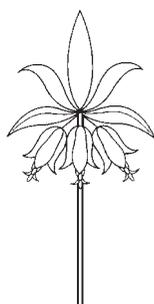


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Errata

Page 132, right-hand column, line 7 from bottom of page: for “218” read “220.”

Page 160, right-hand column, lines 15 and 16 from bottom of page: delete “but with no superscript.”

Page 164, right-hand column, line 3 from top of page: for “222” read “224.”

Page 179, left-hand column, last line: for “218” read “220.”

Page 181, right-hand column, line 23 from top of page: for “218” read “220.”

Page 181, right-hand column, line 27 from top of page: for “9” read “10.”

Page 181, right-hand column, lines 28 and 29 from top of page: insert the three plate numbers indicated in bold, which will then read: “... XXII½; XLII^A and XLII^B; LIX^A, LIX^B, **and LIX^C**; LXVIII^A and LXVIII^B; **LXIX^A and LXIX^B**; LXX^A, LXX^B and ...”

Page 185, right-hand column, line 6 from top of page: for “LXIII” read “LXXIII.”

Page 211, right-hand column, line 7 from top of page: for “94” read “95.”

(Note for clarification: Apparent inconsistencies between the total numbers of Nature-Prints quoted for both octavo publications (seaweeds: “220” and “224”; ferns: “122” and “124”) result from the inclusion, or not, of the small vignettes on the decorative title pages.

The life and craft of William and Henry Bradbury, masters of nature printing in Britain

A. F. Dyer

Abstract

Trained as a printer, William Bradbury set up several short-lived printing companies in London before forming Bradbury & Evans with Frederick Mullet Evans in 1830. Bradbury & Evans became one of London's major printing companies, particularly noted for the excellence of their colour printing. In 1842 they started publishing as well as printing. Henry Bradbury, William's oldest son, entered his father's firm as a letter-press printer but after seeing the work of the Austrian Staatsdruckerei (State Printing Office in Vienna) at the 1851 Great Exhibition in the Crystal Palace, he went to Vienna in 1852 to learn the new *Naturselbstdruck* process for producing intaglio plates from natural objects. The Staatsdruckerei Director, Alois Auer, allowed him to see the process and use it in London. On his return to London in 1853, shortly before the Staatsdruckerei published the first work illustrated by the *Naturselbstdruck* method (by von Heufler), Henry introduced what is essentially the same technique to his father's firm, Bradbury & Evans, and called it first "Phytoglyphy," then "Nature-Printing" and finally "Autotypography." He claimed to have improved the method he saw in Vienna and took out a patent. This initiated a long-running and very public dispute with Auer. Between 1853 and 1860, Henry developed intaglio printing techniques for producing documents that were difficult to counterfeit and founded a successful and long-lasting firm, Bradbury & Wilkinson, to produce bank notes. In parallel with this, he established the Nature-Printing process using the facilities at his father's printing works and printed several works illustrated by Nature-Prints and published by Bradbury & Evans. Henry's suicide in 1860 ended Bradbury & Evans' experiment with Nature-Prints. The last book illustrated by *Naturselbstdruck* prints was published in Vienna in 1873. The Nature-Print/*Naturselbstdruck* process has not been used commercially by any other firms since then but has been successfully revived recently by individual enthusiasts.

Introduction

Students of British ferns and seaweeds, collectors of 19th-century illustrated botanical books, and those who have succumbed to the lure of nature printing (printing from natural objects) will know the names of William Bradbury (1799–1869) and his son Henry Riley Bradbury (1829–1860). William was a prominent figure in the printing and publishing world of mid-Victorian London and co-founder of Bradbury & Evans, noted for their high-quality colour printing, publishers of several prominent authors including Charles Dickens, and proprietors of *Punch* magazine. Henry's working life was short, but as well as producing nature prints commercially, he founded a firm of printers, Bradbury & Wilkinson (later Bradbury, Wilkinson & Co.), that made important developments in the intaglio printing¹ of security documents and bank notes and produced British bank notes into the 1980s. Together William and Henry took the art of nature printing to a level never surpassed in Britain and produced four published works illustrated by nature prints that, once seen, are never forgotten. There is no evidence that William Bradbury had a direct involvement in the production of Bradbury Nature-Prints, but it is unlikely that Henry, as a young man in his twenties, would have been able to initiate and exploit the technique in London without access to the facilities and resources provided by the major printing works and publishing company previously established by William Bradbury and his business partner Frederick Mullet

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Evans. Bradbury & Evans published all the Bradbury Nature-Prints. In this article I will consider the lives and achievements of both William and Henry Bradbury so far as they relate to Nature-Printing.

There have been several accounts of the careers of William and Henry Bradbury, their Nature-Printing technique and the resulting publications, notably by Bradbury (1856a, 1860a), Cave and Wakeman (1967), Dyer (2004), Harris (1970), Heilmann (1982, 1988), Patten (2004a), Patton and Leary (2004a), Wakeman (1966, 1984), and most recently, in the sesquicentenary year of Henry Bradbury's death, Cave (2010). In *Impressions of Nature* Cave presented a comprehensive and well-illustrated account, which placed the botanical nature prints of Henry Bradbury in the context of the 800-year history of all types of nature printing. Several other more superficial accounts not only lacked detail but also were often misleadingly incorrect, especially about the method. In all these published accounts, there were aspects of the technique that were unclear, information about the Bradbury publications that was incomplete, or personal details about William and Henry Bradbury that were missing or incorrect. Moreover, little has been published about the Bradbury family and its origins. The purpose of this article is to make good these defects and deficiencies.

William Bradbury

Birth, life and death

William Bradbury was baptised on 14 April 1799 (Fig. 1; and thus was not born in 1800 as stated in Patten and Leary 2004a) in Bakewell, Derbyshire, the oldest child of John Bradbury (1776–?), a cordwainer,² and Elizabeth, née Hardwick (1774–?). “William” was his maternal grandfather's name. His paternal ancestors can be traced back a further

three generations in Bakewell.³ On 6 July 1826 William Bradbury married Sarah Price (baptised in Bakewell, 7 October 1803) in Bakewell Parish Church.⁴ William had by then been living in London for at least two years and at the time of his wedding was living in the parish of St. Andrew's, Holborn, north of Fleet Street. After their marriage in Bakewell, William and Sarah returned to live in London for the rest of their lives and had five children: Letitia Jane (1827–1839)⁵; Henry Riley (1829–1860; detailed account below); William Hardwick (1832–1892)⁶; Walter (1840–?)⁷; and Edith (1842–1910).⁸

William and his family are known to have moved several times, and they may have lived at other addresses as yet unknown.⁹ In 1829, when Henry was baptised, the family was living in Clerkenwell in north London; in December 1832, when William Hardwick was born, they were probably living in Lambeth, south of the River Thames.¹⁰ At William Hardwick's baptism in August 1833 their address was given as 22 Bouverie Street, off Fleet Street.¹¹ By the time of Letitia's death in February 1839, they had moved to 1 Clarence Terrace, Albion Road, Stoke Newington, some 3 miles north of the City of London and at that time a small village well out in the country. This may have been in order to provide the children with a more healthy environment than that in central London. A special concern was Letitia who had lung disease (?“consumption”), but also, as described



Figure 1. Parish baptism record for William Bradbury at All Saints' Church, Bakewell, Derbyshire, England.

later, there are indications that there was concern about Henry’s survival immediately after birth in Clerkenwell. This experience may explain the decisions subsequently to go to rural Lambeth for William Hardwick’s birth and then to move to Stoke Newington, where, in addition to improved conditions for Letitia, Henry and William Hardwick, any subsequent children (Walter and Edith, as it turned out) would have a better start. However, the move came too late to save Letitia.

They were still at 1 Clarence Terrace in March 1840 when Walter was born, but in the 1841 census (June) their address was given as 6 York Place, Stoke Newington. In April 1842, when Edith was born, they were still in Stoke Newington at 6 York Terrace, Albion Road (perhaps the same address as 6 York Place). Sometime in the 1840s¹² they moved back to London and by Census Day, 30 March 1851, they were living at 13 Upper Woburn Place, St. Pancras (although on that day William was not present and Sarah was listed as head of household). They remained at that address for the rest of William’s life. In Stoke Newington in 1841 they had had two servants, and in Upper Woburn Place in 1851

and 1861 they had three, like their neighbours, indicating a level of prosperity throughout this period. One servant, Amelia Turner, was with the family for more than 20 years. Number 13 Upper Woburn Place is now immediately adjacent to St. Pancras New Church, but the current building is not the substantial detached house shown at that site on the 1870 Ordnance Survey (OS) map of the area, which, if the house numbering hasn’t changed, was the Bradbury home. None of the buildings associated with William Bradbury or his firm Bradbury & Evans is still in existence.

William died after a long period of bronchitis on 11 April 1869, 3 days short of his 70th birthday (Fig. 2). His youngest son, Walter, was present when he died. Notices of his death were published in the *Morning Post* and the *London Standard* for 14 April, and a brief obituary appeared in the *Illustrated Police News* (a popular tabloid weekly first published five years earlier) for 17 April. There was a small paragraph marking his passing with an appreciation of “a good man and a good friend” in *Punch* of 24 April 1869. He was buried (burial number 35855) in Highgate Cemetery in the plot (grave number 10546,

CERTIFIED COPY OF AN ENTRY OF DEATH



GIVEN AT THE GENERAL REGISTER OFFICE

Application Number W132220

REGISTRATION DISTRICT St Pancras

1869 DEATH in the Sub-district of Tottenham in the County of Middlesex

Columns—	1	2	3	4	5	6	7	8	9
No.	When and where died	Name and surname	Sex	Age	Occupation	Cause of death	Signature, description and residence of informant	When registered	Signature of registrar
438	<u>Eleventh April 1869</u> <u>13 Upper Woburn Place</u>	<u>William</u> <u>BRADBURY</u>	<u>Male</u>	<u>69</u> <u>years</u>	<u>Printer</u>	<u>Bronchitis</u> <u>Certified</u>	<u>Walter Bradbury</u> <u>Present at death</u> <u>13 Upper Woburn Place</u> <u>St. Pancras</u>	<u>Fourteenth</u> <u>April</u> <u>1869</u>	<u>John Wells</u> <u>Registrar.</u>

Figure 2. Death certificate for William Bradbury.

square 28 in the West Cemetery) he had bought in 1860 for the burial of his son Henry (see Fig. 11 below).¹³ The grave dimensions were 6'6" × 2'10" × 10'; adjacent plots were close in the crowded cemetery, now very overgrown. The memorial was very plain, and there was no inlaid lead or gold in the incised lettering to make it easier to read. It was inscribed "In memory of William Bradbury of Whitefriars died the 11th April 1869 in his 70th year." The cemetery records stated, "Granted to William Bradbury 12 Upper Woburn Place, St. Pancras 4th September 1860 for £6. 6. 0. Transferred to Sarah Bradbury of 70 Adelaide Road NW ... By value of probate of will produced 6 December 1890."¹⁴ It is odd that, if the date given is correct, the transfer to William's wife occurred more than 20 years after his death. The sum of £6.6s.0d. (£6.30) in 1860 is equivalent to about £270 today.¹⁵

Probate of William's will was granted on 5 June 1869. His executors were his widow Sarah and Nathaniel Lindley (1828–1921), barrister of Lincoln's Inn and author of books on partnership law (and later Sir Nathaniel Lindley, Baron Lindley, Master of the Rolls). Nathaniel Lindley was the second son of the botanist John Lindley, William Bradbury's longtime friend and colleague. In the will, dated 7 March 1866, William bequeathed all his property to his wife Sarah for her lifetime. Afterwards, the oil portrait of himself was to go to his son William Hardwick Bradbury while all the rest was to be divided equally between his youngest son Walter and his daughter Edith. It is stated that his effects were under £8000 (probably a cut-off figure for calculating fees at a time before inheritance tax, and equivalent to about £370,000 today). He had already by this date transferred all his business property in Whitefriars to William Hardwick Bradbury.

William's wife Sarah lived for almost 30 more years.¹⁶ She was buried (burial number

831167) with William and their son Henry in Highgate Cemetery. Underneath the dedication to her husband on the memorial was inscribed, "Also of Sarah Bradbury widow of the above died the 25th December 1898 in her 96th year." The plot was transferred to Charles Swain Agnew (Sarah's son-in-law, husband of her daughter Edith) and William Lawrence Bradbury (Sarah's grandson, William Hardwick's son) of 10 "Bouvere St. [probably Bouverie St.] by value of probate of will produced 2 August 1899." However, there is no record of subsequent burials in that plot.

William Bradbury's printing career

After leaving Bakewell, William moved first to Lincoln where he may have been apprenticed as a compositor to Capt. Felix Joyce, whom he later employed (Patten and Leary 2004a) and who was manager under Frederick Mullett Evans (Patten and Leary 2004c).¹⁷

William then moved to London and in 1824 formed a partnership called Bradbury & Dent, with William Dent, who later married Bradbury's younger sister Mary.¹⁸ The first address of Bradbury & Dent was 76 Fleet Street. This address, on the south side of Fleet Street, close to St. Bride's Church, was occupied in 1821 by John Twigg (?–1831), printer and publisher. Perhaps Bradbury took over the premises when Twigg retired.¹⁹ In 1828 the firm took on another partner and became Bradbury, Dent and Manning.²⁰ Trade Directories for 1828 gave their address still as 76 Fleet Street, but in the previous year, Bradbury had printed *Stories of Chivalry and Romance* under the name "Bradbury & Co" of Dunstan Court, Fleet Street, and printed *Tales of all Nations* and the *Daily News* newspaper as "Bradbury & Co" of Bolt Court, Fleet Street.²¹ They then moved to an address in Oxford Arms Passage (where they were in 1829 and 1830), and finally their address was given as

“Warwick Lane.” Oxford Arms Passage and Warwick Lane were both on the north side of the present Paternoster Square beside St. Paul’s Cathedral, about 600 metres east of Dunstan Court.²²

Later in 1830 the Bradbury, Dent and Manning partnership was ended, and William Bradbury formed the partnership of Bradbury & Evans with Frederick Mullet Evans (1803–1870).²³ This partnership was to last for 35 years. In a directory for 1830 the address for Bradbury & Evans, Printers, was given as 1 Bouverie Street.²⁴ In a brief obituary of William Bradbury in the *Illustrated Police News* for 17 April 1869, the authors stated that “This eminent firm, we believe, commenced business in Basinghall-street, their first successful enterprise as printers and publishers having been with the late Mr. James Silk Buckingham’s books of travel and numerous pamphlets on philanthropic subjects.” This slightly tentative statement has not been confirmed, neither with respect to the address (Basinghall Street passes the east side of the Guildhall) nor the publications. In the Copac list of many publications of James Silk Buckingham from 1819 to 1855, few were published in the 1830s, and none of the publications was listed as being published or printed by Bradbury & Evans, though there was a small number for which the information was not given.

In July 1833 Bradbury & Evans moved their printing works from Bouverie Street to Lombard Street (now Lombard Lane; Patten and Leary 2004a). A notice dated 6 July 1833 found among Bradbury & Evans’ correspondence (Bradbury & Evans 1833–1910) stated that they were moving to a property previously occupied by the late Mr. T. Davison. The Post Office London Directory for 1835 gave the address for Bradbury & Evans as Lombard Street, and that was still the address on a letter from J. M. Barrie dated 17 January 1840 (Bradbury & Evans

1833–1910). In about 1840 the firm acquired or assumed the status of “Printers Extraordinary to the Queen.” For the first 10 years or so, the firm undertook only printing, becoming the primary printers for Moxon, Chapman & Hall and for Smith, Elder, but in 1842 they took over as sole proprietors the struggling magazine *Punch* and started publishing. From 1842 until 1867 the famous *Punch* dinners (later lunches) for editor and staff were held at 11 Bouverie Street.²⁵ In 1846 Bradbury & Evans, with others, launched, and for a short period published, the *Daily News*, a newspaper initially edited by Charles Dickens.²⁶ In 1851 Bradbury & Evans occupied premises at 85 Fleet Street, 11 Bouverie Street and 4–14 Lombard Street (probably the printing works).²⁷ The 1861 Post Office London Directory gave the address for Bradbury & Evans as 11 Bouverie Street and Fleet Street. In the 1873 Ordnance Survey (OS) map Bradbury & Evans were listed as being at 85 Fleet Street, while a large building shown on the east side of Lombard Street was probably numbers 4–14 Lombard Street. Bradbury & Evans eventually occupied the whole of this street with offices and warehouses (Patten and Leary 2004a). On many of their publications, the address is given as “Whitefriars,” the name of the precinct, between Fleet Street and the River Thames, within which Bouverie Street is located. Printing works were concentrated in this area because of the availability of gas, from a nearby gasworks, and water, from the nearby river, for the steam-driven presses. However, in Lindley’s *Vegetable Kingdom*, ed. 3 (1853), Bradbury (1854), Moore (1859/60, 1863) and Johnstone and Croall (1859/60), but, curiously, not in Moore (1855/56), the publisher’s address is given as 11 Bouverie Street. William Bradbury also gave 11 Bouverie Street as his own address for the letters of administration for Henry’s will in 1860 even though he was living at that time at 13 Upper Woburn Place, St. Pancras.



Figure 3.
William
Bradbury,
photograph
from
Spielmann
(1895).

Bradbury & Evans had become a major printing and publishing house and, by the time of an inspection in 1862, employed 300–400 people, working from 8 AM until 8 PM or later (Wakeman 1984). In addition to being the publishers and sole proprietors of *Punch* (1842–1872), from 1844 to 1859 they printed and published all Dickens’s new work (including: *The Haunted Man*, first edition in 1848; *David Copperfield*, issued in 19 monthly parts from May 1849; *Bleak House*, first edition in 1853; and *Little Dorrit*, first edition in 1857). During this period, the three families of Dickens, Bradbury and Evans met socially on many occasions. Bradbury & Evans were also the principal publishers for William Makepeace Thackeray and in addition published books by Charles Knight, Anthony Trollope and Wilkie Collins amongst others (Patten and Leary 2004a). William Bradbury was “the keenest man of business that ever trod the flags of Fleet Street, and the founder of a dynastic line nearly as long and eminent as that of John Murray himself,” according to Spielmann (1895), but he also closely supervised the practical aspects of the printing process. They had a reputation for superbly produced coloured copper engravings.²⁸ Bradbury & Evans had also published John Lindley’s *The Vegetable Kingdom* (first edition 1846, third edition

1853), establishing an association with Lindley, which continued with the folio *The Ferns of Great Britain and Ireland*. Another contribution to botanical and horticultural literature was *The Book of the Royal Horticultural Society* (A. Murray, 1862–1863) with lithographs, mounted photographs and wood engravings. Among the periodicals that they published were the *Horticultural Register*, edited by William Bradbury’s friend Joseph Paxton,²⁹ and Charles Wentworth Dilke’s *The Gardeners’ Chronicle and Agricultural Gazette*, co-founded by William Bradbury with Joseph Paxton and John Lindley in 1841. They also printed some publications, including *Chambers’s Edinburgh Journal*, for the Chambers Brothers in Edinburgh.

In his *History of Punch* Spielmann (1895) included a plate on page 65 labelled “Bradbury & Evans” with four photographs by A. Bassano Ltd.,³⁰ none of which were individually identified or dated. According to Patten (2004b) and Patten and Leary (2004a, b, c), these photographs included William Bradbury, William’s (second) son William Hardwick Bradbury, Frederick Mullet Evans and Frederick’s son Frederick Moule Evans. The white-haired man in the photograph at the top of the page (which also occurred, again unidentified, in the Bradbury, Wilkinson & Co. brochure of circa 1986) is almost certainly William Bradbury (Fig. 3). The photograph at the bottom of the page shows a man who fits the descriptions of Frederick Mullet Evans. The photograph of a younger man shown at centre left resembles the portrait of Henry Bradbury (see Fig. 6) but according to Patten (loc. cit.) must be either Henry’s brother William Hardwick Bradbury or Frederick Moule Evans.

After an acrimonious break with Charles Dickens in 1858,³¹ there was a gradual retreat by Bradbury & Evans from publishing over several years (Patten and Leary 2004b). In

1865, when both William Bradbury and Frederick Mullet Evans retired, their sons William Hardwick Bradbury and Frederick Moule Evans³² (ca.1833–1902) took charge of the business. Both William Hardwick Bradbury and his sister Edith had married into the family of Thomas Agnew, a Manchester-based art dealer, and William Agnew and Thomas Agnew were brought into the firm as partners. Bradbury & Evans became Bradbury, Evans & Co. (Patten and Leary 2004a, b). No Nature-Prints were published under the new management, and William Bradbury died in 1869. Further information on William Bradbury and the history of Bradbury & Evans can be found in Patten (2004a, b) and Patten and Leary (2004a, b, c).

Henry Riley Bradbury

Birth, life and death

There are very few published facts concerning Henry Bradbury's personal details, and most of the published reports of his date of birth and his age at death are incorrect.³³ For example, the *Oxford Dictionary of National Biography* entry (Patten 2004a) has the wrong year of birth and the wrong date of death. Henry Riley Bradbury (Riley after his maternal grandmother, Jane Riley) was born on 20 September 1829 at the family home in Wingrove Place, Clerkenwell (then a terrace of houses on the north side of Corporation Lane; the site is now parkland on the north side of a re-routed Skinner Street). As stated in the parish records (Fig. 4), Henry was christened on 21 October 1829 at St. James', Clerkenwell, about 500 yards from their home (the church has survived and still stands on Clerkenwell Close). No close relatives were named Henry. Interestingly, in the bishop's transcript of the baptismal record there was the additional comment "Named only" (Fig. 5). A possible

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BAPTISMS solemnized in the Parish of St. JAMES, CLERKENWELL, in the County of MIDDLESEX, in the Year 1829.

When Baptized.	Child's Christian Name.	Parent's Name.		Abode.	Quality, Trade, or Profession.	By whom the Ceremony was performed.
		Maternal	Paternal			
18 29	Samuel	Robert	Thomas	St. James	Printer	St. James
18 29	Charles	Charles	John	St. James	Printer	St. James
19 29	Mary	Elizabeth	Elliott	St. James	Printer	St. James
21 29	Henry	William	Bradbury	Wingrove Place	Printer	St. James

Figure 4. Above, Parish baptism record, with birth date, for Henry Riley Bradbury at St. James', Clerkenwell, London, England.

Figure 5. Below, Bishop's transcript of Henry Bradbury's baptism record, showing that he was "named only" at the church, probably after having been baptised at home soon after birth. The entry is in the chronological sequence of baptism date (21 October) not of birth date (20 September).

20 Sep 29	Mary, son of Elizabeth	Wilt	Herkham	—	19	
20 Sep 29	Henry Riley	William	Bradbury	Wingrove Place	Printer	21
26 Sep 29	James William	James	June	Donnal	School	22
19 Sep 29	Mary Ann	James	Mary	Vine Court	Printer	22

interpretation of this is that Henry was so sickly at birth that he was baptised at home, possibly by a midwife, soon after he was born in case he died. Having survived, he could be only "named" when he was taken to church three weeks later.

According to the 1841 census, Henry (aged 12), like his brother William Hardwick (aged 10), was at boarding school in Marlborough Place, Brighton, Sussex. Later, as a young man, Henry entered his father's printing firm. According to the 1851 census (on 30 March), Henry, aged 21, was living at the family home at 13 Upper Woburn Place, St. Pancras, and working as a "letter press printer," implying



Figure 6. Henry Bradbury, albumen print by (George) Herbert Watkins, NPG P301(16), © National Portrait Gallery, London, All Rights Reserved. Courtesy of the National Portrait Gallery, London, England.

that he was not involved with intaglio printing before the Great Exhibition later that year. There are few available images of Henry Bradbury. There is one photograph portrait in the National Portrait Gallery, London (Fig. 6). It is an albumen print produced by (George) Herbert Watkins in the late 1850s. Watkins took photographs of many Londoners at his Regent Street studio, including several portraits of the Bradburys' friend Charles Dickens. In the Bradbury, Wilkinson & Co. brochure is a colour portrait of a young man reproduced from a painting (see Dyer 2004 for a black-and-white copy). Although it does not show much likeness to the photograph of Henry Bradbury, Marshall (the archivist for, first, Bradbury, Wilkinson & Co. and then, after the 1987 takeover, for De La Rue) has assured me (pers. comm., 2003) that the

painting is a portrait of Henry Bradbury. Marshall also wrote enigmatically that the original painting "no longer exists."

Little is on record relating to the character of Henry Bradbury. It is recorded that Henry's father, William Bradbury, was tall and imposing, contrasting with his partner, the avuncular and popular "Pater" Evans (Spielmann 1895), but nothing is available relating to Henry other than what can be inferred from his writings, the subjective comments of Auer³⁴ and Dickens, and his suicide. It seems likely that Henry Bradbury was, at least until the period leading up to his death, ambitious, hardworking and apparently confident in his own abilities ("arrogant and obstreperous" according to Auer), and, if the critics of his treatment of Auer are correct, unscrupulous in furthering his career.

In August 1852 he began a tour of European printing houses, spending several months at the Staatsdruckerei in Vienna and then visiting Prague, Berlin, Frankfurt, Brunswick, Leipzig and Paris, returning to London early in 1853 (Harris 1970). Between 1853 and his death in 1860, Henry Bradbury pursued his printing career in London. Soon after his return, he communicated a patent application, which had probably been prepared by him but was in the name of William Bradbury and Frederick Mullett Evans, for "Improvements in taking impressions and producing printing surfaces"³⁵ (Fig. 7).

Henry Bradbury subsequently developed his Nature-Printing method, and in 1854 he produced the first of the Bradbury & Evans publications illustrated by Nature-Prints (Bradbury 1854). At a general monthly meeting of the Royal Institution (RI) on 5 March 1855 Henry Bradbury was elected a member.³⁶ At a weekly evening meeting on 11 May 1855, aged 25, he gave a lecture titled "On Nature-Printing." The lecture was accompanied by demonstrations of

the method, using workmen and apparatus supplied by Bradbury & Evans. Many samples of Nature-Printing were produced during the course of the evening. Thin electrotype copies of impressed plates were produced in as little as five minutes. (The process of electrotyping, also sometimes referred to as “galvanography,” the electrolytic deposition of a metal to create an exact facsimile and now used for producing circuit boards and jewellery, is generally attributed to von Jacobi, who used the process in 1838 to copy intaglio prints.) In the lecture he acknowledged the limitations of the process and outlined its history. An abstract of the lecture was published, sometimes with three specimen Nature-Prints, in the Royal Institution’s proceedings (Bradbury 1855a), and this was also issued as an offset reprint without Nature-Prints; Bradbury & Evans published a version stated to be “Illustrated with specimens” although none was in the copy I saw (Bradbury 1855b) and another version “as delivered” (Bradbury, 1856a; Fig. 8a, b, c, d). A translation of the last version (Bradbury 1856a) into German was published separately, also by Bradbury & Evans, also in 1856. Copies of the German version are rare (there is one in the library of the Royal Botanic Garden Edinburgh), and it is not clear how widely it was distributed. Over this period, the first book with Bradbury Nature-Prints, *The Ferns of Great Britain and Ireland*, was published (Moore 1855/56).

At the same time Henry Bradbury also took charge of colour printing in relief and several other printing processes at Bradbury & Evans and began to produce high-quality colour illustrations for children’s books.

