

Evidence concerning Gravatt's subsequent life and career is sparse. His ICE obituary made no mention of his ignominious dismissal from the B&ER but it did note that he unwisely accepted the post of Engineer to many abortive railway projects during the 'mania' of the mid-1840s, which left him not only without his professional fees but also saddled him with the costs of surveys.¹ William Mills, who was apprenticed to Samuel Hemming during the B&ER works, was said to have been engaged on drainage works at Lough Foyle under Gravatt and Hemming in about 1842, and later to have been offered a position on the Cambrian and South Shropshire Railway by Gravatt. Mills accepted the position 'as he desired to remain with that gentleman, at whose hands he had experienced great kindness and consideration.'²

Gravatt was elected a Fellow of the Royal Astronomical Society on 12 April 1843.³ In 1850 he designed and supervised the construction on Wandsworth Common of the largest achromatic telescope at that time. The project was successfully completed in 1852 and was highly acclaimed, but within a short time the client suffered financial difficulties which resulted in the telescope being scrapped.⁴ All that is known of Gravatt's professional career after that time is his appointment as Engineer to the

¹ Obit, p.570. In an attempt to assess the approximate extent of Gravatt's railway projects, the present writer carried out a word-search on The Times digital archive for the years 1844 and 1845, which turned up the following fifteen railway proposals with Gravatt named as the Engineer or Consulting Engineer:

Direct Northern; Great North West; Direct East Dereham & Norwich; Alto Douro; Chepstow, Forest of Dean & Gloucester Junction; Worcester, Warwick & Rugby; South Union, or Manchester, Potteries & London; Jamaica Southern, Eastern & Northern; South Union & Birmingham Junction; London, Devizes & Bridgwater; Worcester & Leominster; Dudley, Wolverhampton, Walsall & Tamworth Junction; Newcastle & London Coal Railway; Direct London & Hull; Hull & York;

accessed 29 Sep 2009 via LibrariesWest.

² Anon 'William Mills' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.108 (1892), pp.405-406.

³ RAS undesignated, membership records. Bryan Donkin was one of Gravatt's proposers.

⁴ The Times 23 Aug 1852; Obit, pp.570-571. The focal length was 76ft. The 85ft. long wrought-iron tube of the telescope was balanced by a weight over a brick tower 64ft. high by 15ft. diameter, and it was said that the 'ease of manipulation was perfect.'

Aldershot Gas & Water Company in about 1863.¹ By 1864 he was living at 15 Park Street, Westminster, where he fell ill during 1865. On 29 May 1866 his physician prescribed a sleeping draught which was wrongly administered to him by his house-keeper; he died the following day from an overdose of morphia.² He never married, and his place of burial has not been discovered.

Gravatt's mathematical, scientific and technical abilities were widely acknowledged by his contemporaries. He took a prominent part in discussions at ICE meetings from the 1840s to the mid-1860s (Table A4.1) and he contributed articles to inter alia the Proceedings of the Royal Society and the Philosophical Magazine.³ He counted among his friends Charles Babbage, who said of him that his mathematical capacity was of a high order:

... and mathematicians were glad to consult him; when they had not done so, it was a great satisfaction to them to find that his opinion coincided with their own.⁴

In 1854 Gravatt became a champion and demonstrator of Georg Scheutz's 'calculation engine,' a printing calculator that was based on Babbage's 'difference engine.' Four years later he was elected a Member of the Royal Academy of Sweden in recognition of his development of the machine.⁵

Gravatt's former colleagues, assistants and pupils had varying degrees of success in later years; some of them went on to become distinguished engineers, outshining Gravatt. Brunel was by far the most successful, of course; as far as is known, Gravatt and Brunel never worked together after his dismissal from the B&ER. Having returned to Ireland when the Thames Tunnel closed down, Richard Beamish became Engineer of

¹ TPA HL/PO/PB/5/32/4, Minutes of Proceedings taken before the Lords Select Committee on the Aldershot Gas & Water Bill, 9 Mar 1866; Surrey Advertiser 4 Jun 1866; ICE Occasional Communication No.3274: Wilson A.F., 'Aldershot Water Supply' (unpublished study, 1900); Martin A.R., 'A History of Aldershot's Water Supply' (unpublished study, c.1987).

² The Times 4 Jun 1866.

³ Gravatt W., 'A Letter on Steam Gun-Boats of Shallow Draught and High Speed' Tracts Royal Society of London 570/3 (1854); Gravatt W., 'Elementary Considerations on the Subject of Rotary Motion' Proceedings Royal Society of London Vol.8 (1856), pp.76-77; Gravatt W., 'On the Atlantic Cable' Philosophical Magazine (July 1858), pp.34-36.

⁴ Obit, p.571.