Henry Bradbury also started to develop intaglio printing for bank notes and other security documents, taking over the security printing orders of Bradbury & Evans. He gave another lecture to the Royal Institution on 9 May 1856 titled “On the security and

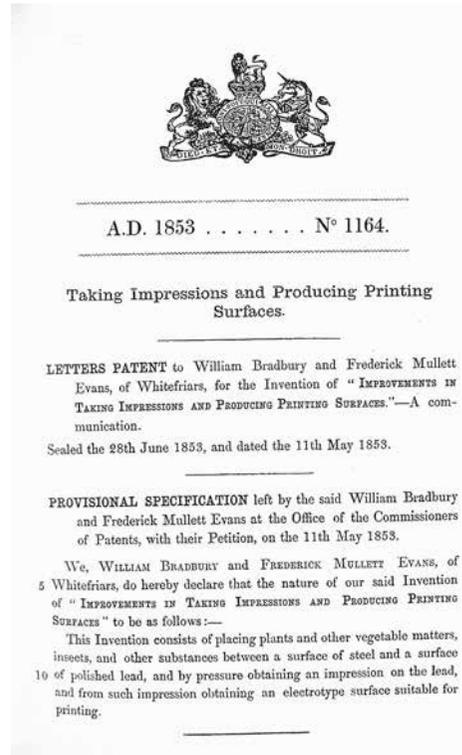


Figure 7. The first page of the Bradbury patent for Nature-Printing.

manufacture of bank notes.” He suggested the use of intaglio printing to combat the epidemic of bank note counterfeiting, which characterised the first half of the 19th century and which was set to expand with the development of photographic techniques. An abstract of the talk, signed “H.B.,” was published in the Royal Institution’s proceedings (Bradbury 1856b) containing two specimen Bank of England notes, one for £10 and one for £100, each with Henry’s signature in place of that of the Governor of the Bank (Fig. 9a). Also on the notes was printed the name of the designer, Henry’s friend John Leighton, F.S.A., who was also the designer of the title pages of the octavo *The Nature-Printed British Sea-Weeds* (Johnstone and Croall 1859/60) and *The Nature-Printed British Ferns* (Moore 1859/60). The text of the lecture

Wesley, John, Esq. (the Publisher)—Educational Series. 12mo.:—
 Chronology of History, Art, and Literature. Vol. I. 1854.
 Dictionary of the English Language. By Hyde Clarke. 1855.
 Grammar of the Greek Language. By H. C. Hamilton. 1854.
 Lexicon of the Greek Language. By H. R. Hamilton. Part II. 1853.
 English-Greek Lexicon. By H. R. Hamilton. Part I. 1855.
 Grammar of the Latin Tongue. By T. Goodwin. 1854.
 Latin-English Dictionary. By T. Goodwin. 1855.
 French-English, and English-French Dictionary. By A. Elwes. 2 Parts.
 1854-5.
 Italian-English-French Dictionary. By A. Elwes. Part I. 1855.
 Spanish-English, and English-Spanish Dictionary. By A. Elwes. 1854.
 Hebrew and English Dictionary and Grammar. By M. H. Bresslau. 1855.
 Classical Series. 12mo. (Edited by H. Young.)
 Greek Delectus. 1854.
 Xenophon's Anabasis. 2 vols. 1854-5.
 Select Dialogues of Lucian. 1855.
 Latin Delectus. 1854.
 Cæsar's Commentaries. 1854.
 Cornelius Nepos. 1855.
 Virgil. Part I. 1855.

WEEKLY EVENING MEETING,

Friday, May 11.

SIR CHARLES FELLOWS, Vice-President, in the Chair.

HENRY BRADBURY, Esq. M.R.I.

On Nature-Printing.

THE Art of Nature-Printing is a method of producing impressions of plants and other natural objects, in a manner so truthful that only a close inspection reveals the fact of their being copies. So distinctly sensible to the touch are the impressions, that it is difficult to persuade those unacquainted with the manipulation, that they are the production of the printing-press. The process, in its application to the reproduction of botanical subjects, represents the size, form, and colour of the plant, and all its most minute details, even to the smallest fibre of the roots.

The distinguishing feature of the process, compared with other modes of producing engraved surfaces for printing purposes, consists, firstly, in impressing natural objects—such as plants, mosses, seaweeds, feathers, and embroideries—into plates of metal, causing as it were the objects to engrave themselves by pressure; and secondly, in being able to take such casts or copies of the impressed plates as can be printed from at the ordinary copperplate-press.

Royal Institution of Great Britain.

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This secures, on the one hand, a perfect representation of the characteristic outline of the plant, as well as that of some of the other external marks by which a plant is known, and even in some measure its structure, as for instance in the venation of ferns, and the leaves of flowering plants; and on the other, affords the means of multiplying copies in a quick and easy manner, at a trifling expense compared to the result obtained—and to an unlimited extent.

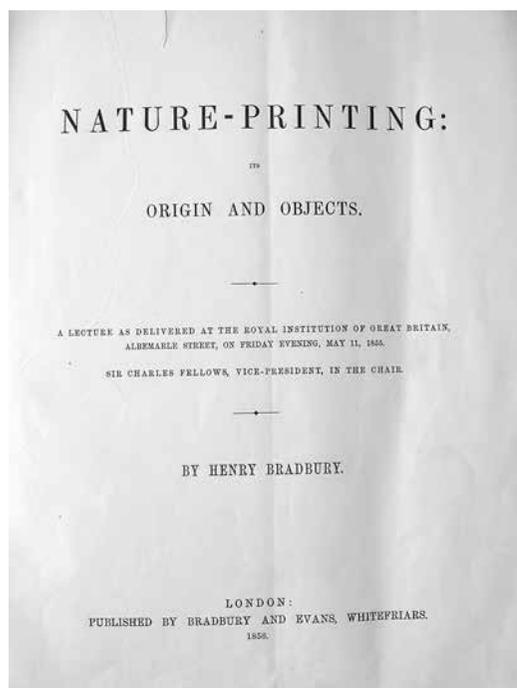
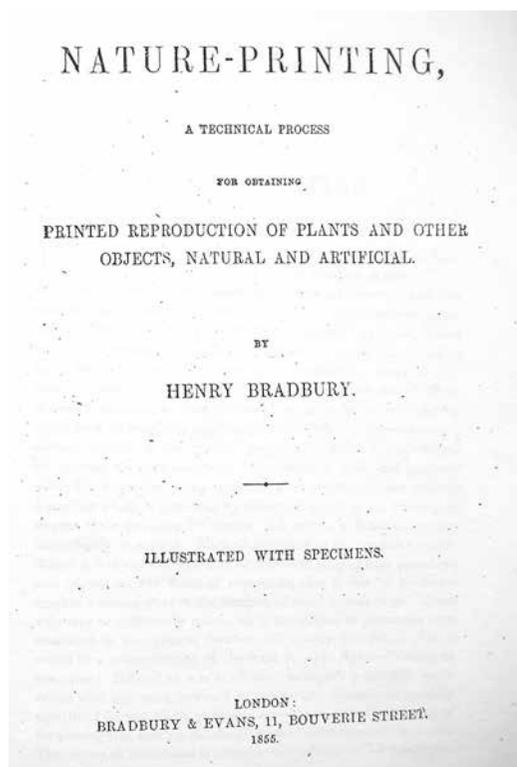
The great defect of all pictorial representations of botanical figures has consisted in the inability of art to represent faithfully those minute peculiarities by which natural objects are often best distinguished. Nature-Printing has therefore come to the aid of this branch of science in particular, whilst its future development promises facilities for copying other objects of nature, the reproduction of which is not within the province of the human hand to execute; and even were it possible, it would involve an amount of labour scarcely adequate to the results obtained.

Figure 8. Title pages of the four printed versions of Henry Bradbury's lecture on Nature-Printing to the Royal Institution, London: (above left, a) In the Royal Institution's proceedings (Bradbury 1855a); (above right, b) An offset reprint of (a); (page 125 above, c) A version published by Bradbury & Evans "Illustrated with specimens" (Bradbury 1855b); (page 125 below, d) Another version published by Bradbury & Evans "Lecture as delivered" (Bradbury 1856a). This version was also published in German.

"as delivered" was also published privately (Bradbury 1856c), with a specimen Bank of Scotland note as well as the Bank of England notes, and a copy was presented to the Royal Institution. The method he recommended was adopted by the Bank of England.

Henry Bradbury, with the help of his father, started in business on his own account as Henry Bradbury & Co. ("probably as early as 1856" according to Marshall 2003) at 12–13 Fetter Lane. The same year, and following on from his lecture to the Royal Institution, he formed another company, Bradbury & Wilkinson, in Fetter Lane with Robert

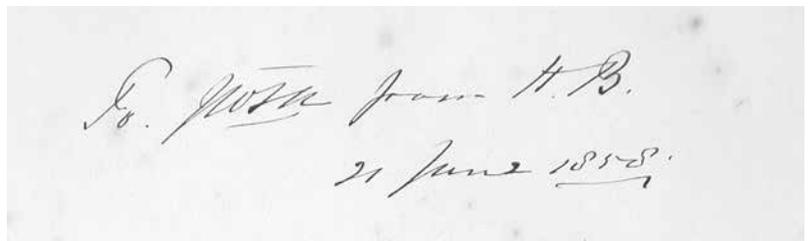
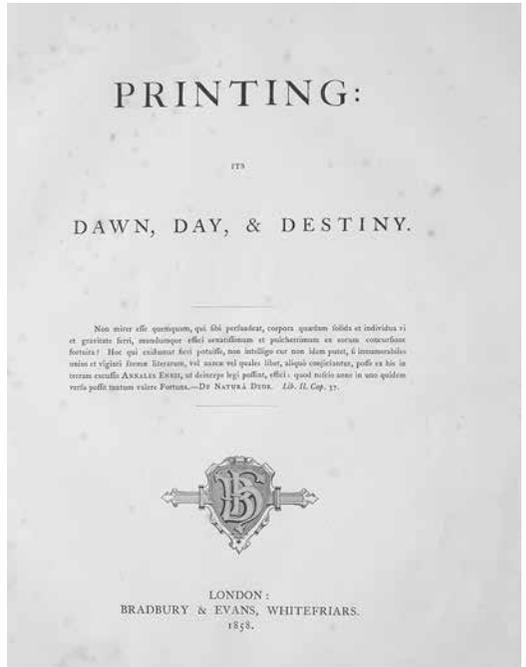
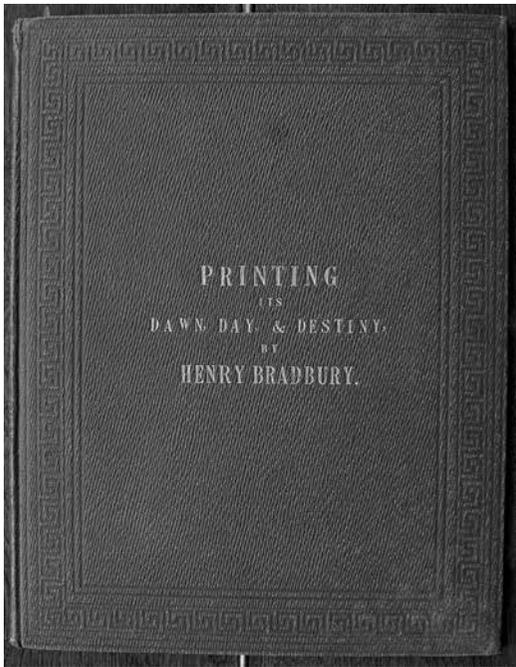
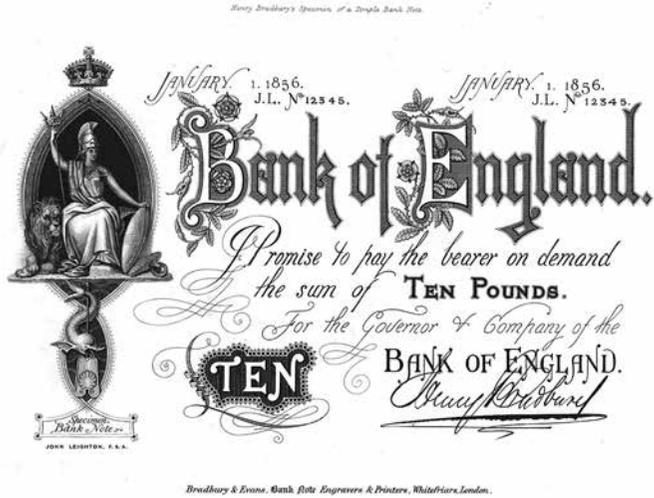
Wilmot Wilkinson.³⁷ Their first bank note was produced in 1858 for El Banco Commercial in Montevideo, and they later produced notes for several banks including the Bank of England and several Scottish banks.³⁸ By 1860 Henry Bradbury was describing himself as a "Bank note manufacturer" in a book he published (Bradbury 1860b) with the title *Specimens of Bank Note Engraving &c. &c. &c. Designed and Executed by Henry Bradbury M.R.I. (Late of Whitefriars)*.³⁹ Produced to attract customers, it is almost entirely composed of examples of the intricate engraved patterns and designs then available to make the task of counterfeiters



more difficult.⁴⁰ In view of the fact that Bradbury & Wilkinson produced their first bank notes in 1858, it remains to be explained why each plate in the abstract of his lecture (Bradbury 1856b) and his book (Bradbury 1860b) had printed at the bottom: “London: Bradbury and Evans Bank Note Engravers & Printers. Whitefriars.” Although Bradbury & Wilkinson, which later became Bradbury, Wilkinson & Co., subsequently became a substantial printing firm, perhaps in the early years Bradbury & Wilkinson relied on the machinery at the Bradbury & Evans printing works. The firm of Bradbury & Wilkinson was created initially to produce bank notes, but although Bradbury died just four years later, the firm that bore his name became known worldwide for the next 123 years as a producer of not only bank notes but also a variety of security documents. The history of Bradbury, Wilkinson & Co., is a story in itself, much of which can be found online.⁴¹

On 14 May 1858 Henry Bradbury delivered a third lecture to the Royal Institution titled “Printing: Its dawn, day and destiny.” No abstract was received by the Royal Institution, but the lecture was published in full (Fig. 9b, c), and a copy was presented to the Royal Institution (Bradbury 1858). (It can be seen in full online at Google Books.) Bradbury gave another copy, to “J W B” on 21 June 1858 (Fig. 9d). As stated at the bottom of the title page, it was published by Bradbury & Evans, but instead of the Bradbury & Evans symbol used on title page 1 of Bradbury (1854; see Fig. 27), the decorative “logo” above the name of the publishers of *Printing: Its Dawn, Day and Destiny*, four years later, is designed round the initials “H B.” The lecture presented a broad survey of the history, methods and prospects of printing. There was only a brief mention of intaglio printing and Nature-Printing, although the importance of electrotype in several printing processes was stressed. An

Figure 9. (Above, a) Specimen £10 note with Henry Bradbury's signature from Bradbury (1856c); (center left, b) cover from *Printing: Its Dawn, Day and Destiny* (Bradbury 1858); (center right, c) title page with "HB" logo from Bradbury (1858); (below, d) Henry Bradbury's handwritten dedication to "JWM, 21 June 1858." Courtesy of Michael Hayward.



autographed copy of all three Royal Institution lectures, bound together in green leather, is held in the library of the St. Bride Foundation, Fleet Street, London. He was preparing a folio work on contemporary graphic arts at the time of his death.

During 1859 and 1860, Henry Bradbury published the four volumes of *The Nature-Printed British Sea-Weeds* and the two volumes of *The Nature-Printed British Ferns*, and the publication of *The Nature-Printed Trees of Great Britain, Native and Exotic* was expected “to appear in the course of the ensuing spring” (Bradbury 1860a).

Henry’s career in printing was then cut short by his suicide on 1 September 1860, just before his 31st birthday.⁴² The death certificate recorded that the cause of death of Bradbury, stated to be a “bank note engraver,” was “Suicide with prussic acid. Mind unsound... in Cremorne Gardens, Chelsea” (Fig. 10). The information was supplied by Thomas Wakley, coroner for Middlesex after the inquest held on 3 September 1860. The coroner’s register for the Western District, County of Middlesex, no. 76, 3 September 1860, reported that the cause of death was as reported on the death certificate, and the place of death as “Chelsea Parish, World’s End.”⁴³ Cremorne Gardens was a pleasure and entertainment park, opened in the mid-1840s on a site previously occupied by Chelsea Farm, and subsequently by Cremorne House and grounds, on the north bank of the Thames about 500 yards west of Battersea Bridge. Cremorne Gardens were more than three miles from Bradbury’s home off Fleet Street, though easily accessible by steamer from the City to Cremorne Pier, but less than a mile upriver from Chelsea Physic Garden, which he was probably visiting regularly at that time to see Thomas Moore, who lived and worked there. (Moore’s address in some contemporary documents was given as “Queen’s Road West,” but that was a previous name for Royal Hospital

GIVEN AT THE GENERAL REGISTER OFFICE

Application Number **B358965**

REGISTRATION DISTRICT **St Luke Chelsea** in the **County of Middlesex**

1860 DEATH in the Sub-district of **South Chelsea**

Columns--	1	2	3	4	5	6	7	8	9
No.	When and where died	Name and surname	Sex	Age	Occupation	Cause of death	Signature, description and residence of informant	When registered	Signature of registrar
14	September 1st 1860 in Cremorne Gardens	Henry Bradbury	Male	30 years	Bank Note Engraver	Suicide with Prussic Acid Mind unsound	By Thomas Wakley Coroner for Middlesex Inquest held 3rd Sept. 1860	September 18 60	H. J. Lohr Registrar

Figure 10. Death certificate for Henry Bradbury.

Road where the Chelsea Physic Garden is still located.) If the publicity statements (Bradbury 1860a) were correct, the octavo *The Nature-Printed Exotic Ferns* was in preparation, and Moore would have been working on the text. As 1 September 1860 was a Saturday, Cremorne Gardens would have been crowded; on Saturday afternoons the amusements were available to children at reduced rates. It was recorded in *The Gardeners' Chronicle* (founded by Lindley and William Bradbury and others, and edited by Lindley) for that week that the weather at Chiswick, only five miles away, was warm (71°F max.), fine and clear during the day after a cold night with heavy dew. In 1860 the gardens opened at 3 PM, admission 1 shilling (5p, equivalent to just over £2 today); dancing began at dusk, and they closed with fireworks at 11–12 PM.⁴⁴ Patten (2004a) stated that Henry drank “soda water laced with prussic acid.” It has been recorded that “soda and something,” where the “something” was presumably usually alcoholic, was a popular long drink at Cremorne Gardens in the 1850s.

Little information has come to light regarding the events leading up to his suicide or the significance, if any, of the place he chose for it. Busy pleasure gardens seem to be an unlikely choice of place to commit suicide, but he may have been a regular visitor, seeking alcohol, entertainment or perhaps female company. He must have brought the cyanide with him, but he might have been contemplating suicide for some time during which he had the cyanide always with him. It may just be that Cremorne Gardens was where he happened to be when he made the final decision. According to Patten (2004a), correspondence from Charles Dickens, a close friend of the family at that time, reveals that the family used their “strong influence” to keep the story out of the papers. This was apparently successful; I searched through local papers for that week and found no mention of his death,

although Cremorne Gardens was mentioned, several suicides were reported in the district around that time and there was a very similar case reported two weeks earlier in the *Chelsea, Pimlico & Brompton Advertiser* for Saturday, 18 August. A woman called Ann Owen had committed suicide by drinking cyanide while sitting on a seat by the Serpentine in Hyde Park. Did Henry read that report?

There have been two suggestions for the cause(s) of Henry's decision to commit suicide. Cave (2010) suggested that Henry had departed suddenly from Bradbury & Evans in 1860, a few years before he could have expected to take over control of the firm, and that this might have been a factor, but equally his departure, if it did occur, might have been a consequence of other problems, or simply that he was setting up on his own. Alternatively, Patten (2004a) reported that George Holsworth, an employee of Bradbury & Evans, thought that Henry was depressed because an unnamed daughter of Frederick Mullett Evans, the business partner of Henry's father William, was marrying someone else.

Of Evans's twelve children, four daughters reached adulthood (Patten and Leary 2004a). Elizabeth Matilda Moule (“Bessie”) Evans (1840–?) married her childhood sweetheart, Dickens's son Charley (Charles Culliford Boz Dickens), on 19 November 1861. Mary Jane Moule Evans, aged 17 in 1860 (and married in 1875), was probably too young to be the object of Henry Bradbury's affection, and Gertrude Moule Evans, aged about 12 in 1860, died unmarried in 1919. It is therefore likely that the daughter referred to was Margaret Moule Evans (1838–1909), who married Robert Orridge (ca.1823–1866) on 21 August 1860,⁴⁵ just 11 days before Henry committed suicide. The marriage at St. Mark's in the parish of St. Pancras was conducted by Harry Moule, a relative of the bride's mother. It was witnessed by William Bradbury, confirming

the closeness of the two families.⁴⁶ In response to George Holsworth's assertion, Dickens, in a letter dated 4 September 1860, doubted "whether any blurred vision of that most undesirable female ... ever crossed his [i.e., Henry Bradbury's] drunken mind" (Patten 2004a). Auer had already accused Henry Bradbury in print of being a "dishonest drunk," so it may be true that he had an alcohol problem. However, Dickens' unflattering opinion of both Henry Bradbury and Evans's daughter Margaret must be interpreted in the light of the fact that at that time Dickens was in fierce dispute with Bradbury & Evans and especially with Frederick Mullett Evans.

There are other possible factors that might have contributed to Henry's decision to take his own life even though his security printing venture with Bradbury & Wilkinson was a success. These include allegations of plagiarism (not for the first time, as discussed below) in relation to a method for producing bank notes (Cave 2010), delays in producing advertised new Nature-Printed works, overwork and, if the comments of Dickens and Auer are to be believed, excessive drinking of alcohol. Perhaps the late appearance in June 1860 of the last volumes of the octavo *The Nature-Printed British Ferns* and *The Nature-Printed British Sea-Weeds*, the latter with fewer Nature-Prints than originally intended, and the non-appearance of Lawson's *The Nature-Printed British Mosses* and other advertised works that had been in preparation for two or three years, indicate that Henry Bradbury's ambitions had outstripped the capabilities of the press. Another possibility is that because of the cost of production, Nature-Printing was not commercially sustainable. One of his two publications in the year he died (Bradbury 1860a; see Appendix) was concerned with Nature-Printing and may give some indication of his state of mind at the time, although there is some uncertainty about the date it was published in that year.⁴⁷

He set out to impress with an exposition of the virtues and plaudits of Nature-Printing in a very extravagant way, emphasising the claimed patronage by royalty and other prominent people in Britain and abroad. Was this style of publicity for an expensive publication common practice at the time, or was it understandable conceit about a remarkable process that had been well received by people of the highest social and scientific standing, or a confident launch of the remaining titles in the octavo series, or a desperate attempt to improve sales, driven by fear of commercial failure? Whatever the motivation, there is no evidence that the book (Bradbury 1860a) was produced and circulated in sufficient numbers to have much impact.

Another factor leading to his suicide may have been the indications emerging at the time that photography would become a successful method for illustrating books with accurate representations of plants, even though early attempts were not a success. Early photographic techniques were very labour intensive, not good at producing detailed close-ups, and, unlike Nature-Printing, were not based on existing technology. The cyanotypes used by Anna Atkins to illustrate *Photographs of British Algae* (issued in 12 fascicles from 1843 to 1853 and the first photographically illustrated book, Cave 2010) proved impractical for reproduction in large numbers, and Mrs. Glaisher's attempts to produce a photographic guide to British ferns had foundered by 1856 (Marten 2013).⁴⁸ However, despite, or perhaps because of, such failures, from the mid-1850s there was considerable competition to develop a commercially viable mechanical method of photographic printing (Hume 2011). Bradbury's mentor Pretsch, working in London in the mid-1850s, was developing his method of photographic printing, which he called "photogalvanography" because the final step in producing an intaglio plate involved

electrotyping (Morgan 2009, 2010). He produced his first album of printed photographs in October 1856.⁴⁹ William Henry Fox-Talbot used his method of “photoglyphic engraving,” patented in 1852, by which intaglio printing plates were produced from positive photo prints. An early example is the illustration of a dracaena tree for a paper by Piazzi Smyth in the *Transactions of the Botanical Society of Edinburgh* for March 1859, pages 250–261 (see plate 6 in volume 6, 1860).⁵⁰ Bradbury was aware of these developments; he announced (Bradbury 1860a) that he hoped to include photographs in a special edition of the projected octavo work on British trees. These early photographic methods were complicated, requiring the intervention of a technician, and the reproduced photograph had to be printed separately from the letterpress, like Nature-Prints and most other forms of illustration apart from woodcuts. As a result, they were perhaps not an immediate threat to Nature-Printing, but it was clear that improved methods would rapidly follow. (The “Woodburytype” process appeared in 1865 and was successful until the mid-1890s when it was superseded by the half-tone process for printing photographs and letterpress simultaneously.)

Finally, his ability to overcome these challenges and setbacks may have been compromised by lead poisoning. Lead poisoning was a widely recognised occupational hazard for printers at that time, and Henry would have been exposed to lead if he was closely involved with the printing processes at Bradbury & Evans. He is likely to have had a very practical role when he first returned from Vienna and had not instructed other workers in the methods; he may have continued to be actively involved in the process if considerations of costs restricted the number of Bradbury & Evans workers who could be employed for Nature-Print production. Symptoms of lead poisoning include neurological disturbances

in the form of changes in mood and emotional experience.

Henry Bradbury was buried (in consecrated ground despite his suicide; his death was probably described as “accidental”) in Highgate Cemetery in grave number 10546, in square 28 in the crowded and now overgrown West Cemetery (burial number 21207; Fig. 11a, b). William bought the grave plot three days after Henry’s death. (William’s nephew Orlando Philip Dent had been buried in that Cemetery eight years previously.) Judging by the wording on it, the Bradbury memorial gravestone may have been engraved, or even installed on the plot, after William died in 1869. On one side it commemorates William and his wife, who were later buried in the same plot; on an adjacent side is engraved: “Also of Henry Riley Bradbury died September 1 1860 aged 31 years.” As the lettering style is consistent throughout, it is even possible that reference to Henry was added when his mother died in 1898. Whenever Henry’s name was added, perhaps the person providing the information was mistaken, or perhaps the engraver was provided with the obituary, thus perpetuating the error regarding his age at death. He was in his 31st year but 19 days short of his 31st birthday.

He died without leaving a will. The grant of Letters of Administration dated 19 October 1860 recorded him as a bank note engraver and printer and as a bachelor. His effects were valued at less than £7000 (probably a cut-off figure for calculating fees at a time before Inheritance Tax, and equivalent to about £300,000 now).

At the time of his death, Henry’s address was still given as 12–13 Fetter Lane in the Index of Wills entry dated 19 October 1860, in the grant of Letters of Administration and in a document recording a creditor’s claim against his estate in November 1860 (National Archives document C15/736/B253). H. Bradbury & Co. was still listed at this address in the Post Office



Figure 11. The memorial to Henry Bradbury and his parents at Highgate Cemetery, London, England: (left, a) The inscription for Henry Bradbury is engraved on the side facing the camera but is not highlighted in lead or gilding and is thus inconspicuous in photographs; (right, b) In this view of the right-hand side of the same memorial, the inscription for William and Sarah Bradbury is facing the camera.

London Directory for 1861. I have not traced any further information relating to his death in the correspondence held at the Bodleian Library (Bradbury & Evans 1833–1910), but two letters to Frederick Moule Evans, one dated 4 September 1860, refer indirectly to a sad event without being specific about what had happened.

Henry Bradbury's Nature-Printing career

Henry saw examples of continental printing at the Great Exhibition of 1851 in Hyde Park, London, where, in the Austrian display in the east wing of the Crystal Palace, the Staatsdruckerei under Auer exhibited, amongst other things, a display of the “galvanoplastic” (i.e., involving the galvanic deposition of metal) printing method devised at the works in 1849 to reproduce prints of fossil fishes.⁵¹ This is a form of “nature printing,” a term I shall use to cover all types of printing from the object to be illustrated. Until the 1840s printing processes for illustrating books required the intervention of an artist or engraver, with the attendant risk of inaccuracies. The only

alternative in the case of plants was to include actual specimens, but this approach lacked uniformity and durability. A nature print is durable, reproducible and avoids artistic interpretation.

The Staatsdruckerei display received a lot of attention and the highest award, a Council Medal (Cave and Wakeman 1967). This encouraged Auer to develop the technique further. Bradbury & Evans, who printed an illustrated catalogue of the Exhibition (*The Art Journal Illustrated Catalogue, The Industry of all Nations 1851*) also exhibited in the Crystal Palace, and were awarded a “Prize Medal” for wood engravings and other work (Cave 2010). It was no doubt as a consequence of contacts made at the exhibition that Henry arranged his visit to Vienna for the following year, 1852.⁵² Henry took to Auer letters of recommendation from Thomas de la Rue (deputy chairman of the printing jury for the 1851 exhibition awards), Dr. W. Schwartz from the Austrian Embassy and J. Bagster, a bible printer known to the Staatsdruckerei (Cave 2010). Auer had generously agreed to Henry’s request to study

their printing methods in detail and “to be allowed the opportunity of making myself acquainted, in a practical manner, with a certain process of printing facsimiles of dried flowers,” and to introduce the process into the London establishment. Henry was provided with practical experience of a variety of techniques under the guidance of Paul Pretsch to whom Auer had delegated responsibility for developing the electrotyping procedure at the Staatsdruckerei (Morgan 2009). Bradbury might well have first met Pretsch at the Great Exhibition, where Pretsch was in charge of the Austrian printing section.

Henry was particularly attracted by Auer’s intaglio “Naturselbstdruck” process, translated by Auer (1854) as the “natural self-acting printing-process” and sometimes referred to as the lead plate method. This was first successfully executed in May 1852 by Andrew Worrington, Auer’s overseer at the Staatsdruckerei. Worrington succeeded Pretsch in the “department of galvanoplastics” set up in 1842, and with the specialist staff under his supervision, produced electrotype relief and intaglio plates from imprints of lace in lead instead of in gutta-percha.⁵³ They then produced plates of a wide range of subjects, from agates to angiosperms (flowering plants) and from bat’s wings to snakeskin, and including ferns (Heilmann 1982, 1985; Östlund 2013). Henry introduced the Naturselbstdruck technique, which he later called Nature-Printing, to the Bradbury & Evans printing establishment and for a year or more worked to improve it. Unlike the Staatsdruckerei in Vienna, which had government support for printing publications for all the scientific societies and institutions in the Austro-Hungarian Empire, for Bradbury & Evans, Nature-Printing had to be made a commercial success selling to a wider public.

In applying for a patent Henry claimed significant improvements over the method he had seen in Vienna. Gavin Bridson suggested

that Bradbury had improved the techniques for polishing the surface of the lead plate and thus facilitated the commercial exploitation of the method (Cave, pers. comm., 2003, 2004). Anonymous (1862) reported that Bradbury’s only problem with the technique, a problem that halted progress for a time, was that the lead plates were transversely ribbed. James Wood, of a London firm of printers’ engineers, J. & R. M. Wood, had recently devised a “screw-propeller Stereotype Planing Machine,” which, by a modification of the knife, he was able to make “polish as well as cut” the lead in one operation. Routledge (1876) also recorded that Bradbury had difficulties in eliminating small irregularities in the lead surface until James Wood prepared for him the machine that could both plane and polish the lead.

By December 1853 Bradbury was ready to demonstrate Nature-Prints to the Society of Arts (Harris 1970). In 1854 he produced his first publication, the collection of prints of flowering plants and ferns without text, initially titled *A Few Leaves Represented by “Nature-Printing”* ... (Bradbury 1854), to attract attention and demonstrate the potential of the technique. On 5 March 1855 Henry presented a copy to the Royal Institution (as recorded in volume 2 of their proceedings). By this date Pretsch was back in London, too, and there may well have been further contact between the two men while Henry was preparing his next publication. Later that year he published the 51 Nature-Prints for the folio *The Ferns of Great Britain and Ireland*, issued first in parts (Moore 1855/56) and reissued, probably as a bound volume, in 1857 (Moore 1857).

Bradbury next produced 218 Nature-Prints for the octavo *The Nature-Printed British Sea-Weeds* (Johnstone and Croall 1859/60). They were published in four volumes over a year between June 1859 and June 1860. This preceded, but overlapped with, the publication of 122 Nature-Prints for the octavo *The*

Nature-Printed British Ferns (Moore 1859/60) produced in two volumes, in October 1859 and June 1860, respectively. These were the last Nature-Prints that Henry Bradbury published, although *The Nature-Printed British Ferns* was reissued posthumously in 1863.

On each print in Bradbury (1854) was the statement “Printed in colours by Bradbury & Evans, Patentees, Whitefriars, London” (with “colours” replaced by “colors” in four plates). On all the folio prints in Moore (1855/56) was engraved “Printed by Bradbury and Evans, Whitefriars, London” and “Nature Printing” although the title page stated “Nature-Printed by Henry Bradbury.” On each of the later octavo fern and seaweed prints it simply stated “Nature Printed by Henry Bradbury.” This was perhaps an indication that Henry Bradbury was the driving force behind the adoption by his father’s firm of the Nature-Printing process and that by the late 1850s he was beginning to strike out on his own.

As described in some detail by Bradbury in a small book titled *Autotypography, or, Art of Nature-Printing* (Bradbury 1860a),⁵⁴ further publications in what he called the “Octavo Series of English Nature-Printed Works” were announced. The full list of titles, none of which included the word “English,” follows.

“I. The Nature-Printed British Sea-Weeds.”

This was already being published.

“II. The Octavo [sic] Nature-Printed British Ferns.”

This was also in production but “Octavo” was not included in the title when published.

“III. The Nature-Printed Trees of Great Britain, Native and Exotic. By Professor Lindley. Illustrated by Figures of their Leaves” (Fig. 12).

This was “intended to illustrate and describe the arboricultural riches of Great Britain, and to facilitate the acquirement of a knowledge of the trees themselves, by accurate Nature-Prints of their leaves.” It was to include only broad-leaf trees (i.e., all trees, except conifers,

able to “bear perfectly the climate of Great Britain”) and only leaves, not flowers or fruits. It was intended for the country gentleman rather than the “systematical naturalist.” John Lindley was to provide the text. No indication of length or number of Nature-Printed plates was given though Bradbury explained why Nature-Printing was particularly successful at reproducing leaves. Having remarked that any form of hand illustration produced a more or less inexact picture, he stated that

when plants are compelled to produce their own image without the possibility of omission or addition, that doubt is dispelled and the reader knows that the representation before him is beyond the reach of question. The beautiful art of Nature-Printing, or Autotypography as it may be termed, accomplishes this purpose. It produces with unerring fidelity the outline, the veins, the very surface of flat bodies like leaves—in short, every peculiarity by which trees are known from each other. It is incapable indeed of representing their flowers and fruits; but this is of little moment considering how seldom such parts are practically consulted and how accurately they are capable of being described.

The final comment indicated that Bradbury had a limited understanding of plant taxonomy.

There was also a statement that: “it is expected that the work now announced will appear in the course of the ensuing spring” (this appears to refer to spring 1861 but as at least some of the text was written in the latter half of 1859, this could refer to 1860). Bradbury also stated: “It is contemplated, if practicable, to publish a special edition, containing photographic representations of some of the most remarkable trees.” Perhaps cooperation with Pretsch was planned. The existence of a surviving copper electrotype plate of tree leaves⁵⁵ might suggest that some progress had been made with the preparation of the Nature-Prints for this work, although it is possible that this was a plate made during a demonstration of the process. The plate

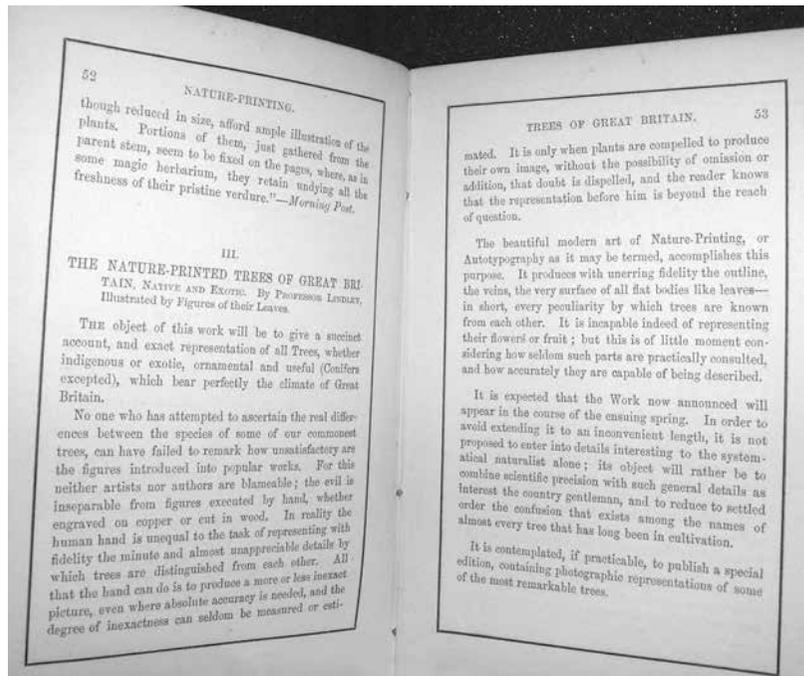


Figure 12. The announcement in *Autotypography* (Bradbury 1860a) of the proposed publication on “Trees of Great Britain, Native and Exotic.” Courtesy of Edinburgh Napier University Library.

showed five leaves, representing at least two, possibly five, different species. Their identity cannot be accurately determined, but they resemble *Salix* (willow and sallow) species. As early as 1857 Bradbury had voiced his intention to produce “a book of leaves with photographic portraits of the trees.” His only published Nature-Prints of trees were the plate of *Tilia europea*, the common lime tree, in Bradbury (1854; plate 14 on his list) and the plate of an unidentified leaf accompanying the text of his 1855 lecture in the Royal Institution’s proceedings (Bradbury 1855a).

“IV. The Nature-Printed Exotic Ferns: being Figures and Descriptions of Ferns, principally Exotic. The descriptions by Thomas Moore, F.L.S.” (Fig. 13).

Bradbury stated that “the plates will be produced by the inimitable art of Nature-Printing, and will be printed in a neutral tint. . . . It is also intended that sufficient engraved analyses of the parts of the fructification shall, where necessary, be added.” It was planned

to provide illustrations of rarer or unknown species or varieties of foreign ferns, and clubmosses were to be included. Foreign specimens would be used as well as specimens grown in gardens. The use of a single colour (“neutral tint”) would simplify production. The figures would resemble herbarium specimens more than living plants.

“V. The Nature-Printed British Mosses. The descriptions by George Lawson, Ph.D.” (see Fig. 13).

Planning of this work was clearly quite well advanced. “The Work, which will be uniform in size and plan with ‘*The Nature-Printed British Sea-Weeds*’ and ‘*The Octavo Nature-Printed British Ferns*,’ will contain 30 plates representing about 200 Species and Varieties; in addition to which, figures showing the characters of the Genera will be given. The letter-press will form about 300 pages.” The proposed text would include full descriptions of the British species and an introduction to their structure, development, reproduction,

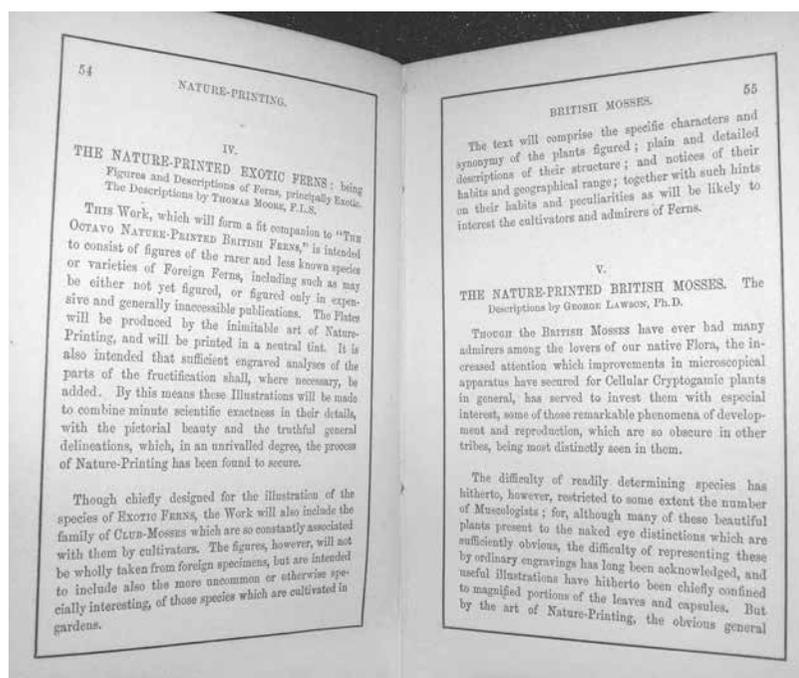


Figure 13. The announcement in *Autotypography* (Bradbury 1860a) of the proposed publications on “Exotic Ferns” and “British Mosses.” Courtesy of Edinburgh Napier University Library.

geographical distribution, ecology, uses, and peat forming, and the management of a Bryarium. Lawson exhibited moss Nature-Prints to the Botanical Society of Edinburgh in December 1857, an indication that preparation was well underway by that date. However, Lawson moved to Canada in 1858, and this may have contributed to the eventual failure to publish.⁵⁶

“VI. The Nature-Printed British Lichens. The descriptions by W. Lauder Lindsay M.D.” (Fig. 14).

According to Bradbury (1860a),

The want which has long been felt of a modern manual of the British Lichens, and the facility with which a considerable portion of them can be represented by Nature-Printing process, has led to the projection of this work, on which Dr. Lindsay has been for some time engaged. . . . The illustrations will consist of Nature-Prints of such species as admit of this mode of illustration, and engravings of the types of such genera as cannot be so printed. The spores and spermatia will be figured.

The text was to have included their economic value and “application in medicine and the arts.” It was to be primarily aimed at those with a scientific interest in lichens, but it would also be “full of interest to the general student of Natural History and to the economist.” While Lindsay appears to have made some progress with writing the text, no evidence has been found that any Nature-Prints were made.⁵⁷

“VII. The Nature-Printed British Grasses and Forage Plants” (Fig. 15).

To quote Bradbury (1860a), “The great importance of the Grasses in an economical point of view, and the interest attaching to the correct discrimination of those of them especially which are used as fodder and for garden purposes, will give a high value to lifelike representations of the plants which it is the purpose of the present Work to place before the public.” It was expected that this would be of use and interest to country residents in general and agriculturalists and horticulturists in particular, as well as attractive to the general

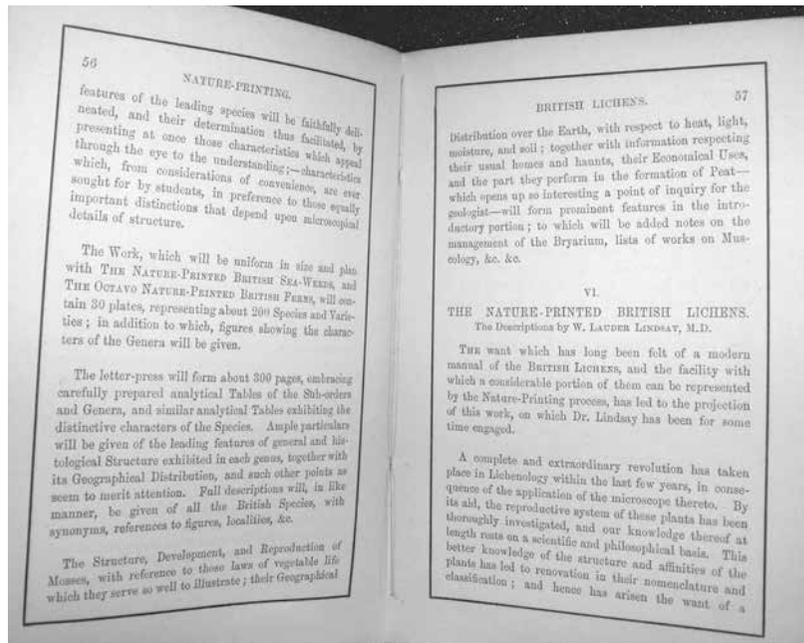


Figure 14. The announcement in *Autotypography* (Bradbury 1860a) of the proposed publication on “British Lichens.” Courtesy of Edinburgh Napier University Library.

reader. The descriptions were intended to provide the aid needed for “the uninitiated” to identify them. There is no information about a prospective author.

“VIII. The Nature-Printed British Weeds and Wild Flowers” (Fig. 15).

Despite his comments, a few pages earlier in Bradbury (1860a), that the technique was incapable of representing flowers of tree species, in volume 8 of the series, Bradbury planned to return to making Nature-Prints of flowers for the first time since he produced “A Few Prints . . .” (Bradbury 1854). As advertised in Bradbury (1860a),

The object of this volume is to represent the Indigenous Flora of Great Britain, by means of Nature-Prints of the more typical plants, with the view of popularising the study of Botany through the agency of our Wild Flowers, many of which admit of having their most important features represented with great fidelity by this remarkable process. The groups of Useful Plants, Poisonous Plants, Weeds etc. will receive especial attention; and the descriptions will be made as plain and instructive as possible.

Again, there are no indications as to who was going to write the text.

“IX. The Nature-Printed British Hepaticae: Comprising the Liverworts and Scale Mosses” (Fig. 16).

Bradbury (1860a) stated, “Like the Lichens, this department of British Botany is much in need of illustration; and the publishers are happy to announce that arrangements have been opened with Dr Carrington of Yeadon to prepare a work descriptive of the entire family and illustrated with Nature-Prints of such species as are suitable for Nature-Printing.”⁵⁸

It is not known how Bradbury found authors or whether authors approached him. All the actual or projected authors except Johnstone had established reputations as published authorities in their respective areas. The list of collaborators is an indication that Bradbury had established contact with many of the leading botanists of the time. Moore and Lindley were prominent in the London botanical community, and Lindley had been a friend of William Bradbury for many years.

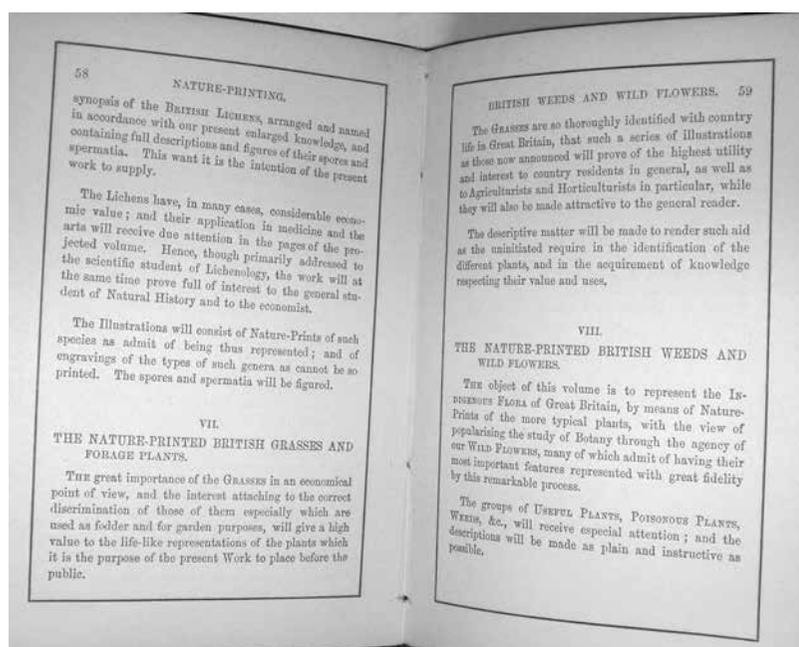


Figure 15. The announcement in *Autotypography* (Bradbury 1860a) of the proposed publications on “British Grasses and Forage Plants” and “British Weeds and Wild Flowers.” Courtesy of Edinburgh Napier University Library.

Croall, though Scottish, had links with Hooker at Kew. Johnstone was also Scottish but moved to London and was a friend of Moore and his wife from late 1856 or early 1857, though whether Bradbury introduced him to Moore or *vice versa* is unknown. Croall, Carrington, Lauder Lindsay and Lawson all had connections with the Royal Botanic Garden Edinburgh. Carrington and Lauder Lindsay studied medicine at the University of Edinburgh and, as with all medical students until 1957, took a course in botany at the University of Edinburgh Botany Department, at that time located at the botanic garden. Perhaps contact between Hooker at Kew and Balfour at Edinburgh completed the link that connected all these authors. Several were fellows of the Linnaean Society, and this would have provided additional possibilities of contact.

When his booklet (Bradbury 1860a) was being prepared, probably in early 1860, Bradbury wrote in a very positive way about future projects and at the time of his

death must have been actively working on *The Nature-Printed Trees of Great Britain* if publication was, as advertised, planned for the following spring. The copperplate with a raised impression of five tree leaves, if not a demonstration plate, seems to confirm that production had begun on this project before Henry died. In a letter dated 3 April 1857 and published in the *Journal of the Society of Arts* on 10 April 1857 as a slightly tetchy response to Christopher Dresser’s claim in a lecture on 25 March 1857 to the society that he had produced a “new system of nature printing” (Dresser 1857), Bradbury (1857b) wrote, “... already are prepared for publication *The Exotic Ferns*, *The British Mosses*, *The British Sea-Weeds* and *The British Lichens*.” The extent to which this statement is true is not clear. If true, by 1857 there must have been produced copperplates, and perhaps some prints, of exotic ferns, British lichens and British mosses as well as the seaweeds, which were published about two years later. A Nature-Print of an unidentified seaweed was published in 1855

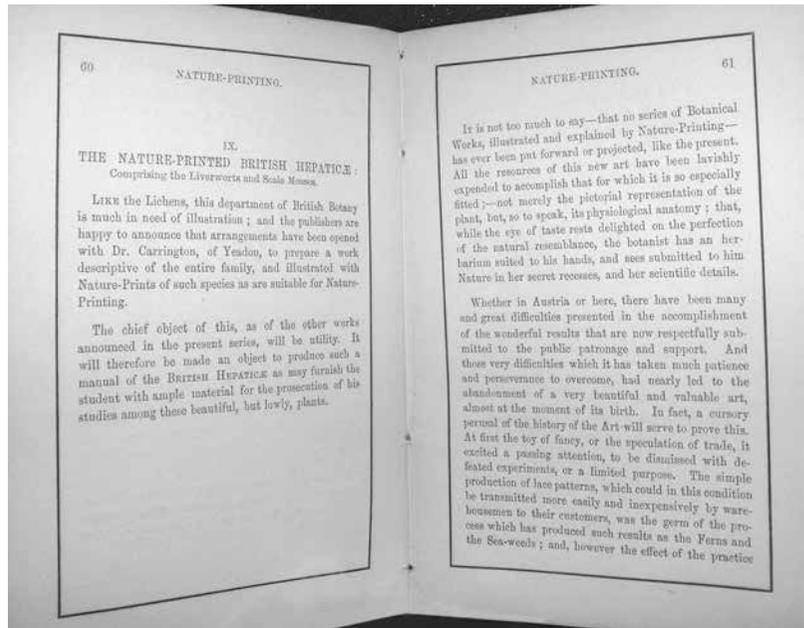


Figure 16. The announcement in *Autotypography* (Bradbury 1860a) of the proposed publication on “British Hepaticae.” Courtesy of Edinburgh Napier University Library.

(Bradbury 1855a) and several Nature-Prints of seaweeds were exhibited to a meeting of the Botanical Society of Edinburgh in March 1858. At about the same time, a single seaweed Nature-Print was issued in a pamphlet advertising *The Nature-Printed British Sea-Weeds*. No Bradbury Nature-Prints of lichens or exotic ferns, and no references to them, are known. However, he must have made considerable progress with preparations for *The Nature-Printed British Mosses* because Dr. Lawson, who was to have provided the text, exhibited a series of Bradbury’s moss Nature-Prints to the Botanical Society of Edinburgh as early as December 1857. Bradbury had published a Nature-Print of unidentified mosses as early as 1855 (Bradbury 1855a).

No new Nature-Prints were published by Bradbury & Evans or anyone else in Britain after Henry Bradbury died in 1860, and no prints from any of Bradbury’s projected works are known. The octavo *The Nature-Printed British Ferns* was reissued in 1863, two years before William retired, but there are

no published Bradbury Nature-Prints with a later date.

Henry Bradbury’s dispute with Auer

Almost as much has been written, both at the time and more recently, about Henry Bradbury’s dispute with Alois Auer as about their Nature-Printing method itself. The dispute was prolonged, personal and public, and, because both were printers and publishers, they could easily state their case, and even reproduce their letters, in print. This may have provided publications and useful publicity for the Bradbury process, but it did not enhance the reputation of either protagonist.

It is difficult at the distance of more than 150 years to achieve a balanced view of the dispute. Similar rivalries were probably not uncommon at a time when technological developments fuelled the industrial revolution, but perhaps they were seldom conducted so publicly. In this case there is no contemporary independent assessment; most of the available information is provided by Auer and Henry Bradbury in

their published statements, which are unlikely to be entirely objective. I have not attempted to locate any records there may be in archives in Vienna. Bradbury's forceful response to Auer's indignation, and his energetic publicity for his process, convinced, at least initially, the interested British public that his actions were justifiable. Most recent accounts have been much more disapproving of Bradbury and more sympathetic towards Auer's claims. Bradbury is now usually portrayed as the villain of the piece, taking advantage of Auer's generosity by ignoring the agreement between them, exploiting the technique commercially and making false claims for his own role in developing the method. Cave (2010) discussed the Auer/Bradbury dispute comprehensively and made strong claims for Bradbury's culpability, even accusing him of "theft of the nature printing process" and "industrial espionage." This is perhaps an overstatement because no subterfuge was employed by Bradbury in gaining access to the printing processes in Vienna, and Bradbury had "always acknowledged his debt to Auer" (Harris 1970) and dedicated his 1855 lecture to him (Bradbury 1856a). However, if Auer is to be believed, Bradbury did try to bribe a foreman to give him additional specimens and was subsequently forbidden access to the Staatsdruckerei.

The essence of the dispute was that Auer considered that Henry Bradbury had taken advantage of Auer's generosity in allowing him to learn, and use, his *Naturselbstdruck* method, by patenting a method very similar to Auer's, and that he had failed to give due recognition to Auer's role in inventing the technique. Bradbury's defence was that his patented method was a significant improvement over Auer's, that Auer's method was merely a stage in the stepwise improvement of a technique traceable back to an invention by Branson in England, and that Auer was overstating his

personal involvement by failing to give due credit to other workers in Vienna.

Regarding the patent issue, Auer gave permission for Henry to introduce the process to Bradbury & Evans for botanical works on condition that Henry did not "monopolise" the method but allowed others to learn from him (Cave and Wakeman 1967). In April 1853, the same month in which he gave a lecture on the development of the method (Auer 1854), Auer had cancelled the Austrian patent, which he had taken out for his method on 12 October 1852 in the name of Worring (Harris 1970), in order to make the *Naturselbstdruck* technique widely accessible. However, Henry Bradbury, on behalf of Bradbury & Evans, communicated a patent application in May 1853 (see Fig. 7), almost immediately after his return from Vienna. Although not described in the patent application, perhaps it was the method of preparing the lead plates that Henry Bradbury saw as the improvement with which he justified his application. Whether or not this was so, Stannard (1860), perhaps influenced by Bradbury's own accounts (Bradbury 1855a, b, 1856a) and maybe by the donation by Bradbury of *Nature-Prints* to include in his book, was convinced that Bradbury had achieved a real improvement and stated "The process, for the introduction of which into this country Messrs Bradbury and Evans have taken out a patent, is in many particulars a material improvement upon Mr Branson's invention, as well as upon that in use at Vienna." On the other hand, Hooker (1855) considered that the Bradbury *Nature-Prints* of the first two fascicles of *The Ferns of Great Britain and Ireland* of 1855 were as good but no better than the excellent *Naturselbstdruck* prints in Heufler's *Florae Cryptogammae* of 1853, while Harris (1970) was of the opinion that the best *Nature-Prints* produced by Bradbury, who himself carried out or supervised the whole process in an ordinary printing works, still did not reach the standard

achieved by Auer, who employed highly skilled specialists for each step. The fact that Bradbury had initial problems is perhaps an indication that he had not seen how the lead plates were prepared for taking the plant impression during his visit to Vienna. At the Staatsdruckerei they must have already overcome the problem of “ribbing,” and thus Auer would not have seen Bradbury’s method as an improvement but simply as a straight copy.

Bradbury informed Auer by letter in December 1853 that he had applied for a patent. Whether Bradbury genuinely convinced himself that he had “improved” the technique, as stated in the title, and had not broken his agreement with Auer or was devious in claiming an improvement in order to control use of the technique in Britain, Auer was annoyed that Bradbury had not acknowledged him in his application (Auer 1854; Cave and Wakeman 1967). Bradbury aggravated matters further, first by stating at the end of the application that “... we would have it understood that what we claim are the combined means herein described of taking impressions, and producing printing surfaces; and we claim the employment of lead for obtaining impressions and for receiving electro depositions of copper” and then by supporting his application with prints made from a plate given to him by Auer in Vienna (Auer 1854; Harris 1970). According to an extract from the *Wiener Zeitung* for 18 December 1853, quoted in Auer (1854), Bradbury, having been given a lead plate with an impression “and the galvanic copper-plate as a keepsake, leaves Vienna, changes the name of ‘Naturselbstdruck’ into ‘Phytoglyphy’ and secures a patent for it.” Bradbury also took much of the material for his 1855 lecture to the Royal Institution from Auer (1854; actually, according to Cave 2010, from a paper by Ritter von Perger first printed in February 1853 and reprinted within Auer’s article) without acknowledging the source.