⁵ Notice of Scheutz's Calculating Machine Minutes Proceedings Institution of Civil Engineers (1857), p.422; Obit, p.571; Merzbach U.C., Georg Scheutz and the First Printing Calculator (Washington D.C., 1977):

http://www.sil.si.edu/smithsoniancontributions/HistoryTechnology/pdf_lo/SSHT-0036.pdf, accessed 7 Oct 2009.

Table A4.1 Gravatt's published contributions to discussions of ICE papers

Pole W., 'An Investigation of the Comparative Loss of Friction in Beam and Direct-Action Engines' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.2 (1843), p.73.
York J.O., 'Account of a Series of Experiments on the Comparative Strength of Solid and Hollow Axles' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.2 (1843), p.93.
Rankine W.J.M., 'Description of a Method of Laying Down Railway Curves on the Ground' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.2 (1843), pp.109-111.
Simms F.W., 'Results of the Application of Horse Power to Raising Water from the Working Shafts at Saltwood Tunnel' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.2 (1843), p.115.
Williams E.L., 'Account of Works Lately Constructed for Improving the Navigation of the River Severn' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.5 (1846), pp.359-360.
Heppel J.M., 'On the Expansive Action of Steam' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.6 (1847), pp.337-343.
Froude W., 'On the Law which Governs the Discharge of Elastic Fluids Under Pressure, Through Short Tubes or Orifices' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.6 (1847), pp.385-399.
Bruce G.B., 'Description of the Royal Border Bridge' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.10 (1851), pp.233-244.
Leslie J., 'Description of an Inclined Plane for Conveying Boats over a Summit, To and From Different Levels of a Canal ' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.13 (1854), p.209.
Bray W.B., 'On Measuring Distances by the Telescope' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.21 (1862), pp.38-39.
Phipps G.H., 'On the Resistance of Bodies Passing Through Water' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.23 (1864), pp.340-375.
Reilly C., 'On Uniform Stress on Girder Work' <u>Minutes Proceedings Institution of Civil Engineers</u> Vol.24 (1865), pp.426-457.

Cork and surrounding counties for six years. Marc Brunel engaged him as Resident Engineer on the Thames Tunnel when work re-started in 1835 but ill-health forced him to resign within two years. He was elected FRS in 1836. Subsequently he led a relatively retired life for ten years until serious financial problems forced him to seek employment. After he had prepared parliamentary plans for the Cork & Waterford Railway, Brunel appointed him Resident Engineer on the Gloucester & Forest of Dean Railway. On its completion in 1850 he gave up all professional involvement in engineering in favour of pursuits connected with the arts, education and religious liberty. In view of his rational

and disciplined approach to engineering, it seems incongruous that, in addition to a belief in mesmeric second sight, Beamish believed he had the ability to read a person's character from the form of their face and hands. He died in Bournemouth on 20 November 1873.¹

'Mr. Hammond,' whose technical and musical abilities impressed Beamish during the months before the Thames Tunnel closed down in 1828, was almost certainly John Wallis Hammond. The name 'Hammond' occurs in the diaries of both Brunels in the early 1830s – in connection with the 'Experimental Arch' in Marc's case, and with the GWR survey and the Sunderland Docks project in Brunel's. Hammond's date of birth is unknown; indeed, nothing else has been discovered relating to his life and career before his appointment as Resident Engineer for the eastern end of the GWR in September 1835. Subsequently he was engaged by Brunel as Resident Engineer on the Bristol & Gloucester Railway and the new South Entrance Lock at Bristol Docks. He became Brunel's chief assistant, and died in Bristol in 1847.² On the completion of the GWR in 1841 George Frere, the Resident Engineer for the western end of the line, left Brunel's employment. He unsuccessfully sought further employment with Brunel in the mid-1840s and subsequently became an iron master in South Wales. He died on 3 December 1887, aged 80.³

Gravatt's three assistants on the B&ER – William Froude, John England and William Peniston – had chequered careers after leaving the B&ER. Froude left Brunel's practice in 1846 and returned to the family estate at Dartington, Devon, where he maintained an interest in engineering matters. He is best remembered for his subsequent revolutionary experimental and theoretical work on the resistance and propulsion of ships, and on hydrodynamics. He died aged 69 on 4 May 1879, at Cape Town while he

¹ ICE undesignated, membership records, list of members, Jan 1830; Beamish R., op.cit., pp.289-296; Anon, 'Richard Beamish' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.40 (1875), p.249; 'Richard Beamish (1798-1873),' BDCE1, pp.46-47.

² BUL DM 1306 I.3.ii, Brunel's Journal, 11 Jan – 19 May 1828 passim; ICE 1828BEADAD, Beamish's Diary, 8 Feb – 9 Jul 1828 passim; ICE TT/BD/1832-1833, Marc Brunel's Diaries, 1832-1833 passim; BUL DD 1834/1, Brunel's Office Diary, 1834 passim; Buchanan R.A., op.cit., p.156; 'John (W.) Hammond (fl.1828-1847),' BDCE1, p.295; 'John Wallis Hammond (c.1800-1847),' BDCE2, p.360.