Nor is there any evidence that Bradbury made the method available to others under licence. Bradbury initially defended himself against Auer’s published criticisms (Auer 1854) by attacking him (Bradbury 1855a, 1855b), although later, perhaps sensing that he was losing public support, his public statements mellowed. Even in the 1856 “as delivered” version of his 1855 lecture (Bradbury 1856a), the modifications included, as well as some minor corrections and insertions, an amelioration of some comments critical of Auer and the addition of a dedication to Auer: “To Alois Auer, Director of the Imperial Court and Government Printing Office at Vienna etc. etc. In memory of his sojourn at Vienna and studies in the establishment over which he presides, this Monograph on the Art of Nature Printing is dedicated by Henry Bradbury.” This version was also published in German, perhaps to make it more accessible to an Austrian readership. In his letter of 3 April 1857 to the Society of Arts (Bradbury 1857b), Bradbury praised “results already effected by the Austrian mode. For the short time that the process has been in operation, they are somewhat remarkable. Austria has produced three practical results—Henfler’s [*sic*] mosses, Ettinghausen and Pokoring’s [*sic*] Flora of Austria, and Frauenfeld’s Seaweeds, ...” though he avoided mention of Auer by name. In his 1858 lecture to the Royal Institution, Bradbury, referring to the Imperial Printing Office in Vienna, stated “Under new direction, it has more than flourished, and attained a wonderful efficiency. It is not merely a great, a National printing-office; it is for ever doing and devising some novelty and some wonder in every branch of scientific printing. Its organisation is perfect.” Whether these were genuine attempts by Bradbury to demonstrate a change of heart by publicly acknowledging Auer’s achievements or a cynical tactic to repair his own reputation is difficult to know.

However, it is tempting to conclude that five years earlier Bradbury, perhaps driven by the need to make nature printing a commercial success for Bradbury & Evans because they lacked the state backing available to Auer, was at best naïve, brash and inconsiderate when publicising his achievements, and, at worst, dishonest, exploitative and guilty of sharp-practice in his attempts to succeed with the process in Britain.

There is less sympathy for Auer's claim of priority for the invention of the process and his indignation at Bradbury's failure to recognise it. In his 1855 lecture (Bradbury 1855a), Bradbury acknowledged that Peter Kyhl pioneered the process whereby an impression could be obtained of fabrics, feathers or carefully-prepared dried leaves by placing them between a steel plate and a smooth lead plate and then running the plates through a rolling press. He credited Branson with the introduction of electrotype copies into the nature printing process and Haidinger with the idea of applying the technique to plants. Bradbury also stated that Worrying in Vienna made a major contribution to the development of Nature-Printing when, in order to reproduce lace patterns in 1852, he first combined a method for obtaining impressions in lead with improved techniques of the electrotype copying previously applied to nature printing by Branson.⁵⁹ Bradbury recognised that the first practical application of the technique for illustrating a botanical publication was von Heufler's imperial folio volume of 1853 on the mosses of the Arpasch valley (*Specimen florae Cryptogamae vallis Arpasch carpatae Transilvani*). According to Bradbury, the second such application, and the first produced in Britain, was the imperial folio *The Ferns of Great Britain and Ireland*, for which he was preparing plates at the time of his lecture.⁶⁰ However, Bradbury made no claims of invention for himself. As reported

in the Royal Institution account of his 1855 lecture (Bradbury 1855a), "Mr. Bradbury hoped to show that he did not put forward personally any claim either to its origin or its first application." In a later privately published version of the lecture (Bradbury 1856a) this statement was omitted, but, in a rewritten introduction, he wrote,

Those who may be sufficiently interested in the subject to peruse the facts contained in the present treatise, will readily understand that it would be a misapplication of the term, to style Nature-Printing an invention. Difficult as it is at all times to dignify a scientific application with this term, it would in the present situation be especially egotistical for any single person to arrogate to himself the merit of having *discovered* that which is the simple result of extension and adaptation.

(The wording is almost identical in Bradbury 1855b.) Harris (1970) commented, "Bradbury himself was the only English nature-printer who never claimed its invention."

In an atmosphere of international squabbling between scientists over credit for inventing different processes relating to photographic printing and allied techniques (Morgan 2009, 2010), some well-developed but sensitive egos were involved. By the end of 1853 Auer was defending his claim of invention of nature-printing against several competing claims from Denmark and England (Harris 1970) even though Westmacott (in Wallis 1863) suggested that Auer knew of Kyhl's work. At the same time, according to Bradbury in a strong criticism of Auer's claims (Bradbury 1855b, 1856a), Auer failed to give Pretsch due credit for developing in Vienna the electrotyping technique that was intrinsic to the *Naturselbstdruck* process and claimed credit for himself. Stannard (1860) commented that Auer "... has in a pamphlet which he has published, printed at his own office in different languages, and circulated over Europe, claimed for himself a far larger share in this

interesting process than he merits.” Stannard further pointed out,

The fact is, that as far as Austria is concerned, the invention was first brought into use by M. Worrung [*sic*] in 1852, with which M. Auer afterwards associated himself. But to neither of these two claimants is due the originality of the invention; for in the year 1851 in March, Mr. Ferguson Branson not only read before the members of the Society of Arts a report of the process, identically the same as that claimed by the Austrian patentees, but even produced printed specimens to illustrate more fully the true meaning of his invention.

While it is not strictly true that Branson’s method was “identically the same,” this statement reinforces Bradbury’s view that Nature-Printing was, if anything, an English invention. It is also worth noting that the Austrian Commission to the 1851 Exhibition stayed on in England until late 1851 or early 1852 and visited Birmingham (Wallis 1863). It seems likely that they met Sturges and/or Aitken and saw the impressions they had obtained in Britannia metal under pressure. The first *Naturselbstdruck* prints were printed after the commission had returned to Vienna.

There is one other claim which if it could be substantiated would establish that a nature printing technique indistinguishable in its essential features from that employed by Bradbury and Auer was first successfully developed in England more than a decade earlier than Bradbury and Auer produced their first prints. According to William Dicks, in a letter written in 1863 to the *Journal of Arts* (vol. 11, p. 453), his friend Edward Palmer⁶¹ of Newgate, London, in “about 1840” obtained impressions of hardened lace and of dried leaves by placing them between a thin plate of lead and a plate of steel, and then passing the plates “through a strong copper plate press.” From a lead impression he made an “electrotype reverse” from which in turn he made a second electrotype plate, an intaglio,

similar to the original lead impression. This “could be worked either at copper-plate or letter-press; from the former giving the effect of black lace on a white back ground and from the latter the effect of white lace on a dark back ground . . .” A Palmer print obtained from the intaglio plate by the copper-plate method of printing would have been essentially the same as an Auer *Naturselbstdruck* or a Bradbury Nature-Print, except that no colours were used. If any Palmer prints have survived, they have not been identified, but there is no reason to doubt Dicks’ account.⁶² Palmer’s advertisements and publications reveal that he was a gifted chemist and engineer with the knowledge and equipment to make electrotype copies of copper engravings before 1840. There is no mention of nature prints, but he must have had access to a copper-plate press in order to produce the prints that he advertised, and he probably had the skills to use it to produce impressions in lead. Dicks, who according to Harris (1970) was a colour printer with an established reputation whose opinion must carry some weight, stated: “My belief has never been that the gentlemen of the Austrian press were inventors of ‘nature printing,’” and “Mr Palmer, the inventor of glyphography, certainly practised the nature-printing process, and that long before its publication in Austria.” Dicks claimed that the Austrians were aware of Palmer’s work, or at least of some of his other inventions such as glyphography and electrotint. It is not known whether Palmer was known to the Bradburys, but it is not impossible.⁶³

It thus appears that several people were experimenting with a variety of techniques, but the staff at the *Staatsdruckerei* could claim to be the first to have the knowledge and facilities to make their *Naturselbstdruck* method successful on a large commercial scale.

Bradbury’s last published statement on the matter was included in his book *Autotypography*

(Bradbury 1860a). He stated,

We come finally to the Austrian claim, which has been paraded with great pretensions, and defended with remarkable pertinacity. In 1852, it appears, certain impressions of lace were taken on metal plates by means of rollers, in the Imperial Printing Office at Vienna. These experiments Councillor Auer owns to have originated in specimens which had been received from London. A patent, however, was taken out in Austria, in the name of Andrew Worrying, overseer of the office, but accompanied by a declaration, signed by Worrying, that he had solved the problem of obtaining matrices for galvanic (electrotype) multiplication from originals, as fossil fish &c., only in consequence of Councillor Auer's exclusive instruction, and that he, Worrying, had obtained the patent only according to the expressed wish of the councillor. Notwithstanding this declaration, the facts appear to be that he, Worrying, after seeing the English specimens, tried gutta-percha, as Dr. Branson did, and found it fail, and then employed, as Peter Kyhl had done before him, soft lead plates. This, however, may fairly have been a pure re-invention of Worrying's and for this he was rewarded by the Emperor. At this juncture, Professor Haidinger, Director of the Austrian Geological Survey, proposed the application of the lace process to plants. To both these important developments in the Art of Nature-Printing as we now possess it Councillor Auer lays personal claim, as appears from his published pamphlet. And in doing so he substitutes fallacies for facts. "Whenever an invention," he says, "is made anywhere, one must be prepared for reports circulated soon after, and stating that the very thing has been derived so many years ago." This is always a suspicious line of argument; but whether re-invented or not, or how far Austria has a right to the merit through the exertions of Worrying and Professor Haidinger, it is certain that the process in its essential features was discovered and employed many years before (Bradbury 1860a, pp. 13–14).

This is followed by an account extracted from the *English Cyclopaedia* compiled by Charles Knight:

Everything that emanates from the Vienna Printing Office, being a Government

establishment, comes out under the auspices of the director, and therefore the first specimens which appeared bore the name of Auer. It was attempted to introduce these specimens into England as a mercantile transaction; but after a provisional patent had been taken out, the scheme was abandoned. It was again attempted to procure attention to them, by inserting them as illustrations in a pamphlet, and for this purpose they were presented to some literary and scientific institutions. The pamphlet, as a history of the new art, was comparatively of little worth. Its object was to assert, with more violence than argument, that the secret of the process has been surreptitiously obtained for this country. Mr. Henry Bradbury was a student at the Imperial Printing Office of Vienna at the time of the alleged discovery. Of course, the mysteries and manipulations of its different departments were communicated to him in such capacity, and he judged, as many of the greatest benefactors of industry have thought before him, that he had every right to make use of his knowledge and skill for the benefit of his own country. No guarantee to the contrary could be exacted, so none could be given (Bradbury 1860a, pp. 14–15).

While it is not surprising that Bradbury chose to include a quotation from an apparently independent review that supported his actions, the fact that Bradbury & Evans published the *Cyclopaedia* and Charles Knight was a friend of the Evans family raises questions regarding its objectivity.

The truth is, as Bradbury acknowledged, that both Bradbury and Auer were building on the achievements of others before them and neither "invented" the process. As Henry Bradbury's friend, John Leighton, stated (in Wallis 1863), Nature-Printing had gone through many phases before reaching maturity. In Vienna, Auer, Worrying and Pretsch made a major contribution to the improvement of pre-existing methods; it is less clear to what extent Bradbury further developed the process. However, his presentations and publications on Nature-Printing received such publicity that they dominated subsequent accounts, at least in Britain. They may even have led to the

abandonment of several other processes, such as the photographs of ferns by Mrs. Glaisher (Cave 2010), because although Bradbury claimed that his technique had developed by adaptation of the achievements of earlier workers, he was very dismissive of subsequent developments by others, such as Dresser (1857).

Bradbury's Nature-Printing method

Nature-Printing—a definition

Although in his short career Henry Bradbury was interested in a variety of printing techniques and applications, he is most widely known for his Nature-Prints. The term “Nature-Printing” in its different forms (“nature printing,” “Nature Printing”) has been variously applied in the past. In this article I use the form “Nature-Printing” favoured by Bradbury, after he abandoned the term “Phytoglyphy” and before he used “Autotypography,” and follow his definition:

The name given to a technical process for obtaining printed reproductions of plants and other objects upon paper. The distinguishing features of the process are—first, the power to impress certain plants, such as ferns, mosses, seaweeds, wild flowers, and similar natural objects, into plates of metal, causing, as it were, the objects to engrave themselves; and second, the method of taking casts or copies of the impressed plates to be printed from at the ordinary copper-plate press (Bradbury 1860a).

“Autotypography” was also used by Wallis (1863) to refer to a different process devised by him to copy a drawing or engraving onto a metal plate for reproduction.

Nature-Prints as thus defined are, therefore, prints made *indirectly* from an object by first taking an impression and then from that impression producing a copy, which can be used as a plate from which a large number of prints can be made. In most cases, an intaglio plate is used; more rarely, and not

by Bradbury, a plate with the image in relief is employed using letter-press printing. This process distinguishes Nature-Prints, and prints by other indirect methods involving prepared plates, from direct nature prints or “Ectypa,” which are prints made *directly* from an object by the simpler method of inking the surface of the object and pressing it onto paper, as in a finger-print (Cave 2010). Both are covered by the general term “nature printing.”

Bradbury's definition would embrace the very similar *Naturselbstdruck* technique developed a few years previously at the Staatsdruckerei in Vienna. This technique was subsequently employed to illustrate books, or at least tested, by printers in Leipzig (Kretzschmar [e.g., Rossmässer 1855]); Nürnberg (von Bibra, [e.g., von Bibra 1855]); Stuttgart (Niederbühl [e.g., Reuss 1869]); Berlin (Wagner); Prague (von Tempsky); Saint Petersburg; Trento, then still in the Austro-Hungarian Empire, (Perini [e.g., Perini and Perini, 1854–1865]); Paris (Paul Masson); Amsterdam and Haarlem (Joh. Enschedé en Zonen); and possibly other European cities (Fischer 1933; Cave 2010). According to Bradbury (1860a), Victor Masson returned to Paris accompanied by Andrew Worrington with the intention of setting up an establishment for the publication of scientific works, but “it is certain that the art has not been presented in France with any favourable results.”

Falling outside Bradbury's definition would be Kyhl's intaglio prints of the early 1830s, taken directly from impressions in metal, together with the nature prints being produced by Branson in Sheffield, and by Sturges and Aitken in Birmingham, by the methods described in the following paragraphs (Wallis 1863; Cave and Wakeman 1967; Harris 1970; Cave 2010).

Peter L. Kyhl, a Danish engraver, described his method in an unpublished manuscript dated 1 May 1833. The following translated

extract was quoted in Art (1857):

To fix an impression into a plate of copper, zinc, tin, or lead, properly prepared for the purpose, a rolling machine, with two polished cylinders of steel, is required; if a leaf quite dried and prepared be placed between a polished steel plate half an inch thick and a thoroughly heated leaden plate with a fine surface, and these two plates, with the leaf between, be run speedily between the cylinders, the leaf will, by the pressure, stamp its form on the softer leaden plate, precisely in its shape, with all its naturally raised and sunken parts.

(A different translation and more complete version was provided in Cave 2010.) Kyhl toughened the plant material, after initially partially drying it, by moistening it and drying it again four or five times. The impression on lead plates was near-perfect, but, in the absence of electrotyping, few prints could be taken from the plate because of the softness of the lead, which lost its polished surface after only a few ink applications. It has been stated that Kyhl died (in 1833 according to Wallis [1863] but in 1847 according to *Dansk Biografisk Lexikon*) before he could develop the method further, and the process was, as a result, a commercial failure and perhaps unknown or soon forgotten outside Copenhagen. However, Pia Östlund (pers. comm., 2011) located some very good prints and a typeset advertisement, dated 1834 and signed by Kyhl, inviting subscriptions for nature prints. Westmacott (in Wallis 1863) was of the opinion that it was likely that Kyhl's work was known to the Staatsdruckerei. Kyhl also experimented with softening and hardening metals, including silver, gold and iron as well as those listed above, to take the initial image and to transfer it to another plate. There is probably more to be discovered about the method he developed and the reasons why he did not take it further.

Ferguson Branson was the first to try several combinations of impressions taken in gutta-

percha, lead or Britannia metal (a pewter-like alloy of tin with small amounts of antimony and copper) with direct printing, electrotyping or lithography.⁶⁴ His first prints were obtained in about 1846. The method that he described in December 1850, in a paper to the Sheffield Literary and Philosophical Society, which was published the following year (Branson 1851a) and then described again in a fuller version in March 1851 in a paper to the Society of Arts (Branson 1851b), involved making a copper electrotype copy of a plant impression taken in gutta-percha after coating the gutta-percha impression with bronze powder. Branson later copied the gutta-percha impression more cheaply by means of brass castings. Five prints of ferns, two dated 1846, are at Sheffield Museum and can be viewed by appointment. There is a Branson nature print of fern fronds, dated 1850 in pencil in the border outside the plate mark, in the Wellcome Library, London. It shows an *Adiantum* sp., another fern (?*Asplenium* sp.) and a *Selaginella* sp. and can be viewed online (<http://images.wellcome.ac.uk/indexplus/image/V0043929.html>). It is also reproduced in Cave (2010, fig. 12.4). The print, heavily embossed on very thick paper, is of inferior quality. The thick green ink obscures fine detail, and there is spotting and smudging of ink on the background. These are characteristics of impressions taken initially in gutta-percha.

On 2 February 1854 (reported in the 32nd annual report of the society in 1855), Branson demonstrated to the Sheffield Literary and Philosophical Society nature prints that he had made by a new method in which an impression of the dry plant specimen was taken under pressure between two highly polished plates of Britannia metal, and then this impression was transferred to a lithographic stone.⁶⁵ However, there is no record that he employed intaglio printing from electrotype copies of impressions taken initially in metal, and

he never established his electrotype method as a commercial process, perhaps because he described it as “troublesome and costly” when comparing it with his preferred method involving lithography.

Richard Ford Sturges (of R. F. Sturges & Co. Ltd., a Birmingham manufacturer of electro-silver-plate, nickel-silver and Britannia metal wares) in August 1851 experimented with lace placed between two sheets of metal under pressure. Among the metals tried were gold, silver, copper, iron, tin, lead and some alloys including nickel silver, brass and Britannia metal. An impression was obtained in the metal plates when they were passed between rollers under pressure, and the plates were then used directly to make prints. According to Wallis (1863), who knew him and received a lace print from him, Sturges had no knowledge of Kyhl’s work. He patented the process on 24 January 1852 (patent no. 13,914).

William Costen Aitken, author of a book recounting the history of brass, was involved in the preparation of the application for Sturges’ patent, and he then brought it into operation in the Cambridge Street Works of R. W. Winfield & Son, Birmingham. Shortly afterwards, in the spring of 1852, he was himself using a similar method to experiment with making plates of a leaf skeleton. One plate, together with a print from it, was given to Wallis (1863). Again this was achieved without knowledge of Kyhl’s work and independently of the methods being developed in Vienna. By December 1852 he had devised a rapid technique using leaves and feathers, which involved printing directly from an original impression taken in polished Britannia metal. In February 1854 he described the method to the Society of Arts in a paper, which was later published (Aitken 1854). In a public demonstration in 1857 high-quality prints were produced in less than three minutes (Cave 2010). The metal was soft enough to take an imprint under pressure but

hard enough to use as a printing surface for at least 170 prints. This was fewer than could be made from a copperplate, but 170 prints would be enough for some nature-printed publications. Furthermore, because his method did not involve electrotyping and was thus cheaper and much quicker, Aitken saw this as an improvement on the “printing at third hand” being used in Vienna despite the fact that Britannia metal tended to leave marks on the paper. His method was publicised in various articles (including Aitken 1854; Lauder Lindsay 1854) in response to Auer’s claim that a new intaglio method of nature printing had been invented in Vienna. He sent examples of his nature prints to the Society of Arts and other bodies in London, including museums, and to the Society of Scottish Gardeners. However, perhaps because the publication of Nature-Prints (as *Naturselbstdruck* prints) in Vienna was already established, no Aitken prints were issued in book form, either alone or as illustrations to a text. Five of his nature prints in one or two colours, including three of ferns dated 1854–1856, are in the possession of Birmingham City Libraries (accession no. 434457).

Intrinsic characteristics of Bradbury Nature-Prints

Even Bradbury acknowledged that “Valuable as are the results of Nature-Printing, it still has its defects; it has its limits and its applications are limited” (Bradbury 1855a, b, 1856a). Perhaps the most obvious limitation inherent in, and peculiar to, all nature printing processes is the inability to reduce or enlarge the image. Another shortcoming of Bradbury’s Nature-Printing method, and other lead-plate methods, is that the specimen is effectively two-dimensional as a result of the pressure applied during the process. This distorts any three-dimensional structures; as with normal herbarium specimens, complicated flowering-plant inflorescences with flower

stems at different angles, and even individual flowers, are flattened into one plane, and fleshy structures may appear wider than they really are. Even Bradbury (1860a) admitted, when writing about his projected publication on British trees: “It [i.e., Nature-Printing] is incapable indeed of representing their flowers and fruits.” These inadequacies can be largely avoided by the judicious choice of material to be featured. Robust and essentially two-dimensional objects, or hard surfaces, with a maximum size of one-half to three-quarters of that of the intended published page, are the best for Nature-Printing. The two-dimensional fronds of ferns, most of which are thick enough to leave an impression but are relatively little distorted by pressing, are particularly well suited to this technique. Bradbury stated in his lecture to the Royal Institution that

Ferns, by their peculiar structure and general flatness, are especially adapted to develop [sic] the capabilities of the process, and there is no race of plants where minute accuracy of delineation is of more vital importance than the Ferns; in the distinction of which, the form of indentations, general outline, the exact manner in which the repeated subdivision is effected, and most especially the distribution of veins scarcely visible to the naked eye, play the most important part (Bradbury 1855a).⁶⁶

Another conspicuous feature of some Bradbury and *Naturselbstdruck* Nature-Prints is that even the most succulent and leathery of leaves, fronds and stems can appear unnaturally ethereal with translucent laminas and pronounced darker veins (Fig. 17). This is because Nature-Printing does not record the surface but more the compressibility and thus reveals aspects of the internal structure. The veins, consisting of small cells with thickened walls, resist compression while the large-celled tissues between the veins collapse on desiccation into a thin flat sheet. This unnatural appearance was both criticised

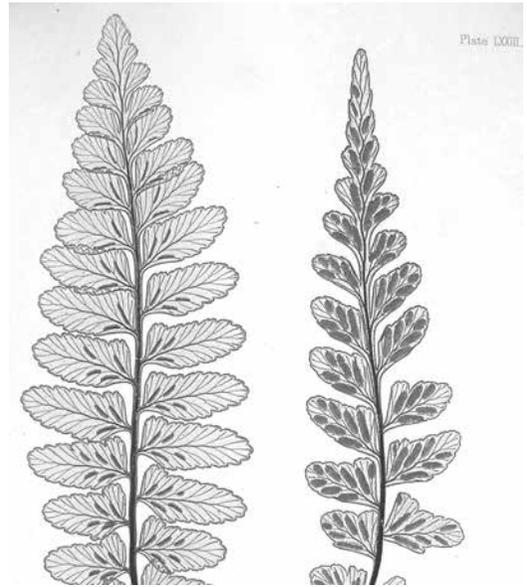


Figure 17. Detail of *Asplenium marinum*, plate LXXIII from the octavo ferns, an example of “ethereal” leaves.

as an undesirable imperfection and exploited as a unique merit. It was recognised as an imperfection in reviews of *The Ferns of Great Britain and Ireland* (Moore 1855/56) as soon as the first fascicle was issued. William J. Hooker wrote in a review, which covered the first two fascicles,

As the art is a new one, and no doubt capable of improvement, we may be permitted to say that the depth of surface-green on the fronds is insufficient, so that they have too much the character of what are usually called skeleton leaves; the nervation is of too prominent a character, and the parenchyma wants substance; the green of it is of the same filmy nature as seen in some of the more delicate hymenophylloid Ferns (Hooker 1855).

However, for authors such as von Ettinghausen, who compared leaf skeletons with fossil leaves, the prominent venation of *Naturselbstdruck* prints produced in Vienna was seen as an asset, and he stipulated that single-colour (brown) relief prints should be used for his books, including *Die Blatt-Skelete der Dikotyledon* (1861). Details of venation can be of taxonomic

significance also in ferns. The prominence of the veins and the translucence of the laminas varied from imprint to imprint of the same plate, perhaps due to differences in the application of ink. Nature-Prints of flowering-plant petals without prominent veins, such as those of primrose, plate 35 in Bradbury (1854), appear even more transparent.

A further limitation of the technique is that surface texture, including surface hairs and other details, is rarely visible. As a consequence, a print in the United States of a non-British fern (*Coniogramme* sp.) made by a similar technique was criticised because the prints had insufficient detail of the sori (groups of sporangia) to allow the identification to species from the print (Bridson and Wendel 1986).⁶⁷ Moreover, there are sometimes imprecisions and inconsistencies in the inking of details in Bradbury Nature-Prints where these details are a different colour from the background, such as brown ripe sori on a green frond. In some plates within the same frond some sori are brown while others are green, like the frond. In other plates the colour of the sori has spread over the surrounding tissue. Thus, for scientific purposes, Nature-Prints can rarely replace herbarium specimens or, in some respects, even good drawings.

Finally, there is the matter of colours. With most Bradbury Nature-Prints, and early *Naturselbstdruck* prints produced in Vienna, there is an attempt to reproduce the natural colours of the live plant. For reasons discussed in more detail later, the final colouring is not always entirely realistic. Also, the use of a single ink for the main structure in each plate, whether leaf, frond lamina or seaweed thallus, and the use of no more than three coloured inks in total per plate, produces an unnatural uniformity of colour. Most of the later works from Vienna abandoned the attempt and employed a single pigment, often brown on white, which resulted in a print that

simulated a herbarium specimen, or white on black. Bradbury also produced a few early prints in “herbarium colour,” for example marsh cudweed, plate 12, and common filago, plate 23 (Fig. 18), in Bradbury (1854). The resemblance to a herbarium sheet may have been intentional; the dimensions of the plate mark in these two plates are 425×270 mm and 425×260 mm respectively, very close to the size of a standard herbarium sheet at Kew Herbarium, 420×260 mm. (Herbarium sheet dimensions are not standardised nationally or internationally; those in the Natural History Museum, London and Royal Botanic Garden Edinburgh (RBGE) and in the United States all still differ from each other and from those at Kew.) Most of the other, naturally coloured, Nature-Prints in Bradbury (1854) are larger, as are those in Moore (1855/56).

Nevertheless, despite all these limitations, Nature-Prints produced in this way are an exact record of the gross morphology of the dry pressed specimen, and, when well coloured and well printed, the image on the paper can be extraordinarily like the original. This likeness is due in no small part to the fact that the image is embossed, giving a three-dimensional form that can be felt as well as seen. This quality, the “tactility” as it has been called, contributes significantly to the unique impact of Nature-Prints and is perhaps their defining feature. This can make it hard to believe that the image has been made by a printing process and is not a real specimen. In this way, a Nature-Print is a foretaste of 3-D printing, which followed more than 150 years later. This tactility is of course absent from lithographic nature prints and is lost when Nature-Prints are reproduced photographically for publications, such as in this article, or online. To appreciate Nature-Prints fully, the originals must be seen. Many prints show details of outlines, venation, marginal hairs and, in some seaweeds, details of cellular structure, with remarkable

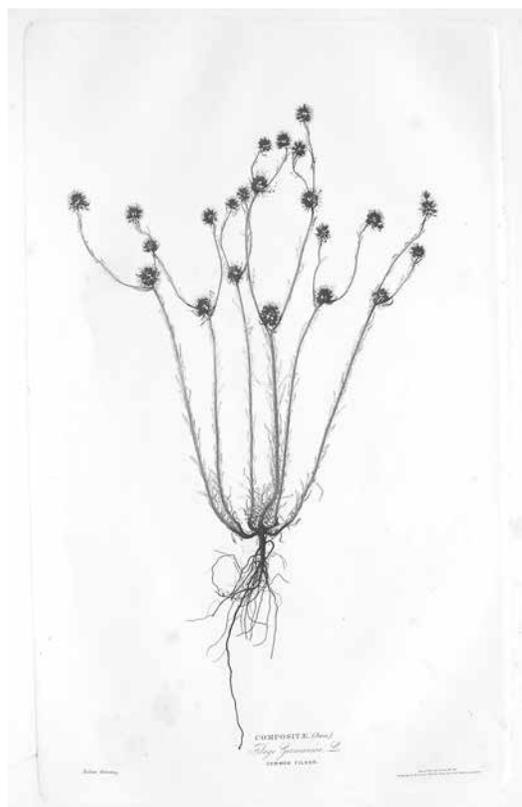


Figure 18. *Left*, Common filago, plate 23 in Bradbury (1854). This is printed in brown and resembles a herbarium specimen.

Figure 19. *Right*, Detail of a Nature-Print, plate CVIII from octavo seaweeds. The dots around the rim of the 5 pence coin are 0.5 millimetres apart. The finest filaments on the print are less than 100 micrometres in width.

accuracy. Algal filaments as narrow as 100 micrometres are precisely recorded, and between the filaments, areas as small as 1 millimetre square or less are entirely free of ink. This provides the ultimate demonstration of the blemish-free quality of the burnished lead plate surface and the skill with which excess ink is removed from that surface before each impression is printed (Fig. 19). Several eminent European botanists, including von Ettinghausen, Pokorny and Heufler, chose to make use of the *Naturselbstdruck* process in Vienna to illustrate their floras, revealing that they considered that the process was of real value. Bradbury's prints, representing the peak of nature printing in Britain, were adopted by several leading British botanists, including Moore, Croall, Lindley and Lauder Lindsay, for books published or planned during the 1850s.

Now valued mostly for their aesthetic merits and historical interest, in the 1850s Bradbury Nature-Prints were competing with other methods of illustrating botanical texts at a time of rapid technological innovation. They had the advantage of authenticity and detailed accuracy over all but the very best hand-drawn illustrations by artists and could be printed in greater numbers than *ectypa*, but they were labour-intensive, expensive and slow to produce and thus expensive to buy. The four volumes of *The Nature Printed British Sea-Weeds* cost 8 guineas (£8.8s) equivalent today to almost £400. (In 1860, 8 guineas was approximately the cost of one year's rent for a 4-room terrace house with running water and a privy, according to the Web site *Census Helper*, <http://www.census-helper.co.uk/victorian-life/>.) Few could afford Bradbury's

Nature-Prints. It has been suggested that the *Naturselbstdruck* process in Vienna was never able to meet its costs with income from sales (Cave 2010), and perhaps Nature-Printing was not able to do so in London either. However, whereas the state-owned Imperial Printing Office provided the resources for Auer to serve the needs of the scientific community, Bradbury had to make Nature-Printing a commercial success or at least cover its costs. Cheaper and quicker lithographic methods of reproducing nature prints were becoming available, and methods for using photographs in printing presses were being developed.⁶⁸ Perhaps for this reason, when Henry Bradbury died in 1860, no one in Britain continued the production of Nature-Prints, although elsewhere books and papers illustrated by the *Naturselbstdruck* process were produced for a few years after this date. The *Staatsdruckerei* in Vienna published several, including *Die Blatt-Skelete der Dikotyledon* (by C. F. von Ettinghausen in 1861); *Neu-Holland in Europa* (by F. Unger, published in 1861); *Plantae Lignosae Imperii Austriaci* (by A. Pokorny, published in 1864); *Die Farnkrauter des Jetzwelld* (by von Ettinghausen, published in 1865); and a new issue of *Physiotypia Plantarum Austriacarum* (again by von Ettinghausen and Pokorny, published in 1873). In Stuttgart, *Pflanzenblätter in Naturdruck mit der botanischen Kunstsprache für die Blattform* by G. C. Reuss was published by E. Koch in 1869. In Trento, *Flora dell' Italia settentrionale e del Tirolo meridionale rappresentata colla fisiotipia* was produced by C. and A. Perini and published by *Typographia Perini* until 1865. However, in most of these later works, plates were printed in a single colour, usually brown, and sometimes relief plates (where the plant image is raised above the plate and printed by the letter-press method) were used instead of the more expensive intaglio plates printed by the copper-plate method. In *Pflanzenblätter in Naturdruck*... (available to

view on the ETH-Bibliothek Zurich Web site), 42 folio plates each portray individual leaves of several species as nature prints similar to those of von Ettinghausen with clear venation but in a single shade of green. In the *Flora dell' Italia*..., the plates were nature printed in black and then hand-coloured in watercolour (Östlund 2013). Where only leaves were portrayed to illustrate patterns of venation, a single-colour relief print was entirely adequate and considerably cheaper. The second issue of *Physiotypia Plantarum Austriacarum* was the last book from the *Staatsdruckerei* that was illustrated by the *Naturselbstdruck* process although *Naturselbstdruck* illustrations appeared in new scientific articles for another 20 years or so. Some *Naturselbstdruck* prints by the *Staatsdruckerei* remained unsold, perhaps because they were expensive, until comparatively recently (Cave 2012).

The Nature-Printing method as described in published accounts

Bradbury's Nature-Printing technique is described inadequately or inaccurately in many of the brief accounts that accompany references to the plates (e.g., Barnes 1991; Elliott 1993; Rauh 1998). The main features of Bradbury's process as patented are given by Bradbury (1856a), Dresser (1857), Routledge (1876), Cave and Wakeman (1967), Harris (1970), Wakeman (1966, 1984) and Cave (2010). There are no additional details in Bradbury (1860a). According to Heilmann (1988), Bradbury also published *On Nature Printing* in London in 1858, but this may be a typographical error in referring to the Royal Institution's proceedings report of his lecture (Bradbury 1855a) under this title. Several important details are rarely explained, even in the patent application; a few are still a matter of speculation. These details may have been omitted in order to protect the Bradbury monopoly, or perhaps because at the time they would have been aspects of printing

and electrotyping that were self-evident to the printing trade. The following account has been assembled from descriptions in all available sources.

Nature-Printing as practised by Bradbury is a form of intaglio copper-plate printing, i.e., the ink lies in the recesses of the plate and is transferred to soft paper under pressure, thus creating a raised image on the paper and a recessed plate mark. The first step in Bradbury's process for ferns and flowering plants was to dry the plant specimen by carefully arranging the material between folds of blotting paper before pressing it in a screw-press. This would have been done by the collector soon after picking to avoid wilting of the specimen. Some collectors took more care than others when arranging the specimens prior to pressing, and aesthetic considerations as well as scientific requirements might determine the way the plants are presented. The paper was changed several times, and if necessary the drying was accelerated by gentle heating.⁶⁹ This process is easy to envisage for a fern frond or flowering plant specimen, but delicate seaweed specimens will have presented additional challenges. At the back of volume 4 of *The Nature-Printed British Sea-Weeds*, Johnstone and Croall (1859/60) described in detail the complex procedure they followed to prepare well-presented dry specimens of algae mounted on stout paper for herbarium storage. The process differed from that used for the more robust ferns and flowering plants mainly in that (i) the specimen was arranged on stout paper by placing both in water, with the spread-out specimen above the paper, and then carefully lifting the paper so that the specimen was stranded on it as it emerged; (ii) the drying specimen was separated from the blotting paper placed above it by thin muslin; and (iii) pressure was applied by weights, not a screw-press. The implication of their account is that the dried algal specimen remains

attached firmly to the paper as a herbarium specimen and that these mounted specimens could be used for taking the impression in lead for Nature-Print production, but this is not explicitly stated. If the specimen was left on its paper sheet, it is possible that the paper would leave an impression of the paper on the lead around the specimen, and this impression would have to be removed by burnishing. If the specimen was lifted from the paper to which it had adhered during drying, and then transferred to the polished lead sheet, there must be a risk of damaging, or at least disturbing the arrangement of, the delicate filaments of finely divided algae. However, Pia Östlund (pers. comm., 2011) has found by experiment that successful transfer of the specimen from paper to lead is possible.

The thoroughly dried specimen, however prepared, was carefully laid on a 2–3-millimetre-thick sheet of soft lead, which had been made completely mirror-smooth by planing and polishing.⁷⁰ Early problems with preparing the surface of the lead were overcome when James Wood prepared a machine that could plane and polish the lead in one operation (Routledge 1876). The specimen was then covered by a sheet of polished steel, and both sheets were passed, under pressure, between two polished steel rollers in a rolling press (also called a copper-plate press). (According to the description in the patent application, the lead and steel sheets were also passed through the rolling press *before* the specimen was placed between them, so that the lead surface “is rendered very even.”) It may have been necessary to adjust the distance between the rollers according to the thickness of the sheets used in order to avoid spreading the lead. An indented impression of the plant was then created in the lead sheet. Östlund (2013) stated that the plant specimen was easily removed from the lead impression after pressing, but according to Bridson and

Wendel (1986), the specimen usually remained embedded in the impression after pressing but sometimes sprang free if the plate was heated to cause it to expand. Brittle or tender specimens were damaged beyond recovery. Any pieces of brittle material left embedded in the lead were destroyed by careful use of a blowpipe flame, taking care not to melt the lead. This lead impression could not be used directly as a printing plate for more than five or ten times; after that, it was impossible to retain the initial polished surface or, therefore, to clean it thoroughly (Bradbury 1855a).⁷¹ Because the lead plate deteriorates if used for printing, a copy in copper (an electrotype plate) was made from the lead impression by electrolytic deposition. The back and sides of the lead plate were first varnished so that only the face of the plate with the impression remained conductive. The plate was then used as one electrode (cathode) in a solution of copper sulphate,⁷² with a copper rod as the other electrode (anode). Large (e.g., folio) lead plates are difficult to handle and are likely to bend when putting them vertically into the electrotyping bath unless backed with wood. Copper was deposited on the unvarnished face when an electric current was passed through the solution. Bradbury stated that this deposited copper was stronger than “normal” copper, and this has been confirmed recently (Östlund 2013). The resulting copperplate was thin (the only surviving example is 0.5 mm thick though Östlund has suggested that it might be a plate made during a demonstration of the technique) and showed the plant impression in relief. A photograph of such a plate from the Staatsdruckerei was shown in Östlund (2013). In the Bradbury method, separation was effected by gentle warming, but Östlund (2013) reported that, when she reconstructed the method, it was difficult to remove the copperplate from the lead impression without bending or distorting the

lead plate. The relief copperplate then becomes the new matrix in storage. According to the Bradbury & Evans patent application, the flat surfaces of this copperplate around the raised image were then burnished. From this plate, another electrotype plate was made in order to once more obtain an impression depressed below the surface of the plate, like the original lead impression but this time in copper. To do this, the face of the plate was brushed over with “fine, pure blacklead” according to Routledge (1876), or oil, or silver or beeswax (Östlund 2013) in order to prevent the new deposit becoming incorporated with the first copperplate.⁷³ In the electrotyping solution of copper sulphate, the copper is deposited on the blackleaded face until it forms a layer about one-eighth of an inch thick (3 mm), considerably thicker than the first (relief) plate (Routledge 1876; Morgan 2010). Auer’s copperplates were about two millimetres (Östlund 2013) or three–four millimetres (Heilmann, pers. comm.) thick. Östlund (2013) stated that such a plate takes about two days to form. Large (folio) copperplates will have been expensive to produce.

This intaglio copper electrotype plate could then be burnished around the impression to obtain a smooth surface free of imperfections. Once reinforced by attachment to a 10-millimetre-thick lead plate, the copperplate could then be used as an intaglio printing plate. Inks were applied to plates *a la poupée*, that is, worked into the indented surface of the plate by hand with a cotton daub or “dolly” (French “poupée”). Warming the plate before inking aided the process (Östlund 2013).

Surprisingly, nothing was said about the inks used, even though it has been said that the ink was the “most important material in the printed job” (Wiborg 1926) and the availability of appropriate colours was especially important in the production of lifelike Nature-Prints. Perhaps this was an indication that there was

nothing remarkable for the time in the choice and source of inks. Information about printing inks in the mid-19th century (Wiborg 1926; Bloy 1967) provide the basis for conjecture. It seems likely that Bradbury & Evans produced their own inks as and when needed, using traditional pigments and dyes with boiled linseed oil as the medium, mixing different inks to produce intermediate colours.⁷⁴

When two or more different coloured inks were used on the same plate, they were all added to appropriate parts of the plate before the flat surface of the plate was wiped clean. According to Östlund (2013), who has reconstructed the method,

The excess ink is then wiped away from the plate, starting with a rougher cloth and then a finer, but taking care to not wipe away the ink from the recesses. The plate is worked circularly and finishing off with the palm (side) of the hand and printers chalk to make certain that the background is clean of any ink residue. For this to be done successfully, the plate needs to have a sufficient space around the image, in order to let the hand slide across the surface. Care is also needed so as to not leave lines or wipemarks on the image-area.

Cleaning is difficult when the image comes close to the edge of the plate.

After inking, the plate was placed face-up on the bed of the copper-plate press. Prints were made on soft, thick, unsized, machine-made paper with a single “pull.” The paper was probably made damp first, by pre-soaking and then partially drying, although neither Bradbury nor Auer mentioned this; dampening the paper was standard practice for intaglio printing. A sheet of paper was laid on the inked plate and covered by four or five layers of blanket before all were passed between two rollers under heavy pressure. In this way was produced the embossed appearance of the print that helped to make the print so lifelike, with the image in high relief and indentations on the verso. At the same time the plate left a “plate-

mark,” as in Bradbury (1854). The absence of a plate mark in Bradbury’s later published *Nature-Prints* reveals that either the plate was larger than the paper used, or the plate mark was removed by trimming.

As in all intaglio printing at that time, this method required the plate to be re-inked by hand for every copy of the print. (In the late 20th century automatic inking and cleaning by machine was available to firms like Bradbury, Wilkinson & Co.) Although each print required only one “pull” of the press even when several colours were used, the re-inking made the printing slow and laborious. There is no more detailed account of the inking method employed than that written by Bradbury (1855a; repeated in 1855b and 1856a with one word “colour” replaced by “tint”):

where there are three, four or more colours, for instance, as in flowering plants, having stems, roots, leaves, and flowers—the plan adopted in the inking of the plate is to apply the darkest colour first, which generally happens to be the roots—the superfluous colour is cleaned off,—the next darkest colour such as perhaps the colour of the stems, is then applied—the superfluous colour of which is also cleaned off;—this mode is continued until every part of the plant has received its right colour. In this state, before the plate is printed, the colours in the different parts of the copper look as if the plant was imbedded in the copper. It is claimed that, by putting in the darkest colour at the beginning, there is less chance of smearing the lighter ones; the printer too is not only able by this means to blend one colour into another, but to print all the colours at one single impression.

Thus at any particular part of the image, only one ink has been applied.

According to Wakeman (1966), a quicker inking technique was introduced by 1859 for the octavo *The Nature-Printed British Ferns*, where most individual plates have more colours than those of the seaweeds. No details were given, but Wakeman implied that after the first ink was applied to the right parts,

each subsequent ink was placed, without prior cleaning, on top of parts of the image that had been already inked as well as on the other appropriate areas for that colour; the final ink covered all the image, after which surrounding areas of the plate were cleaned of unwanted ink. In this way, the fully prepared plate must have resembled the plant less than after the earlier method and been more or less uniform in colour. This uniform final layer of ink was next to the paper after printing. The ink that showed in the printed impression was the one that was first applied to any particular part of the image. The evidence for this is that some prints have chips where one colour of ink has come away revealing another colour beneath, instead of the white paper as would be expected if Bradbury's original inking method had been used.

Inking was even quicker, simpler and cheaper when a single colour was used, usually brown. Although this was frequently employed in later works from the Staatsdruckerei, the only prints of this type that Bradbury published were in Bradbury (1854; e.g., Fig. 18), although he intended to use them throughout the proposed book of Nature-Printed Exotic Ferns, announced in 1860.

The lead impressions could be stored, though not without problems—they bend if not stored flat and horizontal and impress each other if stacked one upon another (Pia Östlund, pers. comm., 2011). Moreover, according to Heilmann (pers. comm., 2003), a floor of the Imperial Printing House at the Staatsdruckerei collapsed under the weight of stored lead plates. However, Östlund pointed out that even if the lead plates survived separation from the relief copperplate without damage or distortion, it is not clear why it should be necessary to store them. The relief copperplates can act as new “mother plates” from which to produce intaglio plates as required and are lighter and easier to store.

Perhaps the plates causing the floor collapse in Vienna were final intaglio plates, which had been backed with type metal, perhaps one centimetre thick. Although the copperplates could be kept indefinitely, it appears that they sometimes had a limited printing life. Intaglio printing, including the cleaning of the plates between each pull, does cause some wear on copperplates,⁷⁵ and it was common practice in intaglio printing generally to use engravers to restore lost details. In his lecture to the Royal Institution on the manufacture of bank notes (Bradbury 1856b, c), Bradbury commented that since the discovery of the electrotype, “the average number of impressions rarely reached 500—the electro-copper, too, spread from the pressure of the printing-press” although he also claimed that the increased hardness of deposited copper when printing specimen bank notes had made it possible to print “an average of 1600 perfect impressions.” Peter Heilmann (pers. comm., 2003) is of the opinion, based in part on his experience of producing more than 500 prints from a single copperplate that he made by the Auer/Bradbury process, that the electrotype plates could be used many times without loss of print quality.

*Further aspects of the Nature-Printing method
as indicated by detailed examination of
Bradbury prints*

i. Obtaining plant material

A detailed consideration (Dyer 2004) of the 39 plants portrayed in Bradbury (1854) failed to reveal any obvious explanation for the choice of 5 ferns and 34 flowering plants. No one has suggested that Bradbury had any botanical expertise, and the plants are likely to have been supplied by a botanist, not least because some are unlikely to have been easily found in London. In the subsequent publications (Moore 1855/56; Johnstone and Croall 1859/60; Moore 1859/60) it can safely be assumed that the authors supplied Bradbury

with the material used to make the Nature-Prints. The authors in turn relied on other field collectors for some of the specimens. Bradbury stated in respect of the octavo *The Nature-Printed British Ferns* (Bradbury 1860a):

The account of the varieties embraces some very interesting novelties, which have been kindly donated for publication by their discoverers." He continued: "We have only further, in this place, to perform the grateful task of tendering our thanks, generally, to those who have kindly assisted us with materials both for description and illustration. In particular, our account of the many varieties of some of the species could not have been so complete without this assistance. We trust that the friendly intercourse now for many years held with the majority of our most enthusiastic Fern-gatherers may yet long continue.

Bradbury described a method for drying plant specimens, so perhaps sometimes he was provided with live material, but it seems likely that he was also provided with already-pressed herbarium specimens. This is certainly true for the seaweeds.

ii. Preparing impressions

I have made detailed comparisons of eight different copies of the first issue of the folio volume *The Ferns of Great Britain and Ireland* (Moore 1855/56) and three copies of the 1857 reissue (Moore 1857). These comparisons reveal that four plates (II, III, VI and VIII), exist in two different versions, demonstrating that, for whatever reason, an entirely new plate depicting different specimens of the same varieties had been prepared before the print run was complete (e.g., Figs. 20, 21). Fischer (1933) mentioned that different versions of plates III and VI exist, but otherwise this feature has received no attention. The eight examined 1855/56 copies included six different combinations of alternative plates for II, III, VI and VIII (one combination of these four plates was found in three copies), but all three copies

of the 1857 reissue had the same combination as each other, a combination not yet found in the first issue. One "rogue" copy (British Library 1259.d.30, stamped "British Museum") has both versions of plate II, no plate III and two identical copies of the same version of plate IV. While the loss of plate III could have been an error during the modern rebinding, the other errors must have occurred when the parts were issued, and this reveals that both versions of plate II were available, at least as prints, simultaneously. It seems reasonable to assume that the version of each of the four plates included in all the 1857 issues was the later version (i.e., "version ii"; e.g., Fig. 21), the alternative plates in some volumes of the first issue being the earlier version (i.e., "version i"; e.g., Fig. 20). If this small sample of 11 copies is characteristic of the whole print run, it suggests that both the lead plates and the electrotype copies for four of the plates in the first 3 parts issued (in mid-1855) either failed or were accidentally damaged, although no more than one replacement lead impression using a different specimen was required. Perhaps there was a technical problem early in the production that was later overcome.

Another intriguing feature is that, in a survey of 8 copies, including both 1855/56 and 1857 issues, of *The Ferns of Great Britain and Ireland*, 47 of the 51 plates (all but plates I, II, VIII and XX) have one or more asterisks after the plate number in at least one of the copies examined. No plate has an asterisk in every copy examined. In each copy, between 16 and 25 plates have at least one asterisk. Usually there is only a single asterisk, but one instance of two asterisks and one of four asterisks have been recorded. I have seen no previous reference to these asterisks apart from a brief mention in Fischer (1933). There are no asterisks beside the plate number when it is referred to in the accompanying text. There are no asterisks beside any of the plate numbers in the octavo *The Nature-Printed British Sea-*

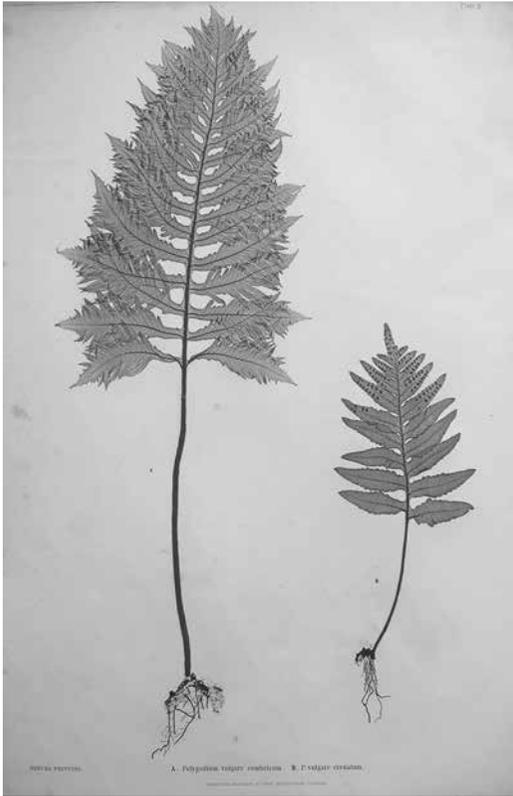


Figure 20. Plate III version (i) from folio ferns (Moore 1855/56).

Weeds (Johnstone and Croall 1859/60) or *The Nature-Printed British Ferns* (Moore 1859/60). One possible explanation of the asterisks is that the quality of the final copperplates varied according to who made them and to such variables as the temperature and concentration of the copper sulphate solution, so that two or three of the best ones for each specimen have to be selected and marked accordingly with one or more asterisks (Heilmann, pers. comm., 2003). Another suggestion is that some plates had to be replaced by other electrotype copies of the same original lead impression before the end of the print run, the replacement copperplates being indicated with asterisks. It is worth noting that Auer had earlier stated (1854) that: “If a great number of copies is required, which the lead form on account



Figure 21. Plate III version (ii) from folio ferns (Moore 1855/56).

of its softness is not capable of furnishing, it is stereotyped, in case of being printed at a typographical press, or galvanised, in case of being worked at a copper-plate press, *as many times as necessary*, and the impressions are taken from the stereotyped or galvanised plate instead of from the lead plate” (my italics). This explanation might refer to being galvanised once for relief plates or twice for intaglio plates, or alternatively imply, notwithstanding the earlier comments about the numbers of impressions that can be obtained from a copperplate, that for the folio *The Ferns of Great Britain and Ireland* at least the copperplates did deteriorate with use and had to be replaced. One possible explanation of copperplates deteriorating before producing the expected number of prints is the use of acid inks that

attack the copper. Another factor may be their large size, leading to damage in handling.

In *The Ferns of Great Britain and Ireland* (Moore 1855/56), there are also differences in the “crispness” of the image between different plates and even between the same plate in different copies. In some the details have lost definition. This could also be due to wear or spreading of the copperplate, the deterioration not being considered severe enough to warrant replacement. Alternatively, Heilmann (pers. comm., 2003) and Cave (pers. comm., 2004) suggested that the differences in “crispness” between prints arose during the complex hand-inking and printing process. Pia Östlund (pers. comm., 2011) found that differences in the dampness of the paper can affect the result. Cave pointed out that during the later 1850s Bradbury was experimenting with facing the copperplates with other metals in order to improve the printing of bank notes and suggested that Bradbury might have been experimenting with the Nature-Prints, too, thus causing some of the variation in print quality. There are no consistent discernible differences in print quality between the 1859/60 and the 1863 editions of *The Nature-Printed British Ferns*, even though it is likely that the octavo prints were produced in larger numbers than the folio prints.

Whatever the explanations, variations such as these between prints apparently apply mainly if not entirely to the “folio ferns” (Moore 1855/56). Perhaps the replacement and the touching up of copperplates observed in that volume were made necessary by early technical production problems, which were overcome in the four years before the publication of Johnstone and Croall (1859/60) and Moore (1859/60).

iii. Reuse of images

Comparison of plates in *The Ferns of Great Britain and Ireland* (Moore 1855/56) and *The*

Nature-Printed British Ferns (Moore 1859/60) reveals that some images used in the folio volume were reused in the later octavo publication. Ten instances involving five folio plates, six octavo plates, and seven species have been identified (1855/56 plate number first): XXXVIII G/LXXIII bis A; XXXVIII H/LXXIII bis B; XXXIX F/LXXVI bis C; XXXIX H/LXXVI bis D; XLI A5/LXXIX D; XLI A7/LXXIX B; XLI A8/LXXIX C; XLI B2/LXXX A; XLIII A4/XCIII B; and LI B3/CXIII B. In each case the image of a single frond from a composite folio plate of several fronds has been incorporated into a composite octavo plate. All the fronds are small, and all are of rare varieties or hybrids. In two cases the lower part of the stipe (stem) of the frond had been removed in order to fit it into the octavo plate.

This observation prompts questions about the method of producing the intaglio copperplates, but in the absence of any surviving plates, only speculation is possible. Perhaps the most probable interpretation is that, for folio plates with several images, an impression of all the specimens was taken at the same time on a single lead plate, and from this a copper relief plate was made. An intaglio copy of this, or perhaps several copies in order to accelerate production, was used to print the plates, while another intaglio copy was cut up to provide images for the later octavo work. This would mean that the new octavo plate would also have to be cut so that the image from the folio plate could be incorporated. A skilled metal worker could then unite these separate parts and burnish the joins so that they left no trace. Alternatively, it is possible that this “cut and paste” process was done at the previous copper relief stage, probably using a second copy from the lead impression rather than by sacrificing the relief plate used as a template for the folio production. This would allow burnishing at both the relief and intaglio

plate stage to ensure that all traces of the joins had been removed.

These ten images were reused probably because new specimens of these rare ferns were difficult to obtain. Because it is not possible to examine any of Bradbury's plates, we cannot know whether plates were assembled in this way only when rare images were reused or whether these examples revealed a more routine practice in the production of plates with several images. It is known that similar reuse and reassembly was employed at the Staatsdruckerei in Vienna (Östlund, pers. comm., 2015).

iv. Inking

Some of the prints in Bradbury (1854) show smears and spots of ink on the background where the plate was not properly cleaned before printing, perhaps because the surface was irregular. The extraneous ink is particularly clear on several prints in the British Library set (e.g., plates 2, 5, 16, 26 and 31). The Nature-Prints published subsequently are cleaner and in most cases entirely free of extraneous ink marks; perhaps the technique for preparing the surface of the lead sheet was improved before the folio fern prints for *The Ferns of Great Britain and Ireland* (Moore 1855/56) were produced.

The colours are not always precisely lifelike, and not always exactly the same in different impressions of the same plate, and this is true of early Auer prints as well as Bradbury's Nature-Prints. Moreover, the colour may not be an accurate representation of the live plant. The unnatural colour is particularly obvious in my copy of Bradbury (1854) in some of the flowers, such as the hedge woundwort (pl. 6; Fig. 22), tuberous bitter vetch (pl. 10) and rosebay willow-herb (pl. 27). In each case the flowers are too blue. Some of the red seaweeds in Johnstone and Croall (1859/60) may also be the wrong shade. Several factors may have

contributed to this. There may have been a limited range of colours of printing inks available to Bradbury for his Nature-Prints. Bradbury & Evans, noted for their colour printing, would have been able to obtain and provide a wide range of coloured inks (and a broader colour palette was used for some *Naturselbstdruck* prints produced by the state-funded printing works in Vienna [Östlund, pers. comm.]), but the need to control cost might have caused Bradbury to limit the total number of pigments he used and to keep to a minimum the number of inks and thus the number of inking processes employed for each print. Secondly, most if not all the colours used would have required mixing of pigments to produce the palette of one, two or three coloured inks for each plate; perhaps when more ink was needed, the mixing was not always consistent. Thirdly, the colours may have been unstable and changed over the 150 years since they were printed. Change due to exposure is perhaps most likely in the early prints (Bradbury 1854) that were never issued by the publishers in book form and have in some cases spent many years as loose sheets. In plates 6, 10 and 27 mentioned above, the ink used might have been a mixture of red and blue pigments in which the red component has faded. Most blue pigments used then were stable inorganic pigments, but many of the reds were less stable organic dyes.⁷⁶ Fourthly, there may have been an incorrect choice of colour owing to ignorance or misinformation. Those doing the inking are unlikely to have had botanical knowledge or fresh specimens from which to work, and each printer may have been working from a dried specimen. Flowers and seaweeds frequently change or lose colour during the drying and pressing process; flowers often darken, but seaweeds sometimes appear brighter. In the absence of a live specimen the printer may have been using a selected print made previously, a hand-coloured illustration



Figure 22. Hedge woundwort, plate 6 from Bradbury (1854). Note the absence of a plate number in bottom left corner.

or a colour chart (first available in the late 18th century) as a guide to the colours required, and the colour of the guide might have been incorrect. Moreover, colour perception is subjective. Finally, each plate had to be re-inked for each impression but not necessarily always by the same person each time, thus introducing yet another possible cause of variation in colouring between imprints. Potential errors in representing natural colours are avoided when a single arbitrary colour is used, as in many later publications by the Staatsdruckerei, although the main purpose of selecting a reddish sepia tint may have been to optimise contrast and tone rendering in revealing details such as veins (Östlund 2013).