³ James B.Ll. 'The Making of a Scholar Ironmaster: An Introduction to the Life of G.T. Clark' in James B.Ll. (ed.), op.cit., p.8; 'George Edward Frere (1807-1887),' BDCE2, pp.318-319.

was cruising as a guest of the Royal Navy.¹ Having left the B&ER in 1843 John England went on to work on surveys for the Norwegian Trunk Railway. He then accepted the post of Engineer for the proposed Lima-Callao Railway in 1848. His journey to Panama and across the isthmus ruined his health, and he soon returned to England where he took years to recover. He never again took an active engineering role and he died in depressed circumstances on 8 February 1882, aged 69.² William Peniston was engaged by the Bridgwater Corporation in 1844 to prepare plans for a horse tramway linking Bridgwater Station to riverside quays. The following year he was appointed Resident Engineer on the Wilts, Somerset & Weymouth Railway. In about 1858 he went out to Brazil as Resident Engineer on the Pernambuco & São Francisco Railway until 1862. Four years later he gave evidence to a Parliamentary Commission on railways in Natal. He died in St. Pietermaritzburg in 1869 aged about 55.³ Gravatt's former factotum George Layard continued working on the B&ER until at least September 1842. No details have been found of his subsequent career. He died on 27 July 1848 aged 42 and was buried at Mayfield, Staffordshire.⁴

After a mere three months as a junior assistant on the B&ER, Charles Richardson went on to work on several of Brunel's other railway projects in the south-west of England and South Wales. In 1873 he was appointed Engineer for the Severn Railway Tunnel. He died in Bristol on 10 February 1896 aged 82.⁵ Peter Margary, who worked on the B&ER while he was a pupil of Gravatt's, was taken on as an assistant to Froude at the Devon end of the B&ER in mid-1841.⁶ He next worked on the South Devon Railway, becoming Chief Engineer to this Railway in 1859 and to the Cornwall Railway in 1868. He died in 1896 aged 76.⁷ Richard Hassard, another former pupil of Gravatt,

¹ Anon, 'William Froude' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.60 (1880), pp.395-404; 'William Froude (1810-1879),' BDCE2, pp.319-320.

² Anon, 'John England' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.70 (1882), pp.415-417; 'John England (1813-1882),' BDCE2, pp.265-266.

³ 'William Michael Peniston (c.1815-1869),' BDCE2, p.612.

⁴ TNA/PRO RAIL 75/95, B&ER journal No.1, Dec 1836 – Sep 1842 passim; <http://www.wishful-thinking.org.uk/genuki/STS/Mayfield/MIs.html> accessed 11 January 2011.

⁵ Anon, 'Charles Richardson' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.124 (1896), pp.417-419; 'Charles Richardson (1814-1896),' BDCE2, pp.662-664.

⁶ TNA/PRO RAIL 75/95, B&ER journal No.1, Sep 1841 – Sep 1842 passim.

⁷ Anon, 'Peter John Margary' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.125 (1896), pp.409-410.

worked on railway and water undertakings in the UK and Ireland, including acting as Resident Engineer on the Devon and Somerset Railway. He died in 1913 aged 92.¹

In stark contrast, William Cobbe, whose clandestine appointment onto the B&ER became one of the contentious issues leading to Brunel dismissing Gravatt, would later find notoriety. He stayed on the B&ER at least until September 1842 and while he was working in the Bridgwater area he came under the influence of Henry James Prince, a former Anglican curate who claimed to have received a divine sign of the Second Coming. In 1845 Prince, Cobbe and another former curate married three wealthy sisters under dubious circumstances and lived together in a somewhat scandalous manner in a quasi-religious commune known as the 'Agapemone' at Spaxton, near Bridgwater.²

¹ Anon, 'Richard Hassard' (obituary notice) Minutes Proceedings Institution of Civil Engineers Vol.193, (1913), pp.359-360; 'Richard Hassard (1820-1913),' BDCE2, p.376.

² TNA/PRO RAIL 75/95, B&ER journal No.1, Jun 1841 – Sep 1842 passim; Somerset County Gazette 28 Jun 1845; Felix Farley's Bristol Journal 30 Jun 1849; Mander C., The Reverend Prince and his Abode of Love (Wakefield, 1976), pp.70-103 passim; Schwieso J.J., 'The Founding of the Agapemone at Spaxton, 1845-1846' Proceedings Somerset Archaeological & Natural History Society Vol.135 (1991), p.116; Mitchell S., op.cit., pp.57-288 passim.