A further indication that it was not always the same person who inked a plate after each impression comes from further comparisons of prints. For example, comparing the same plate in different copies of *The Ferns of Great Britain and Ireland* (Moore 1855/56), or in one copy of each of the 1859/60 and 1863 issues of *The Nature-Printed British Ferns*, in some cases they are indistinguishable. In other plates there are differences in the thickness of the ink between copies. Almost invariably, there are differences between plates within a copy. For example, in my copy of *The Ferns of Great Britain and Ireland* (Moore 1855/56), although *Blechnum spicant* and *Ceterach officinarum* in plate XLIII (Fig. 23) are heavily inked and thus look more realistically opaque though perhaps less attractive, *Asplenium marinum*, a species with particularly fleshy fronds, in plate XXXVIII (see Fig. 17) appears to have thin membranous pinnae. In other copies, the fronds on plate XLIII appear equally translucent. In other plates there are differences in the shade of green or brown employed, in the precision with which the brown and green colours are separated (as in brown sori on green pinnules, brown scales on green stipes), and occasionally by the extent of brown colour along an otherwise green stipe.

A more obvious difference between different copies of the same plate, which is occasionally observed, is where a different colour is used on part of a print. For example, on plate XII of one copy of the 1863 reissue of *The Ferns of Great Britain and Ireland*, the engravings of pinnule segments and spores were printed in black rather than in the same shade of green as the Nature-Print of the frond on the same plate, as seen in other copies. In another copy the engravings of spores in plate CXIV are printed in black instead of the usual green. These could be “one-off” errors, which occurred when at the time of inking the lettering in black it was found that

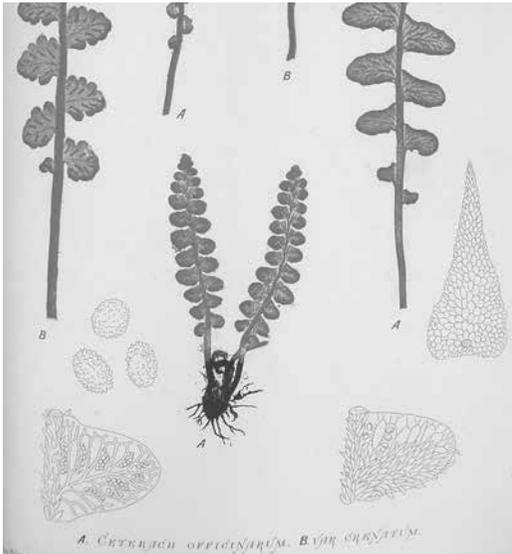


Figure 23. Detail of *Ceterach*, plate XCIII from octavo ferns (Moore 1859/60), showing the engravings of structural details.

engravings had been missed when the green ink was being applied. Less easy to explain are the engravings of a pinnule and spores on plate XI of two copies I have seen of *The Ferns of Great Britain and Ireland*, one of Moore (1859/60) and one of the 1863 reissue, which are coloured the same brown as the rhizome. Perhaps these engravings were inked in error when the darker colour was applied first, or, if green was applied first, they were missed initially and then inked later when the darker rhizome colour was applied. Maybe a wider survey will reveal other similar instances of inking anomalies.

These observations suggest that if the plates, with Nature-Prints, engravings and lettering, were printed in one pull, then the lettering was inked last, and if a plate had incomplete inking of a coloured area at the time that the next colour or the lettering was inked, the error was not corrected with the appropriate colour. This in turn perhaps suggests that there was an “assembly line” approach to inking, with two or three people involved with each plate, each

applying a different ink in a planned sequence; if an area of the plate had not received the appropriate colour, it was not always sent “back up the line” for correction. Östlund (2013), in her studies of Auer and Bradbury, came independently to a similar conclusion: “It is likely that each workman was responsible for the application of one specific colour only. This would have sped up the inking process. It would also have evened out the overall quality of the plates by erasing the input of the single craftsman.”

v. Numbering plates

Bradbury numbered all his published plates with roman numerals, but, as described above, some plate numbers have a supplementary suffix. Thus, some of the plates in the folio *The Ferns of Great Britain and Ireland* (Moore 1855/56) have one or more asterisks after the number, but no number is repeated (as in: XIX, XX*, XXI), which, as discussed above, might indicate that the marked plate was not the first electrotype to be derived from the original lead impression. In the octavo *The Nature-Printed British Sea-Weeds* (Johnstone and Croall 1859/60), some plates were labelled with superscript *A* or *B*. These always followed a plate with the same number but with no superscript (as in the sequence: XIX, XX, XX^A, XX^B, XXI), and the marked plates illustrated additional specimens of the species with that plate number. In the same work “½” identified a plate of an otherwise unrepresented species that had been inserted at a late stage in preparation after plates of related species had been completed and numbered (as in: XIX, XX, XX½, XXI). In the octavo *The Nature-Printed British Ferns* (Moore, 1859/60), “bis” plates (“bis” meaning “again” or “twice”), which were illustrations of additional varieties of the same species as on the preceding plate, were inserted after the numbering had been decided (as in the sequence: XIX, XX, XX bis,

XXI). In Bradbury's publication advertising the possibilities for bank note printing (1860b), both asterisks and superscript letters were again used, though the majority of plates had neither. In this case asterisks sometimes occur on plates with repeated numbers but different images (as in the sequence: XIX, XX, XX*, XXI); superscripts *A*, *B*, *C*, *D* and *G* occur on some unrepeat numbers (as in the sequence: XVIII, XIX^A, XX, XXI^G, XXII). While the significance of these suffixes is not always clear, it does reveal that plates were sometimes substituted, or added at a late stage, in the collation of the Nature-Printed illustrations for all Bradbury's publications.

Modern reconstructions of the Auer/Bradbury method

The method has been successfully reconstructed at least twice. Peter Heilmann has produced prints, of single *Ginkgo* and *Acer* leaves, by the Auer method (Heilmann, pers. comm., 1988, 2003). A hydraulic press producing pressures of up to 30 tons was used to obtain the initial impression on soft lead. Initially Heilmann obtained the impression of a *Ginkgo* leaf on a 2.5-millimetre-thick polished lead plate. Then, using a car accumulator battery as a source of current over a period of about two days, he produced in a copper sulphate bath a copper electrotype 0.8 millimetres thick. The process was repeated to produce the intaglio copperplate, which was then attached to a wooden board for printing. Subsequently, with assistance from a "galvanographic craftsman," his technique was improved to produce 3-millimetre-thick plates fixed to a 10 millimetre lead plate, the same as those produced by the Staatsdruckerei in Vienna. From such a plate a limited edition of 750 copies of a single-colour (brown) nature-print of a leaf of *Acer circinatum* was printed in 1989 by Karlheinz Bölling of Bad Soden, Germany.

Since then Furio de Denaro (2008) reported (in an essay introducing a catalogue of the

19th-century natural history books in the library of the Museo Civico di Storia Naturale, Trieste) success in producing lead impressions under pressure although there is no mention of producing copper electrotypes from them. More recently Pia Östlund (pers. comm., 2013) overcame a number of technical problems experienced while attempting to repeat the whole Bradbury method and has now achieved prints of single oak leaves, which could be mistaken for Bradbury Nature-Prints. Reference to some aspects of her method can be found in Östlund (2013).

Bradbury's Nature-Prints

Unpublished Nature-Prints

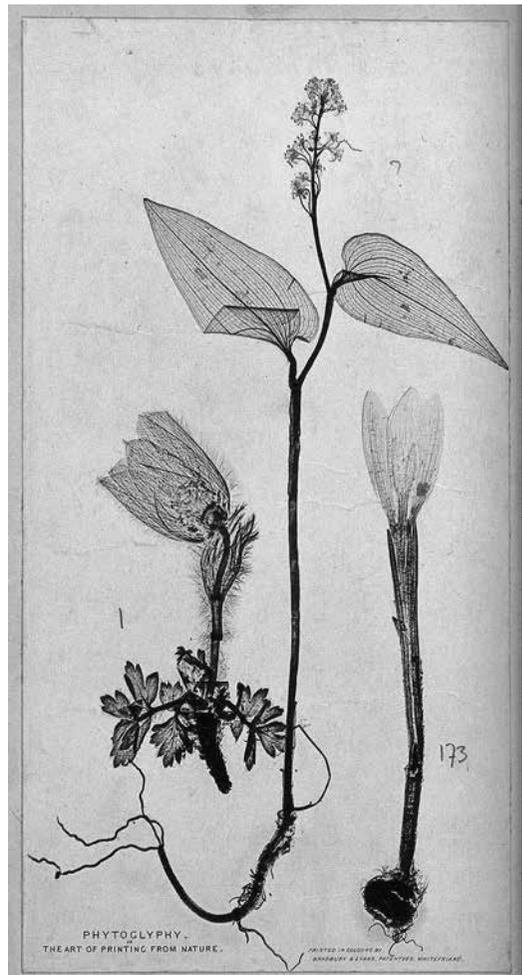
It is likely that Henry Bradbury produced some trial Nature-Prints before any were published. However, very little archival material of Bradbury & Evans seems to have survived, and no documentary evidence relating to these early efforts has been traced.⁷⁷ However, unpublished prints have been located in two collections.

In the *Punch* archives at the British Library, included with a set of 18 plates from Bradbury (1854), is a single composite unpublished Nature-Print of 5 different unidentified flowering plants with several different flower colours (Fig. 24). There is no plate mark. It is reminiscent of a Bradbury print in the Wellcome Library though a little larger. The unlabelled specimens can be identified as a honeysuckle (possibly *Lonicera periclymenum*), a pink primula (possibly *P. farinosa*) and three members of the Fabaceae (previously Leguminosae, pea family): a milk-vetch (possibly purple *Astragalus danicus*), a clover (possibly red *Trifolium pratense*) and a white trefoil or clover (*Trifolium* sp). It has been mounted early in its life on a small board, approximately 310 × 250 mm, originally with



Figure 24. Above, Honeysuckle, a primula and three members of the pea family, unpublished Nature-Print, probably by Henry Bradbury, *Punch* archives, British Library, catalogue number PUN 692.11, © British Library Board, All Rights Reserved. Courtesy of the British Library.

Figure 25. Right, *Maianthemum bifolium*, a *Crocus* or *Sternbergia* species, and a *Pulsatilla* or *Anemone* species, unpublished Bradbury Nature-Print of three unlabelled flowers. Courtesy of the Wellcome Library, London.



a loop for hanging it for display. On the lower left corner is stuck an old paper label with the name “LONDON” in black. There is no other lettering and no mention of Bradbury on the plate, but given the Bradbury link with *Punch* and its inclusion with prints from Bradbury (1854), there is no reason to think it was printed in continental Europe, the only other source of prints by this method. Henry Bradbury sent some specimen prints to the Society of Arts before December 1853 (Harris 1970) and thus before he had published any Nature-Prints. In a report published in the *Journal of the Society of Arts*, 1853–1854, of

the fourth ordinary meeting of the society on 7 December 1853, there was reference to “specimens” exhibited by Messrs. Bradbury and Evans “who are working the process [i.e., Nature-Printing] in this country.” Perhaps PUN 692.11 was one of these early specimens.

Two unpublished Bradbury Nature-Prints in the Wellcome Library, one of three flowering plants and the other of a fern frond, are possibly also early trial prints that predate all the published prints. As described in Dyer (2004), one is a small print (226 × 117 mm), without a plate mark and in four colours, of three flowering plants: *Maianthemum bifolium*

(May lily, wrongly identified in the Wellcome catalogue as “a mercury”), a *Crocus* or *Sternbergia* species, and an *Anemone* or *Pulsatilla* species (Fig. 25). The *Maianthemum* leaves have the ethereal translucent quality characteristic of many later Nature-Prints. It resembles early *Naturselfstdruck* prints by Auer in having several unidentified species in one plate. The other print, of which there are two identical copies in the Wellcome Library, is of the British fern *Polystichum aculeatum*, although it is identified in the Wellcome catalogue as *Dryopteris filix-mas*, perhaps because one copy has the obsolete synonym “?Lastrea f-m” written on it in pencil (Fig. 26). *Polystichum aculeatum* is winter-green, and the other three plants, all cultivated non-native species, flower in the spring. It is likely that the specimens were pressed early in 1853, and the Nature-Prints made later that year or early in 1854. (The patent application submitted by Bradbury in May 1853 was accompanied by a Nature-Print using a copperplate made in Vienna; the first published Nature-Prints appeared during 1854.) Unlike the published fern prints, the plate mark of the Wellcome fern print is narrow (458 × 200 mm) and contains only a single frond, and there is no printed plant name. On none of these prints is there a plate number. In the bottom right-hand corner of both the flowering plant and the fern print is printed “Printed in colours by Bradbury & Evans, Patentees, Whitefriars” as was also printed in many published prints. At the bottom of both prints within the plate mark is printed “Phytoglyphy or the Art of Printing from Nature.” The term “phytoglyphy,” literally meaning “plant carving,” does not appear on any published print. Bradbury notified Auer in a letter dated December 1853 that he had called the Nature-Printing process “Phytoglyphy” (Auer 1854; Cave and Wakeman 1967) in order to demonstrate that Nature-Printing was an English invention

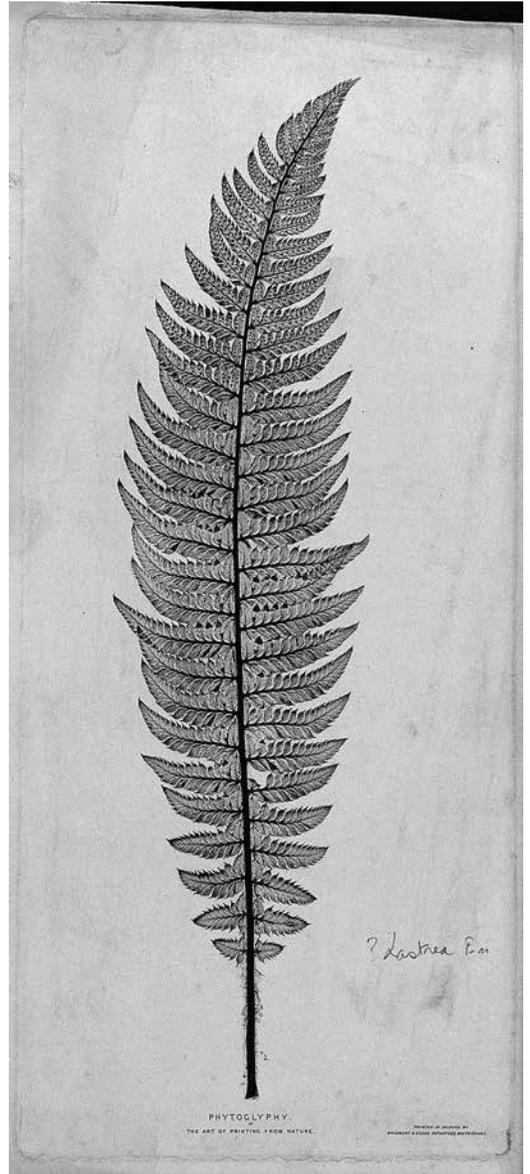


Figure 26. A frond of the fern *Polystichum aculeatum*, unpublished Bradbury Nature-Print. Courtesy of the Wellcome Library, London.

(by Branson), but he seems to have abandoned the term in his published work in favour of “Nature-Printing” and then in 1860 referred instead only to “Autotypography” (Bradbury 1860a). This seems to indicate that, despite

the date “c.1860” in the Wellcome catalogue entry, both prints were produced early, perhaps before the 1854 publication, but evidently after the patent was issued in June 1853. The prints were reproduced in colour in Cave (2010, figs. 14.1, 14.2) and can be viewed on the Wellcome Web site (<http://images.wellcome.ac.uk> and search for “Bradbury”; nos. V0043909 and V0043910). Together with the British Library print PUN 692.11, these are probably the earliest known Bradbury Nature-Prints.

Other unpublished prints were exhibited to the Botanical Society of Edinburgh, as revealed in accounts of meetings in the society’s transactions (vol. 6, 1860). On 10 December 1857 (see page 18 of the transactions) “Dr Lawson exhibited a series of beautifully executed plates of British Mosses, nature-printed by Mr Henry Bradbury, which were presented to the Museum at the Botanic Garden. The figures included several species that had recently been added to the British Flora.” The museum had been set up by J. H. Balfour in new premises at the garden in 1851. The subsequent fate of the prints is not known; a search at the RBGE has failed to locate them. (Many of the museum collections were destroyed in the 1960s.) They would be of particular interest if rediscovered because only one moss Nature-Print was published by Bradbury (it is in some copies of the Royal Institution’s proceedings for 1855), and the projected book on Nature-Printed mosses with text by Lawson was announced (see Bradbury 1860a) but not published.

Published Nature-Prints

Henry Bradbury produced Nature-Prints in five works published by Bradbury & Evans. These were a collection of 39 folio plant prints with no text (Bradbury 1854); a folio book on British ferns with 51 Nature-Prints and a text by Thomas Moore (Moore 1855/56; reissued 1857); 1 octavo Nature-Print of a

seaweed accompanying a printed pamphlet (Anonymous ca.1858); a set of 4 octavo volumes on British seaweeds with 222 Nature-Prints and a text by William Grosart Johnstone and Alexander Croall (Johnstone and Croall 1859/60); and a set of 2 octavo volumes on British ferns with 124 Nature-Prints and a text by Thomas Moore (Moore 1859/60; reissued 1863). In addition three octavo Nature-Prints were published in the Royal Institution’s proceedings (Bradbury 1855a). These publications containing Bradbury Nature-Prints are considered in detail in chronological order below.

1. Bradbury, H. 1854. *A Few Leaves Represented by “Nature-Printing” Showing the Application of the Art for the Reproduction of Botanical and Other Natural Objects with a Delicacy of Detail and Truthfulness Unobtainable by Any Other Known Method of Printing.* London: Bradbury & Evans. 39 loose prints, imperial folio.

This was the title on the title page, referred to below as “title page 1” (Fig. 27), which accompanied the set of 33 prints that Bradbury presented to the Royal Institution on 8 February 1855 (this set is referred to as “RI”). This donation was announced at the general monthly meeting on 5 March 1855 and reported in the Royal Institution’s proceedings. An alternative, possibly later, title, *A Few Leaves from the Newly Invented Process of “Nature-Printing” Showing the Application of the Art for the Reproduction of Botanical and Other Natural Objects*, under the heading “By Royal Letters Patent” and referred to below as “title page 2” (Fig. 28), has been found in 4 of the 11 examples of title pages that have been located. Both title pages are dated 1854. This work, which consisted of sets of prints without text apart from a title page, a list of plates and some reviews, was printed and published by Bradbury & Evans. The Bradbury & Evans symbol, what would be now called a “logo,”

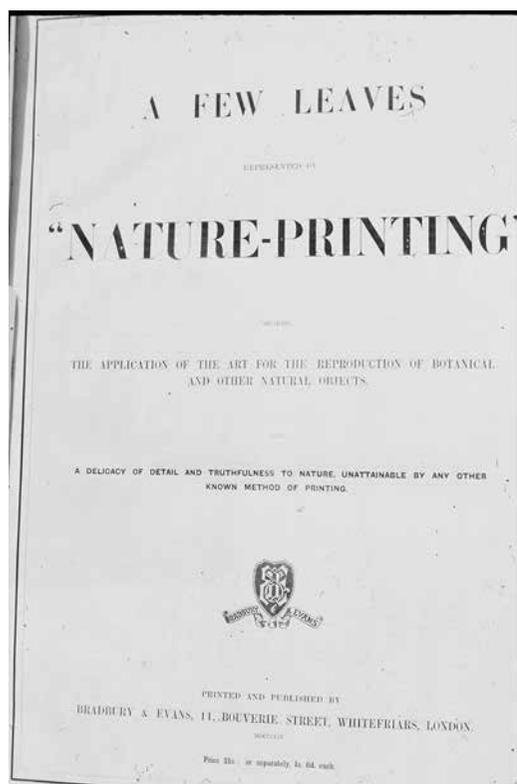


Figure 27. Title page 1 from Bradbury (1854).

above the publisher's name on title page 1 is omitted in title page 2 and instead a royal crest was added at the top of the page. This collection was described for the first time in detail by Dyer (2004), and the following account presents a summary and update of that description in the light of further observations and the discovery and examination of a further eight sets.

The page dimensions are 556 × 368 mm, approximately the same as those of the imperial-folio *The Ferns of Great Britain and Ireland* (Moore 1855/56), but there is a clear plate mark (varying in size from 505 × 275 mm to 410 × 265 mm in my set of 21 plates). All but one are in "portrait" format; plate 3 is in "landscape" format. Other minor differences between the plates were described in Dyer (2004). Unlike Bradbury's early unpublished

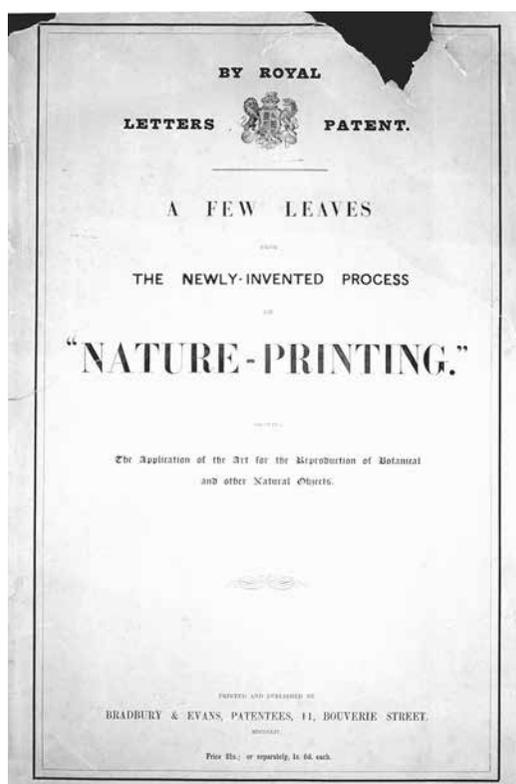


Figure 28. Title page 2 from Bradbury (1854), photograph by Michael Hayward.

prints of flowering plants described above, each plate portrays one species. Within the plate mark, printed intaglio in black ink, are the common and scientific names of the plant and the name of its plant family. On each plate is also stated "Nature Printing" and "Printed in colours by Bradbury & Evans, Patentees, Whitefriars, London" although on four plates (3, 10, 21 and 24), "colours" is replaced with "colors." The size of the prints and consistency of the paper is very similar to those of a set of prints that Auer had previously distributed (Hayward, pers. comm.). During a 1988 conservation procedure, the paper used for a set of Bradbury (1854) prints now in the *Punch* archives at the British Library was described as "good quality, long fibred, light cream, machine made, wove, smooth, heavy, stiff and

even textured.” In some bound sets, each plate is protected by a sheet of tissue paper—a plate guard or “flimsy.”

Initially, the prints were offered for sale unbound, and, as stated on the original title page, either singly at 1s.6d. (7.5p) each or in sets of 21 at 1 guinea (21s, £1.05) equivalent to about £53 today. Probably all sets were sold within a paper wrapper, although this has not always survived. The outside of the front wrapper was the title page; the inside of the front wrapper had “Opinions of the Press”; the list of 33 plates was on the outside of the rear wrapper under the title “‘Nature-Printing’ Specimens. List of Plates.” The purchased prints were selected from a list, initially of 33 different plates. Some sets have one or more

prints selected from an additional six plates. These were possibly produced later, but they are still referred to here as “Bradbury 1854.”

Details of all 11 sets then known were given in Dyer (2004). A list of all 39 plates is repeated here (Tab. 1).

A summary of information about the eight newly discovered sets is given below. Plate numbers follow those in Bradbury’s original list and the additional plates listed in Table 1.

MZ. Private ownership in United States. Sold at Christie’s on 24 November 2009. 21 plates; unbound; title page 2; plates 1, 2, 6–12, 14, 17–24, 27, 29, 31.

KEW. Held at Royal Botanic Gardens, Kew. 6 plates located amongst other papers and specimens after a search using the RI

Table 1. List of plates in Bradbury (1854)

Plate number (1–33 according to Bradbury’s list issued with the RI set; extra prints arbitrarily numbered 34–39. These plate numbers are not shown on the plate)	Plate name (1–33 named as on Bradbury’s list; 34–39 named as on plate)	Added plate number in 14-plate sets and MH2 (Printed number subsequently added to the original plates)
1	Common Hare’s Ear	
2	Water Capitate Mint	
3	Common Celandine	13
4	Crosswort Bedstraw	1
5	Common Lady’s Mantle	
6	Hedge Woundwort	
7	Marsh St. John’s Wort	8
8	Common Guelder Rose	9
9	Common Milkwort	14
10	Tuberous Bitter Vetch	6
11	Three-nerved Sandwort	2
12	Marsh Cudweed	17
13	Yellow Pimpernel	26
14	Common Lime Tree	
15	Withering Fern	
16	Wood Vetch	11
17	Great Nettle	

list, probably the survivors of a 21-plate or 33-plate set; unbound; no title page; plates 1, 5, 10, 17, 30, 32.

L&AC. Held at Library & Archives Canada. 21 plates; modern binding; title page 1; plates 1–3, 5–7, 10–12, 14–15, 17–18, 20, 22, 26–28, 31–33. Viewed online.

MH1. Private ownership in England. 21 plates; unbound; title page 2; plates 2, 3, 5–7, 10–13, 15, 17, 19, 21–23, 26–27, 31–33, 35.

MH2. Private ownership in England. 30 plates; contemporary half-leather binding with a title “Newly Invented Process of Nature Printing” in gold lettering; no title page or list of plates; plates 1, 2, 3, 5, 6, 7, 8, 9, 12, 13*, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24*, 26, 27, 28, 29, 30, 31*, 32, 34*, 35*, 37. Those marked

with an asterisk have a printed plate number added to the plate as follows: plate 13 “plate 26”; plate 24 “plate 10”; plate 31 “plate 24”; plate 34 “plate 16”; plate 35 “plate 18.” The first four numbered plates have been previously recorded (see Tab. 1 and Dyer 2004). “Plate 18” has been added to Table 1. This appears to be a late-issued set, with 3 of those plates, which were later added to the original list of 33, and some plates substituted by the later, numbered, versions. The content of 30 plates rather than the more usual 33 could be because either some plates had been lost before binding, were no longer available when ordered or were not required.

NYPL. Held in New York Public Library, originally in the Astor Library founded in

18	Tormentil	3
19	Great Yellow Loose-strife	30
20	Bree’s fern	
21	Mountain Currant	7
22	Dog’s Mercury	23
23	Common Filago	21
24	Meadow Sweet	10
25	Sea Spleenwort	
26	Common Hart’s Tongue	
27	Rose-bay Willow-herb	
28	Lily of the Valley	
29	Common Saw-wort	22
30	Common Golden-rod	
31	Common Butter-bur	24
32	Flowering Fern	
33	Common Marsh Marygold	
[34]	Hairy Rock-cress	16
[35]	Common Primrose	18
[36]	Common Meadow-rue	15
[37]	Upright Bed-straw	12
[38]	Red Berried Bryony	31
[39]	Common Nightshade	

1849. 33 plates; modern (1936) binding; same list and title page 1 as in RI. Viewed online.

RBGE. Held at Royal Botanic Garden Edinburgh, originally J. H. Balfour's personal copy. Using the RI list, 21 plates were located scattered through the herbarium (plate 5 has been subsequently mislaid); unbound; no title page; plates 4, 5, 7, 10–12, 14–20, 22–24, 26–28, 30, 32.

USLC. Held at United States Library of Congress. 33 plates; modern binding; same list and title page 1 as in RI. Viewed online.

In addition to the three reported in Dyer (2004), 15 more plates have been recently discovered in the *Punch* archives during cataloguing after they had been transferred to the British Library. The current list is:

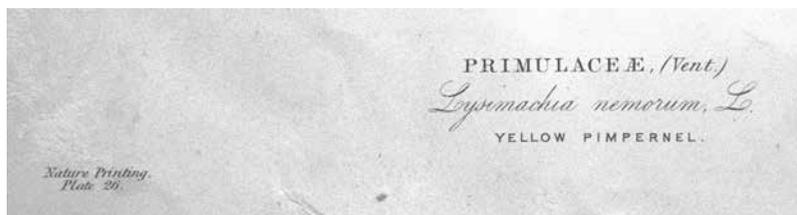
PUNCH. 18 plates, probably the survivors of a 21-plate set; unbound; no title page; plates 1–2, 4, 7, 10–13, 15–16, 18, 20, 22, 26, 28, 30–32.

Most of the 19 sets currently known consist of 33 plates (7 sets), 21 plates (7 sets) or 14 plates (2 sets); the other 3 sets (of 6, 18 and 30 plates) are probably incomplete, containing the surviving representatives of larger sets. The plates of 12 of these sets are all from the original list of 33 plates; 6 sets (1 of 33 plates, 3 of 21 and 2 of 14) include some plates from the additional numbers 34 to 39. Some sets consist of loose plates as issued, others have been bound either soon after issue or more recently. The 33-plate sets were possibly for deposit in copyright libraries, for publicity or for presentation. All but one of these 33-plate sets have the same complement of plates and title page as the set presented by Henry Bradbury to the Royal Institution; one 33-plate set, in Cambridge University Library but previously in private ownership, has a different selection of 33 plates including 5 of the later 6 plates, and the alternative title page 2. The set presented to the Royal Institution has a collection of herbarium specimens in a pocket inside the back cover, but it is not clear how or if they

relate to the Nature-Prints. The 21-plate sets were probably private purchases; all of the 21-plate sets examined have a different selection of plates. One of the 21-plate sets has title page 1 together with plates only from the original 33, three have title page 2, and two of these include plates from the additional list of 6. The RI set is in generally good condition apart from handling marks round the margins outside the plate marks, but some of the other sets that have not been stored in such good conditions contain plates that have significant foxing.⁷⁸

The two 14-plate sets, both lacking a title page, consist of plates identical to some of those in the other sets except that a printed plate number, which is not the same number as on Bradbury's original list (see Tab. 1), has been engraved on each plate (Fig. 29). These 14-plate sets have been identified as a later reissue in which the numbers had been added to the original plates (Dyer 2004), an assumption supported by the fact that 4 of the plates are among the 6 added later to the original list of 33. It has also been assumed that these were complete sets as issued, with 14 plates (though not the same 14 in each).⁷⁹ One of the 14-plate sets is in the Wellcome Library (<http://images.wellcome.ac.uk> and search for "Bradbury"; nos. V0043911 to V0043924). According to the Wellcome Library records, it was issued by Baildon in Edinburgh in 1867, but there might be confusion with Baildon's own nature prints, first exhibited in 1867 and published in 1869.⁸⁰ Bradbury & Evans had established connections with Edinburgh since the 1830s through their associations with the Chambers brothers for whom they printed works including *Chambers's Cyclopaedia* (Patten and Leary 2004a). However, if the 14-plate sets were printed in Edinburgh, the printing process must have been replicated exactly, and no other indications have been found that these Nature-Prints were reissued after Bradbury's

Figure 29. Detail of a Nature-Print from a 14-print set of Bradbury (1854) showing the plate number “Plate 26” added below “Nature Printing.” This example is from the set identified as “MF” in Dyer (2004). The added plate numbers can also be seen on the set of 14 at the Wellcome Library, identified as “WL” in Dyer (2004).



death in 1860.⁸¹ It seems more likely that the numbered plates were produced by Bradbury & Evans, and further evidence for this has been recently obtained. The 30-print set MH2 described above includes 5 numbered plates along with 25 plates unnumbered as originally issued. This is the only known “mixed” set and seems to confirm that the numbered prints were produced and issued by Bradbury & Evans, who probably also provided the contemporary binding (Hayward, pers. comm., 2013). Together with the 14-print sets, this reveals that 23 of the 39 Nature-Prints are now known to have been issued in both numbered and unnumbered forms; 8 of the numbered plates occur in two different sets. Perhaps all 39 plates were numbered. It is still not clear why or when the plates had the numbers added. The added numbers do not match the sequence in the RI list, and neither do they relate to the position of the plants in taxonomic treatments, such as that in Hooker’s *British Flora*, available at the time.

Most of the 19 known sets are in museums, libraries or similar institutions, and only five are in private ownership. They sell for several thousand pounds on the few occasions in recent years that they have been offered for sale.⁸² It is not known how many sets were produced. Peter Heilmann, a collector and world authority on nature printing who lives in Mainz, Germany, estimated that only 20 or 30 sets were sold or presented (pers. comm.,

1988). There may be several as yet undiscovered in the United Kingdom or abroad, in surviving Victorian libraries of large houses or in herbaria. The sets in the botanic gardens at Kew and Edinburgh had been dispersed through the herbaria, each plate inserted into the appropriate folder of specimens. They did not appear in the library catalogues. Other sets may be lurking, similarly undetected, in other major herbaria in Britain, the United States and elsewhere. Nevertheless, they are rare and, for understandable reasons, until recently apparently unknown to all but a handful of authors writing about nature-printing (Dyer 2004). For example, Elliott (1993) referred to Bradbury’s “first publication, in the form of a few specimen pages” but implied that he had not seen these earlier prints when he stated: “What success would Bradbury’s method have with flowering plants?” Bradbury himself made no reference to the 1854 prints in his later publications (Bradbury 1855a, b, 1856a, 1860a). It seems that he saw them, as the title implied, solely as a demonstration of the capabilities of the technique.

Of the 39 plates recorded in total for Bradbury (1854), 5 are of ferns, and the remainder are of flowering plants (Fig. 30, see Fig. 22), including one tree, the common lime. As discussed in Dyer (2004), there is no obvious theme connecting the species portrayed though there are indications that most if not all were collected in the south of

England during the summer of 1853. They might have been provided by John Lindley, whom William Bradbury had known since the early 1840s, but some specimens have been carelessly arranged when pressed, so more than one collector might have been involved. Apart from the specimen tree leaf print in the Royal Institution's proceedings (Bradbury 1855a, see Fig. 33 below), these are the only Nature-Prints of flowering plants published by Bradbury or produced by anyone else in Britain, which makes this publication particularly important in the history of British Nature-Printing. Overall, there is a wider palette of colours employed than in the fern prints; no doubt the intention was to demonstrate the potential of the method. However, no more than three colours were employed on each plate: where only leaves with or without stems, inconspicuous flowers or immature buds or fruits are shown, a single colour is used throughout, although different shades of green were mixed for different plates; where conspicuous flowers are illustrated, an additional colour is used; and when roots are included, again a further colour is employed. Plates showing a complete plant with conspicuous flowers require three colours. Plates 2, 6 and 19 are reproduced in colour in Cave (2010, figs 15.1, 15.3 and 15.4). Some of these prints are more successful than others, depending largely upon how much the three-dimensional structure is distorted by pressing and drying of the original specimen. Thus plates 11, 12, 21 (see Tab. 1) are much less satisfying illustrations than plates 3, 6, 17 and 22, and even then, details of the three-dimensional leaf arrangement and the floral morphology of the latter four are lost. Reviews at the time of publication expressed reservations, particularly concerning the failure to portray the important details of flower structure (Cave 2010), so that while amateurs might find the Nature-Prints an aid



Figure 30. *Alchemilla*, plate 5 from Bradbury (1854). Note the absence of a plate number in bottom left corner.

to identification, for the professional botanist, they could not replace actual specimens. Nevertheless, as pointed out by Harris (1970), amongst them are some of Bradbury's finest Nature-Prints.

It is interesting to speculate about Bradbury's intentions in publishing these prints. He was clearly trying to promote the technique in Britain, using the facilities at his father's printing works, and chose plants, both ferns and flowering plants, as the subject because of the success with them that he had witnessed in Vienna in 1852/53. However, it is also possible that at that time he had no contacts with botanists to provide accompanying texts.

Perhaps he released the prints to show what he could achieve and attract the attention of potential authors so that in future he could provide the illustrations for scientific texts in the same way as Auer's printing works did in Vienna. If this was his plan, it was successful, because he was soon cooperating with Moore in the production of *The Ferns of Great Britain and Ireland*.

2. Bradbury, H. 1855a. On Nature-Printing. Notices of the Proceedings at the Meetings of the Royal Institution of Great Britain. 2: 106–118.

Three little known and rarely seen Nature-Prints are included in some published accounts of Bradbury's lecture to the Royal Institution in 1855. They are of particular interest because they include the only published print by Bradbury of a moss and one of only two published prints of a tree leaf. Only Wakeman (1966), Dyer (2004) and Cave (2010) referred briefly to these prints. Notices of the Royal Institution's proceedings contain the report of this lecture written in the third person but signed "[H.B.]," so presumably a précis of the lecture written by Bradbury himself. In some, but not all, bound copies of this publication, three octavo specimen Nature-Prints are included (Figs. 31, 32 and 33).⁸³ These prints may be the three additional Nature-Prints that were donated to the Royal Institution by Bradbury and accepted, along with an abstract of his discourse, at their meeting on 5 November 1855. However, they were not referred to in the text of the lecture and were not included in reimposed offprints (with changed page numbers) of the same article.

Bradbury also published separately two other, fuller, versions of the lecture, each with different additions and alterations and different titles (Bradbury 1855b, 1856a). The first stated on the title page that it was "Illustrated with specimens," but none were in the copy that I saw in the Royal Institution

Library. The second version, described on the title page as "A lecture as delivered..." had no illustrations. In the Royal Institution's proceedings, one Nature-Print was of an unidentified red seaweed, a precursor of the illustrations for the work by Johnstone and Croall (1859/60) produced four years later. Another was of at least three moss species,⁸⁴ an echo of the earlier publication in Vienna by von Heufler. This is the only moss Nature-Print that Bradbury is known to have published, although some were produced and more were planned. The third was a tree leaf, which cannot be assigned to a species native in Britain, again reflecting Bradbury's unrealised intention for future publication of a work titled *The Nature-Printed Trees of Great Britain, Native and Exotic*. This and the lime tree print, plate 14 in Bradbury (1854), are the only Nature-Prints of trees that Bradbury published. None of the specimens was named; at the top of each print was printed "Specimen" and at the foot, "Nature-Printing" and "Bradbury & Evans. Whitefriars, London."

3. Moore, T. 1855/56. *The Ferns of Great Britain and Ireland*. London: Bradbury & Evans. (Reissued 1857.) 1 volume, imperial folio.

This was the first book with a text that was illustrated by Bradbury Nature-Prints. The text was written by Thomas Moore,⁸⁵ F.L.S., "Curator of the Botanic Garden of the Society of Apothecaries, Author of 'Handbook of British Ferns' &c. &c." and edited by John Lindley,⁸⁶ Ph.D., F.L.S. "Corresponding member of the Institute," again printed and published by Bradbury & Evans. Bradbury advertised the size as imperial folio. Hall and Rickard (2006) gave the size as 375 × 560 mm, which is close to the 390 × 550 mm that currently equates to imperial folio, but some copies are slightly smaller. My copy, which has gilt-edges, is 368 × 553 mm, suggesting that, in this case at least, the original fascicles were



Figure 31. Nature-Print of a seaweed accompanying Bradbury's lecture published in the Royal Institution's proceedings. Courtesy of the Royal Institution, London.

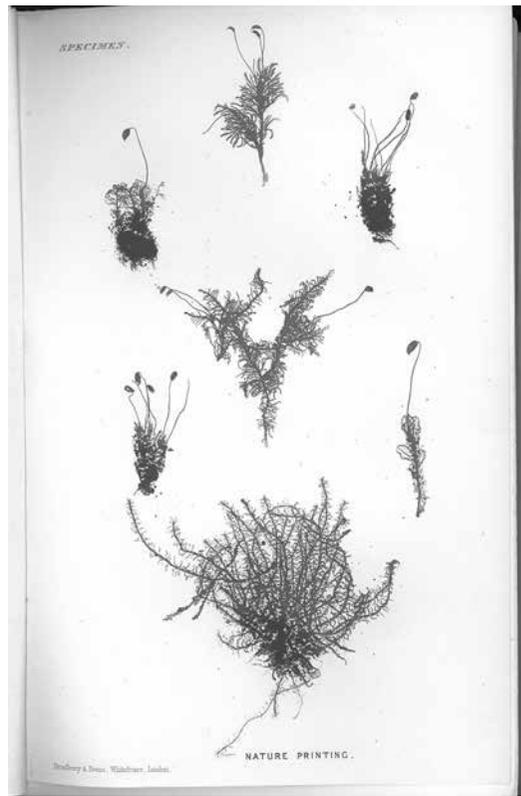


Figure 32. Nature-Print of mosses accompanying Bradbury's lecture published in the Royal Institution's proceedings. Courtesy of the Royal Institution, London.

trimmed (planed) before they were bound and gilded. It contains 51 Nature-Prints. Unlike those in Bradbury (1854) these are without plate marks, which gives the plant prints an even more lifelike appearance on the page. The copperplates must have been larger than the final size of the paper. Its impressive size was no doubt intended to draw attention to the process and the attractive prints it produced, and the volume was to that extent promotional, like the previous one, but *The Ferns of Great Britain and Ireland* was also intended to demonstrate the value of Nature-Prints in illustrating a scientific text. Several considerations may have led to the choice of subject matter. Previous experience (Bradbury 1854 and earlier

unpublished Nature-Prints) will have revealed to him that the essentially two-dimensional fronds of ferns were peculiarly suitable for Nature-Printing of pressed specimens with minimum distortion. Comprehensive coverage of the British fern flora consisting of about 50 species was achievable, whereas the flowering plant flora of some 3000 species would have presented a considerable challenge. At that date, the "Victorian Fern Craze" was at its height in Britain, ensuring an interested public and a potential market. Although Laird (1988) suggested that Moore commissioned Bradbury & Evans to provide the illustrations for his book, Cave (2010) stated that Bradbury & Evans commissioned

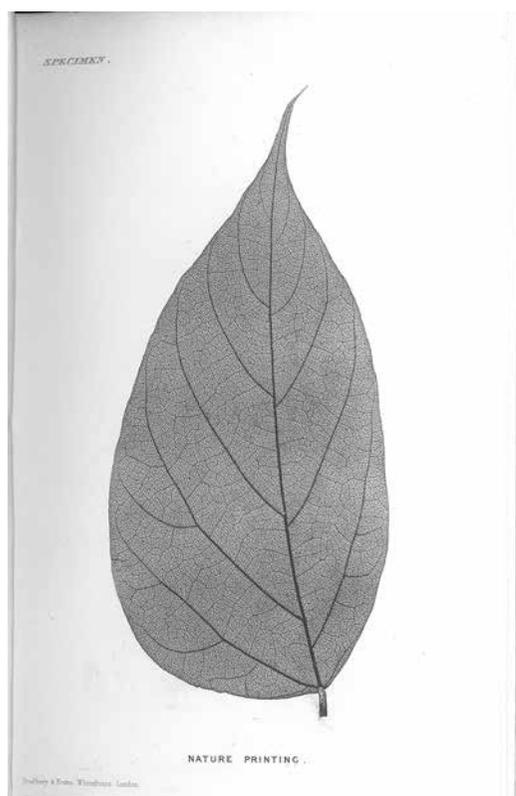


Figure 33. Nature-Print of a tree leaf accompanying Bradbury's lecture published in the Royal Institution's proceedings. Courtesy of the Royal Institution, London.

Moore to write the text to accompany their Nature-Prints. In view of Henry Bradbury's intentions to produce a series of botanical texts by several authors, Cave's interpretation seems the more likely. Either way, Bradbury was fortunate that Thomas Moore, eight years his senior, wrote the text because Moore was then the leading authority, and an established, successful author, on British ferns. The pedigree was further enhanced by having Moore's mentor, John Lindley, as editor. (William Bradbury had known Lindley since at least 1841 when they co-founded *The Gardeners' Chronicle and Agricultural Gazette*. Perhaps this contact provided the Bradburys with access to the botanical community.) The

later, octavo, publications with Nature-Prints did not involve an editor.

According to Lindley's preface, Moore selected the specimens to be figured in Nature-Prints produced under Henry Bradbury's direction. However, 35 collectors, including Moore, were named in the volume as having provided specimens, and it was probably these who arranged and pressed the specimens, some with more care and artistic appreciation than others (Östlund 2013). In the author's preface Moore thanked W. J. Hooker for information from his herbarium about localities, Lindley for careful overall supervision and G. B. Wollaston for information on the varieties within species.

All the British fern species then recognised were illustrated (e.g., Fig. 34). For the smaller species, whole plants were portrayed, but the bulky rhizomes of some of the larger species were omitted. Since 1856, some species names have been changed, some intra-specific variants have been elevated to separate species, and some that were designated in the 1850s as species have since been identified as hybrids (e.g., Fig. 35). In addition, some of the more extreme morphological variants so beloved by Victorian fern enthusiasts have also been illustrated (e.g., Fig. 36). Another plate is reproduced in colour in Cave (2010, fig. 15.6).

On the title page is stated "Published by Bradbury and Evans, Whitefriars, Printers Extraordinary to the Queen." The firm's name is repeated on the other side of the title page. On each plate, together with the current scientific name(s) of the fern(s) portrayed, the plate number, and the words "Nature Printing," is the statement "Printed by Bradbury and Evans, Whitefriars, London." All lettering is printed intaglio in black ink. Unusually, there are no page numbers on the text pages. Although the Bradbury & Evans printing establishment almost certainly included a bindery (Shillingsburg 1992), this



Figure 34. *Left*, *Oreopteris*, plate XXVIII from folio ferns (Moore 1855/6), a typical folio Nature-Print of a large fern species. The diameter of the 5 pence coin is 17 millimetres.

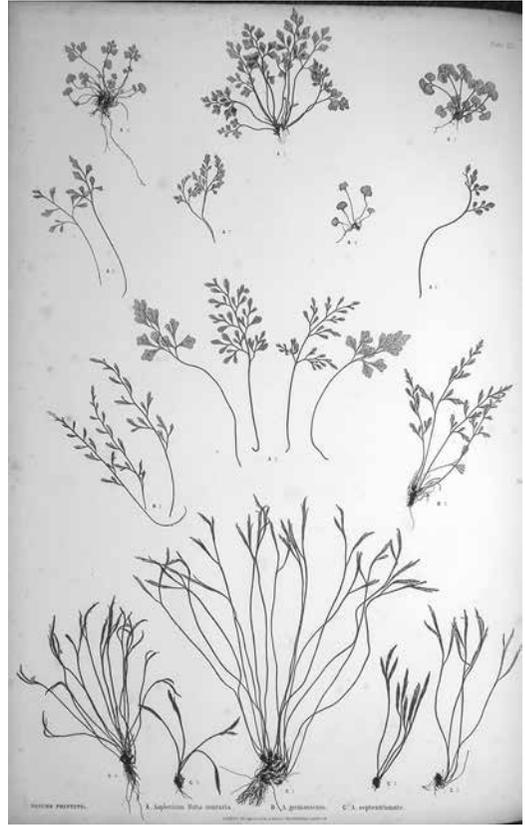


Figure 35. *Right*, *Asplenium*, plate XLI from folio ferns (Moore 1855/56), a typical folio Nature-Print of small fern species, one of which, *A. germanicum* at *B* (centre), is now known to be *Asplenium* \times *alternifolium*, the hybrid between *Asplenium ruta-muraria* and *A. trichomanes*. Also figured in this plate is *Asplenium ruta-muraria*, at *A* (above), and *A. septentrionale*, at *C* (below).

work was first issued unbound in 17 fascicles (referred to as “parts” in several previous publications, especially the more recent ones including Cave 2010 and Östlund 2013), which were dated monthly from April 1855 to August 1856. Each fascicle has a paper cover with a title. Lindley’s preface is dated 20 March 1855; the author’s preface is dated 14 July 1856, in time to be issued with the last of the 17 fascicles. As reported at the general monthly meeting on 3 November 1856 and recorded in their proceedings, Henry Bradbury donated an unbound set of fascicles to the Royal

Institution. (One of the British Library copies, catalogue number H S 74/1022, of Moore [1855/56] is stamped “Patent Office Library” and “BL,” but it is not known whether it was donated by Bradbury or had any relevance to a patent application; according to a manuscript inscription, it was also at one time privately owned.) *The Ferns of Great Britain and Ireland* was also offered as a bound volume, presumably only after August 1856.

It has been sometimes stated, and perhaps even more often assumed, that each fascicle as issued contained three plates, together

with the appropriate text. This is confirmed, at least for the first two issues, in a review in *The Phytologist* (Anonymous 1855). However in one bound copy at the British Library (catalogue number 1259.d.30), the positions of the original paper covers of each fascicle, and the associated British Museum accession date-stamps, seem to indicate that some fascicles as issued contained one, two, four or five plates.

Eight of the eleven copies that I have compared are dated “1855” (in roman numerals) on the title page. The other three copies (Wellcome Library, London; New York Public Library, viewed at <http://digitalgallery.nypl.org/nypldigital>; and one of the two copies in the Missouri Botanical Garden Library, viewed at <http://www.botanicus.org/title/b11977395>) have the date “1857” on the otherwise identical title page, indicating that there was a later re-issue, perhaps only as a complete bound volume. The Victoria & Albert Museum, London, Library, and the New York Botanical Garden Library also have copies of the 1857 re-issue in addition to the 1855/56 publication, but I have not examined these. As discussed above, there are two versions of four of the plates, and these can occur in different combinations in different copies of the work. Fischer (1933) listed one part of this work that was dated “1869” and was held by New York Botanical Garden, but this is not listed in their current library catalogue. It seems likely that this entry referred to Moore (1869), of which only one fascicle was published, with lithographic nature prints by Baildon.

Harris (1970) and Desmond (2003) pointed out that a few of the copperplates for the folio ferns, but not for the prints in Bradbury (1854), were touched up to make the detail clearer. Harris stated, “The copper of the ferns was touched up with burin and punches to make the image clearer, and the marks are still obvious. In some cases the outline and veins



Figure 36. *Lastrea filix-mas*, plate XVI from folio ferns (Moore 1855/56), showing examples of cultivars with abnormal “crested” frond development.

were engraved with the burin, occasionally a light aquatint ground was thrown over the leaf to deepen the tone, and some of the spore clusters on the fern leaves were stamped in with one or two small punches.” The evidence for this is not noticeable to the inexperienced eye in the prints that I have seen, but Bradbury’s patent stated that touching-up was sometimes necessary. Perhaps only some plates showing premature wear were treated in this way. Cave (pers. comm., 2003) stated, “I believe that Bradbury and Auer sometimes retouched their plates...” but gave no information for the basis of the statement. Östlund (2013) considered that Bradbury retouched the sori on some fern prints by colouring them with

a brush. Auer always implied that retouching turned a nature-print into a work of art, but some of his earliest prints also showed signs of careful burnishing (Harris 1970). As in previous Bradbury Nature-Prints, up to three colours, but in the majority of cases only two, were used per plate during printing. Usually, a single green was mixed for each plate, though different plates had different shades of green. In two plates (XLV and XLVI) young crosiers were coloured a different green from the mature fronds on the same plate. In all but one plate (XXXIV), one or two other colours, usually shades of brown, were used for roots, rhizomes and large sori on fertile fronds, when these were portrayed. In some, the stipes, or the stipe bases and scales, are also coloured brown. Several different shades of brown were used for different plates but never more than two in each plate, so in some plates two or more features, such as rhizomes and sori, or roots and stipe and rhizome, shared the same shade of brown.

The fascicles were offered at 6s. (6 shillings; £0.30) each, and the whole volume at 6 guineas (£6.6s.0d.; £6.30), now equivalent to about £310. One copy, which had been resold in 1909 for £1.11s.6d. (£1.575, equivalent to about £90 today), was bought by me in 1959 for £3.3s.0d (£3.15, equivalent to about £50 today) at a time when there was little interest in ferns or Nature-Printing. In recent years copies have sold for between £4,000 and more than £6,000 in the United Kingdom,⁸⁷ and in New York in 2011 a copy was offered for sale through Abe at over £11,000. Individual prints have been advertised at about £200 each!

Once all 17 fascicles had been accumulated, some owners would then get them bound. As a consequence, the bindings differ between copies. Some are in contemporary bindings, some of which used gutta-percha rather than stitching. The later Bradbury & Evans octavo publications with Nature-Prints, which were

not issued in fascicles, were also bound using gutta-percha. This suggests that those copies of *The Ferns of Great Britain and Ireland* that were originally bound with gutta-percha are those issued by Bradbury & Evans as a bound volume, although it is possible that some owners who collected the 17 separate fascicles returned them to the publishers for binding. Most are bound in half-leather, but an image of a volume bound in red with gold lettering and blocking, including a royal crest, can be viewed on the Zucker Art Books Web site (www.zuckerartbooks.com) under “Nature Printing Collection”; it is signed “W H Bradbury” (Henry’s brother) on the fly leaf. This, and another copy I have seen, which is bound in red leather with similar gold blocking and lettering, were perhaps presentation copies bound by Bradbury & Evans. Some copies can be seen to have been subsequently rebound with stitching, usually if not always because the binding has become loose. Although the innovative use of gutta-percha may have been seen at the time as an effective and less costly alternative to stitching, it disintegrates with time and the fascicles become detached. Other copies appear to have been bound for the first time in a modern binding having survived for most of the intervening years as separate fascicles.

In the process of binding, the green paper covers of each fascicle as issued were usually discarded, but they can be seen in the British Library copy (catalogue number 1259.d.30). In this copy all the plates are bound along the right-hand margin, so that they are viewed on the left side of the open book, and in most cases face the first page of the chapter with the relevant text, with no intervening tissue guard. Perhaps this was how they were issued and intended. However, in some other copies, the plates are differently arranged, with some or all on the right side, not facing the text, or all assembled at the end of the book after

all the text. In most copies, there is a tissue guard or “flimsy” over each plate. However arranged, the plates of most copies are bound in sequence according to the plate number, I–LI, but in at least one copy some plates are out of sequence. The plates of most copies have foxing to varying degrees, though a copy at the British Library (catalogue number 1259.d.30) stamped “British Museum” is very clean, perhaps because of good storage conditions since it was issued. In one copy where the plates are all placed consecutively at the back of the volume, the amount of foxing differs between successive sets of three plates. These differences might be an indication that the fascicles were in different storage conditions prior to binding, or that the paper, or the degree of acidity in the paper, differs between the fascicles (Hayward, pers. comm., 2006).

Auer sent sets of *Naturelselfdruck* prints as gifts to influential people and potential customers in Europe.⁸⁸ Henry Bradbury followed this precedent, despite the fact that he did not have the financial support available to the *Staatsdruckerei*, and distributed free copies of *The Ferns of Great Britain and Ireland*, presumably in bound volumes rather than in separate fascicles. They were sent to several European heads of state (Bradbury 1860a; see Appendix), including Queen Victoria and Pope Pius IX, as well as the President of the United States. A copy with the Belgian Royal Crest on the cover, which was sold a few years ago at Christie’s (M. Hayward, pers. comm.), is probably the one that Henry Bradbury sent to the King of the Belgians, as stated in Bradbury (1860a). Bradbury’s intention may have been, at least in part, to attract sponsors for his future publications because, as a private firm, Bradbury & Evans did not receive external support to subsidise production, unlike the *Staatsdruckerei*. Bradbury received letters of thanks between January 1857 (a letter written on behalf of Queen Victoria; Fig. 37) and May

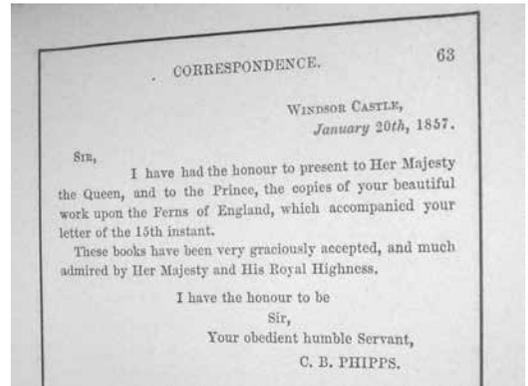


Figure 37. Letter of thanks on behalf of Queen Victoria for a complimentary copy of folio ferns (Moore 1855/56) from *Autotypography* (Bradbury 1860a). Courtesy of Edinburgh Napier University Library.

1859 (a letter written on behalf of the Pope) indicating that Bradbury sent copies to heads of state and other dignitaries over a period of two years from early 1857. Perhaps some had been sent the 1857 re-issue. The King of Prussia sent an autograph letter with the Large Prussian Gold Medal (reported in *The Times*, 7 July 1857). The Emperor of Russia sent him a diamond ring (Leighton 1857). According to a report in the *Elgin Courier* on 21 August 1857, and in the *Westmorland Gazette*, the *Exeter and Plymouth Gazette* and the *Leeds Intelligencer* on the following day, Napoleon III, Emperor (and President) of France, sent his copy back without thanks and spoiled by handling, apparently because he was offended by the way he had been referred to in *Punch* whose proprietors were Bradbury & Evans. There is no evidence that a copy of the book was sent to Auer in Vienna, but a letter of thanks on behalf of the Emperor of Austria dated 14 April 1857 was given prominence near the beginning of *Autotypography* (Bradbury 1860a). By the summer of 1859, *The Ferns of Great Britain and Ireland* was out of print. Cave and Wakeman (1967) stated that one fascicle was reissued in 1869, but I have not been able to confirm this. It is possible that there is confusion with the short

book on ferns, with text by Moore and four nature printed plates, which was published in 1869 (Moore 1869), but the nature prints were chromolithographs by Baidon and neither Bradbury nor his technique was involved.

The Ferns of Great Britain and Ireland was generally well received (Bradbury 1860a; Cave 2010). It had the considerable merit that it portrayed typically-sized fronds of all but the largest fern species, albeit folded in some cases; the frond of bracken, *Pteridium aquilinum*, is smaller than average for the species, the fronds of which can reach 2 or even 3 metres (10 feet) in length in Britain (Fig. 38). The main weakness of this impressive volume was its high price (Cave 2010). An anonymous reviewer of the first two fascicles stated,

These extremely delicate and exact figures are the best possible evidence that nature printing may and will be extensively adopted as a medium for displaying the vegetable kingdom; we had almost written for superseding herbaria ... [and finished with] ... this splendid and elaborate work ... is specially recommended to all students of this difficult order, and to all cultivators of these interesting and now fashionable plants, as a trustworthy authority; we anticipate that it will eventually be received into the lady's boudoir, and get a place among other works of art on the table of the drawing-room (1855).

Another reviewer (Art 1857), after examining some of the Viennese Nature-Prints, recognised that “the representations of flowers are less perfect than those of leaves, and the ferns are, therefore, especially adapted to the method” and was very enthusiastic about this publication but clearly considered that cost was a crucial issue. He stated,

A promising future lies before the art of “Nature-printing,” if it can be carried further in one direction, that of economy, and this, we imagine, is merely a question of time. Cheap series of prints of the British grasses, of the common trees, of noxious weeds, and the like, would be a most desirable acquisition for village and other schools....



Figure 38. Bracken, plate XLIV from folio ferns (Moore 1855/56), showing an example of a very large fern species. Compare with Fig. 46.

Sadly, this sanguine prediction of the future of Nature-Printing was not fulfilled, but these life-size fern images remain as striking examples of what can be achieved by this method and are as much prized by fern enthusiasts as they are by collectors of botanical illustrations.

4. Anonymous. ca.1858. Preparing for Publication: British Marine Algae, Nature-Printed. London: Bradbury & Evans.

A seaweed Nature-Print, labelled “*Plocamium coccineum*, Lyngb.” and “Nature Printing by Henry Bradbury,” accompanied an undated and unsigned two-page pamphlet issued by Bradbury & Evans and probably written by Henry Bradbury (Fig. 39). It advertised the octavo work on seaweeds (Johnstone and

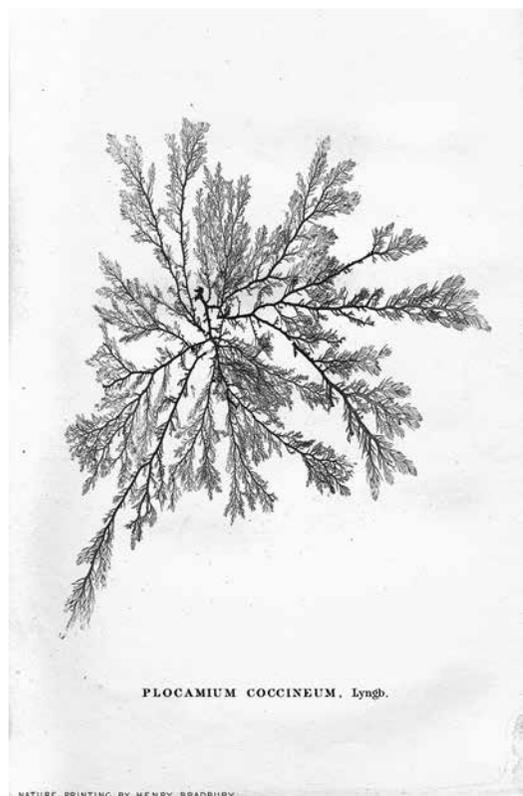


Figure 39. Seaweed Nature-Print unique to a pamphlet advertising the forthcoming publication of the octavo seaweeds. Courtesy of University of Aberdeen.

Croall 1859/60) while the books were in production. The Nature-Print was not the same as that used to illustrate the same species in the finished work.

The text began, “The Art of Nature-Printing is now so well known and appreciated in this country, through the publication of *The Ferns of Great Britain and Ireland*, that it is needless here to recapitulate the many advantages it has over engraving, however well executed: and in no department of Botany can we expect to see it so truthfully and beautifully carried out as in our Algae.”

According to the pamphlet, the finished work was expected to include 300 species illustrated by Nature-Prints, but when published it contained only 218 such prints.

The pamphlet also included the following invitation: “Specimens of Algae, and any information as to habitats, characters and geographical distribution of species, will be gratefully received, and duly acknowledged on being sent to W. G. Johnstone, Prescott Cottage, Harley Street, Battersea, London, S.W.; or Alex. Croall, 77, Castle Street, Montrose, N.B.” A copy of this rare publication (Shelf Mark: Thomson 278/2) is held in the Thomson Pamphlet Collection, Special Libraries & Archives, King’s College, University of Aberdeen. It is reproduced in colour in Cave (2010, figs 15.7 and 15.8).

5. Johnstone, W. G. and A. Croal. 1859/60. *The Nature-Printed British Sea-Weeds: A History, Accompanied by Figures and Dissections, of the Algae of the British Isles*. London: Bradbury & Evans. 4 volumes, royal octavo.

William Grosart Johnstone, F.B.S.E., and Alexander Croall, A.B.S.E, wrote the text for this work published in June 1859 (volume 1, covering part of the “Rhodospereae,” the red algae), November 1859 (volume 2, covering the remainder of the red algae), May 1860 (volume 3, covering the “Melanospermeae,” the brown algae, reviewed in the *Morning Post* for 11 July 1860) and June 1860 (volume 4, covering the “Chlorospereae,” the green algae). “June 1860” has been previously recorded as the month of publication for volume 4, but according to an advertisement in the *Manchester Courier & Lancashire General Advertiser* for 14 July 1860, it was published in July. Bradbury (1860a) stated that the size was “Royal Octavo.” Hall and Rickard gave the size of the matching set on ferns as 150 × 240 mm, close to the 150 × 250 mm currently quoted for royal octavo, but many copies were slightly shorter in height. My copy is typical of these, with dimensions of 153 × 235 mm. It has been rebound and all edges have been gilded; the pages were probably trimmed (planed) in the process, hence the reduced

height. The same may apply to other copies with slightly smaller pages.

According to Croall's friend Howden (quoted in Anonymous 1885), Croall wrote the text and prepared the drawings of microscopical details. Howden also commented, "The '*British Sea Weeds*' was nominally the joint production of W. G. Johnstone⁸⁹ and Alexander Croall,⁹⁰ but I have reason to know that nearly the whole of the work devolved on Croall, while the remuneration went to Johnstone, who died, or in some way conveniently vanished, before accounts were squared between them."

What Howden clearly didn't know was that Johnstone, who was born "William Grosart" on 22 August 1825, died, aged 35, on 22 September 1860 of scarlet fever, dropsy and "morbus cordis" (a catch-all phrase meaning heart disease) in Millbank Prison, Westminster, London. He was employed as a clerk in London from January 1858 and recorded as an "Accountant" at the time of death, and, although a member of the Botanical Society of Edinburgh, he does not seem to have left any trace of work with seaweeds. He became ill early in 1860, temporarily left London in early June 1860, and was thus perhaps unable to contribute fully to the production of the last two volumes of *The Nature-Printed British Sea-Weeds*, although the preface in volume 4, probably written by him, is dated 31 May 1860.

The cover is blind-blocked with an appropriate pattern of waves and shells round the margin and gold blocked in the centre of the front cover and on the spine with images of seaweeds, a dolphin, an anchor and a trident surrounding all the printing except the authors' names. On the front cover is the title *The Nature Printed British Sea-Weeds*. On the spine is *The Nature Printed British Sea Weeds*; and "Vol. I Rhodospermeae," "Vol. II Rhodospermeae," "Vol. III Melanospermeae," or "Vol. IV Chlorospermeae" as appropriate; and "W. Johnstone & A. Croall; 1859; London." The

original binding is not stitched but, as with *The Nature-Printed British Ferns*, held together with gutta-percha, which perishes, often necessitating re-binding. Re-bound copies were often bound in contemporary half-morocco, sometimes with gilded edges.

Each of the four volumes has two title pages: an engraved decorative page, and a main title page. The title on the decorative title page includes "Nature Printed" as on the cover, but on the main title page it states "Nature-Printed," including the hyphen as was Bradbury's usual practice. Each of the four volumes is dated 1859 on the decorative title pages, which include a small Nature-Print in a vignette (Fig. 40). A different species of seaweed appropriate to the content is shown in the vignette in each volume. The actual year of publication of each volume is shown at the bottom of the main title page under "Bradbury and Evans, 11 Bouverie Street." On the reverse of each main title page, and at the end of the fourth volume, the name is given as "Bradbury and Evans. Printers Extraordinary to the Queen. Whitefriars." For all four volumes, the decorative title page and the binding, in green cloth (and, according to Wakeman 1966, occasionally brown), were designed by John Leighton, F.S.A., a noted colour printer and a friend of Henry Bradbury. Leighton's name is printed in very small letters on the decorative title page.

After the title pages of each volume are fulsome dedications. Volume 1 is dedicated to "The late Mrs Griffiths of Torquay"; volume 2 to "Robert Kaye Greville, Esq., LL.D., Edinburgh"; volume 3 to "William Henry Harvey, Esq., M.D., M.R.I.A., etc., etc., Keeper of the Herbarium of the University of Dublin"; and volume 4 to Sir William Jardine, Bart. F.R.S., F.L.S. of Applegarth, Dumfriesshire "whose fame as a naturalist, both in the closet and field is everywhere known and acknowledged."⁹¹



Figure 40. Title page with vignette for octavo seaweeds, volume 2 (Johnstone and Croall 1859/60).

Following the title pages and dedications, only volume 4 has an authors' preface, dated "May 31, 1860," just days before publication and apparently written after all work on the contents had been completed. The preface is brief, consisting mainly of thanks to those who have provided information and specimens and answering critical comments that had appeared in the *Athenaeum*. It is signed by both authors, but the London address indicates that it was provided, if not entirely written, by Johnstone. Volume 1 has a conspectus of volumes 1 and 2; volumes 3 and 4 each have a conspectus for the relevant volume. In all four volumes, an alphabetical list of species

then immediately precedes the first species description. There is no introductory text before the species descriptions, as occurs in the companion work on ferns but at the end of volume 4 are accounts by Croall of the history of British algology, geographical distributions, structure, uses, collection and preservation methods, examination and culture techniques, synopses of families, genera and species, and a comprehensive bibliography, before the glossary and index.

This publication is probably the most comprehensively illustrated work on seaweeds issued, certainly of its time. In the main text, excluding the brief treatments in the addenda, 378 taxa are listed and described, of which 209 (55%) are illustrated. However, the proportion of taxa descriptions accompanied by an illustration falls progressively from 75% in volume 1 to 25% in volume 4. In addition to the 4 small Nature-Print vignettes on the decorative title pages, the 4 volumes contain 218 Bradbury Nature-Prints distributed through the text alongside the appropriate description, fewer than the 300 advertised earlier. Plate numbers go up to 207 (CCVII), but 9 numbers are repeated (thus: XXII and XXII^{1/2}; XLII^A and XLII^B; LIX^A and LIX^B; LXVIII^A and LXVIII^B; LXX^A, LXX^B and LXX^C; XCI^A, XCI^B and XCI^C; XCII^A and XCII^B; CXLIII^A and CXLIII^B; and CCVI and CCVI^B) because extra plates have been inserted. (Those with superscript *B* or *C* show different forms of the same species as the other plate with the same number but with a superscript *A* or no superscript. Plate XXII^{1/2} is the only plate of *Polysiphonia furcellata*, and the number is repeated in the accompanying text. It has clearly been inserted at a late stage in production.) There is one unnumbered Nature-Print among the addenda, following page 212 of volume 4. One colour plate, plate XLI, is not a Nature-Print but a hand-coloured aquatint. Every Nature-Print is protected by

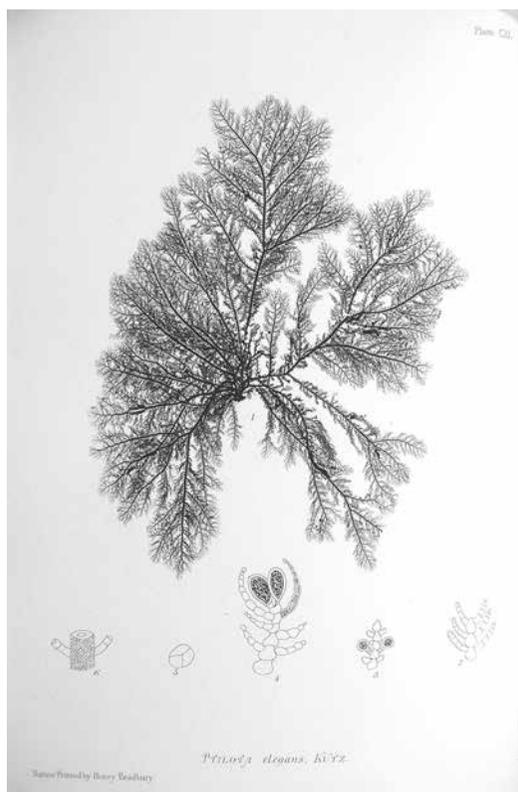
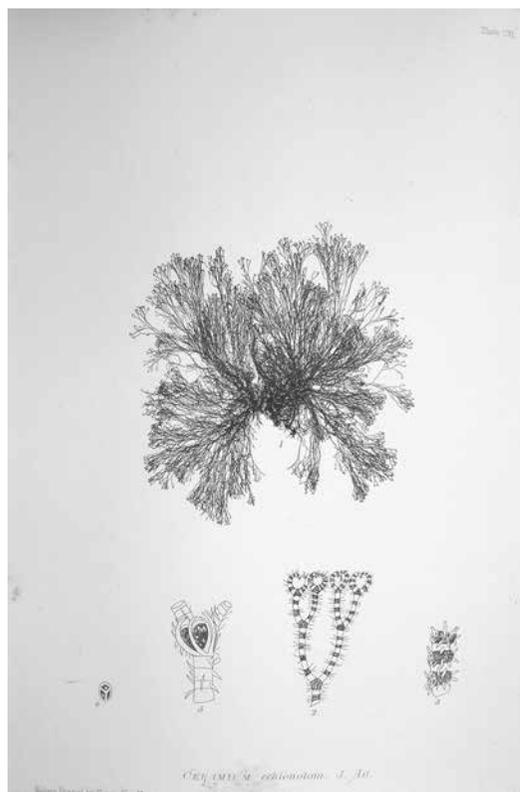
a tissue guard. (There is also one uncoloured and unnumbered plate following page 301 of volume 4, and many black-and-white, wood-cut illustrations on text pages throughout.)

For every species (except *Naccaria hypnoides* in the unnumbered plate in the addenda) there are several small, delicately detailed, engravings of microscopical characteristics of vegetative and reproductive structures and anatomy, drawn by Croall and printed intaglio with the same coloured ink as the Nature-Print (or in the case of plate XLI, the aquatint). These engravings are absent from the extra plates with superscript *B* or *C*. They are in general less detailed in volume 4, though whether this reflects the less complicated structure of the species covered or a more hurried preparation of the last set of plates, is not clear. It is not stated within the work that Croall did the dissections and original drawings, many of them requiring examination with a microscope; the engravings were probably done at the Bradbury & Evans works. On all plates the name of the species is printed intaglio in black ink at the bottom of the page and the plate number at the top. On each plate (except plate XLI) is also printed in black ink: "Nature-Printed by Henry Bradbury" (not "Bradbury & Evans" as in earlier publications). The Nature-Prints, which have no plate marks, are inserted throughout the text, each on the left side facing the appropriate page of descriptive text. Each Nature-Print portrays a single species, but numerous described species are not accompanied by a Nature-Print. Some of these are thalloid species in volume 1 that are unsuitable for Nature-Printing, but most are in volume 4, perhaps an indication that the production of Nature-Prints fell behind the publication schedule.

It can be argued that some of the seaweed Nature-Prints are the best that Bradbury produced (Figs. 41, 42). Two prints are reproduced in colour in Cave (2010, figs. 15.9,

15.10). Volumes 2 and 4 can be viewed online at Google Books. A wide range of colours is used for the different species, though only one colour is used in each Nature-Print except two (LIII and LVII), which have two colours. Many of the algae are filamentous, and the Nature-Prints of these are extraordinarily lifelike (see Fig. 19). The ink is dense, and the prints, even more strikingly than in the ferns, demonstrate the extraordinary capabilities of the technique to record fine details, in some cases including small reproductive features and epiphytes and even cellular structure⁹² (Fig. 43, see Fig. 19). Even in the more membranous species, the thin inking of the broader surfaces, which produces the unnaturally ethereal images of ferns, is sometimes less of a problem with the laminate algae because they are often translucent when alive. However, some plates (e.g., XLIII–LII, 43–52) appear to have been hand-coloured after printing. There is no obvious evidence of retouching of the copperplates.

The Nature-Prints for these volumes were being produced more than a year before publication of the first volume; according to the published *Proceedings of the Botanical Society of Edinburgh* for a meeting on 11 March 1858: "an extensive series of nature-prints of seaweeds which had been sent by Mr Johnston and Mr Croall as examples of the illustrations of their forthcoming work on the Marine Algae" were exhibited by Dr. Balfour to the society. Also in March 1858 Johnstone presented the Botanical Society of Edinburgh with a printed copy of Bradbury's lecture (Bradbury 1856a); this indicates that by that date Johnstone was in some way acquainted if not associated with Bradbury's work. The choice of seaweeds for his first octavo edition might have been prompted by the production in 1855 by the Staatsdruckerei in Vienna of Georg Ritter von Frauenfeld's *Die Algen der Dalmatischen Küste*... containing 26 folio Naturselfstdruck plates of 157 marine algae in colour.



Each volume of *The Nature-Printed British Sea-Weeds* sold at the same price as the companion work on ferns of 2 guineas (£2.2s.0d) per volume, equivalent today to almost £400 for the set of four volumes. It has been stated that it sold less well than the fern publication, perhaps because it was more expensive, the authors were less well-known, and there are some reports that at that time there was less interest in seaweeds than in ferns (although, according to a review in the *Morning Chronicle* quoted in Bradbury [1860a], “The success that has attended publication of this extraordinary volume [i.e., the folio *The Ferns of Great Britain and Ireland*] has induced Mr. Bradbury to produce a work upon ‘Sea-Weeds,’ which are even more popular as subjects of study and admiration than the ferns are”). According to Wakeman (1966) the original cost of these octavo volumes

Figure 41. *Above left*, Plate CVI from octavo seaweeds (Johnstone and Croall 1859/60).

Figure 42. *Above*, Plate CXI from octavo seaweeds (Johnstone and Croall 1859/60).

Figure 43. *Below*, Detail of plate CX from octavo seaweeds (Johnstone and Croall 1859/60). The diameter of the 5 pence coin is 17 millimetres.



illustrated by nature prints was about the same as similar contemporary works illustrated with lithographs but more than those with woodcuts, which could be printed with the letterpress. Since then *The Nature-Printed British Sea-Weeds* has been offered for sale less often than its companion set on ferns, especially in recent years.⁹³

In July 1859 Bradbury received thanks from the influential botanists Joseph Hooker (director of the Royal Botanic Gardens, Kew) and John Lindley for the complimentary copies of volume 1 that Bradbury had sent them (Bradbury 1860a). Lindley wrote that he was “charmed with the ‘Seaweeds,’” and Hooker commented, “Some of the plates seem to surpass the specimens themselves in elegance and in colouring.” In the same month Bradbury received letters of thanks from R. K. Greville at Edinburgh’s Royal Botanic Garden (to whom volume 2 was dedicated) and W. H. Harvey in Dublin (to whom volume 3 was dedicated). Although the letters do not specify what they had received, it is likely that they too had been sent copies of volume 1.

6. Moore, T. 1859/60. *The Nature-Printed British Ferns: Being Figures and Descriptions of the Species and Varieties of Ferns Found in the United Kingdom*. London: Bradbury & Evans. (Re-issued 1863.) 2 volumes, royal octavo.

Produced as a companion to the work on seaweeds, this is the best-known publication containing Bradbury Nature-Prints and the second work in what was planned as a series of octavo publications. The text is by Thomas Moore, F.L.S., F.H.S., as in the previous, folio, work, *The Ferns of Britain and Ireland*. Volume 1 was first published in October 1859 and volume 2 in June 1860 (Hall 1984) although some copies of volume 2 contain an advertisement dated 1861 (Hall and Rickard 2006). Bradbury stated that this work was the same size as the volumes on seaweeds, namely

royal octavo. Hall and Rickard (2006) gave the dimensions as 150 × 240 mm (my copies are 156 × 239 mm for the 1859/60 issue, and 157 × 241 mm for the 1863 issue), but some copies are slightly smaller than this, perhaps due to trimming during re-binding.

Production overlapped with that of the four volumes of *The Nature-Printed British Sea-Weeds*. Each volume has two title pages, a decorative one and a main title page. The title on the decorative title page includes “Nature Printed” as on the cover, but on the main title page it states “Nature-Printed,” including the hyphen as was Bradbury’s usual practice. The two engraved decorative title pages, again designed by Leighton, have different small Nature-Prints of part of a fern frond in a vignette. Both volumes are dated 1859 on the decorative title page, but the main title pages are dated 1859 for volume 1 and 1860 for volume 2. The author’s preface to volume 1 is dated “Chelsea, August 31, 1859,” that for the second volume “Chelsea, May 29, 1860.” At the bottom of both title pages of both volumes, the publisher’s name is given as “London. Bradbury and Evans, 11, Bouverie Street” and on the reverse of the title pages as “Bradbury and Evans, Printers Extraordinary to the Queen, Whitefriars”; the last page of text finishes with “Bradbury and Evans, Printers, Whitefriars.”⁹⁴

The original binding as issued is in red cloth (although at least one set was produced with red leather binding⁹⁵) but has the same blind-blocked design by Leighton around the front and back covers as the companion volumes on seaweeds, though the waves and shells are less appropriate for a book on ferns. The gold-blocking in the centre and on the spine has around the lettering a design that is based on fern fronds. On the front cover is printed “*The Nature Printed British Ferns*” and, on the spine, the same title followed by “Volume I” or “Volume II” as appropriate; “Octavo Edition;

T. Moore”; “1859” or “1863” as appropriate; and “London.” The binding process was simplified by inserting all the plates and protective tissue guards together in numerical sequence at the end of the volume in which the relevant text appeared. As with *The Nature-Printed British Sea-Weeds* volumes, the original binding was with gutta-percha, and many sets are now loose or have been re-bound. Some re-bound copies are gilded or marbled on the top or all edges.

In the preface is a discussion of the intra-specific morphological variants that were recognised, named and illustrated and their implication for understanding what constitutes a species. At one point is the comment: “We believe, however, that varieties such as these we have recorded, have a botanical significance; that they are, in fact, items in the mass of evidence by which we may assume at the conclusion that species generally have a wide range of form, even within narrow geographical limits.” It is not clear to whom “we” refers; the preface is unsigned but dated “Chelsea, August 31, 1859.” The first person plural is used frequently, including in the last paragraph when those who have assisted by providing material are thanked. It seems likely that the preface was written by Moore on behalf of himself and Bradbury. Five introductory chapters, by Moore and occupying 50 pages, survey general features of ferns, their structure, and their classification. At the end of volume 2 are several addenda—including an entry for the newly discovered *Lastrea remota* (now *Dryopteris remota*) but without an illustration—followed by a glossary and an index.

In addition to the two small Nature-Prints in vignettes on the decorative title pages, there are 122 Nature-Prints, none of which has plate marks (Figs. 44, 45). On each plate it states, “Nature Printed by Henry Bradbury,” the scientific name(s) of the fern(s) shown and

the plate number, all printed intaglio. Plate numbers go up to CXIV (114), but eight plate numbers are repeated where extra plates have been inserted. Thus there are plates LIII and LIII bis; LVI and LVI bis; LX and LX bis; LXXIII and LXIII bis; LXXVI and LXXVI bis; XC and XC bis; XCI and XCI bis; and XCII and XCII bis. These extra plates are all in volume 2 and illustrate additional forms of *Athyrium filix-femina*, *Asplenium marinum*, *Asplenium trichomanes* and *Asplenium scolopendrium* (as *Scolopendrium vulgare*). As in the earlier folio work, all the British fern species then recognised are included, together with many of the morphological variants identified within them.

Between one and three colours were used for each Nature-Print, in most cases two. (Two plates are reproduced in colour in Cave [2010, figs. 15.11, 15.12]). Apart from one plate (LXIII, 63), showing a frond of a variety of *Athyrium filix-femina* with a pink stipe, the only colours used are green and brown. Where no rhizome or roots are shown, some plates are a uniform shade of green throughout, though more often a second colour, a different green for the rachis or stipe, or a brown for the sori, stipe, rachis, and/or scales, was used. Rhizomes and roots are coloured brown; sometimes the shades of brown used on the fronds and on the rhizomes are different. Different shades of green and brown are used in different species, reflecting the characteristic differences seen in the original specimens, as for example between *Gymnocarpium dryopteris* and *Dryopteris dilatata*, but the shade used is not always accurate, as seen in plate XCIII (93) of *Ceterach officinalis*, now *Asplenium ceterach*. The lettering is printed intaglio, usually in black. As with the folio *The Ferns of Britain and Ireland* (Moore 1855/56), species with thick fronds sometimes appear unnaturally thin and membranous; conspicuous examples, in both my copies, are *Asplenium marinum*

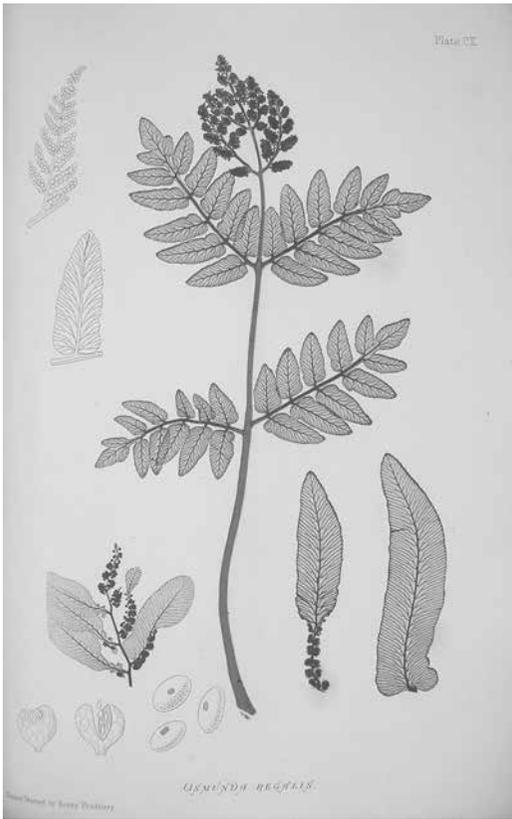


Figure 44. *Osmunda*, plate CX from octavo ferns (Moore 1859/60), showing an example of an abnormally small frond of a large fern species.

(plate LXXIII, 73; see Fig. 17), *Scolopendrium vulgare* (plate LXXXIII, 83), *Blechnum spicant* (plate XCIV, 94) and *Asplenium ruta-muraria* (plate LXXVIII, 78). Bradbury's technique had improved by the time that these octavo fern prints were produced, and there is no evidence of retouching (Harris 1970). Although cheaper, and thus more accessible, and more comprehensive in its coverage of morphological variants than the folio *The Ferns of Great Britain and Ireland* (Moore 1855/56), this work suffers in comparison by having to portray atypically small or incomplete fronds of the larger species like *Osmunda regalis* (see Fig. 44) and bracken, which can grow to 10 feet in height (Fig. 46). However,

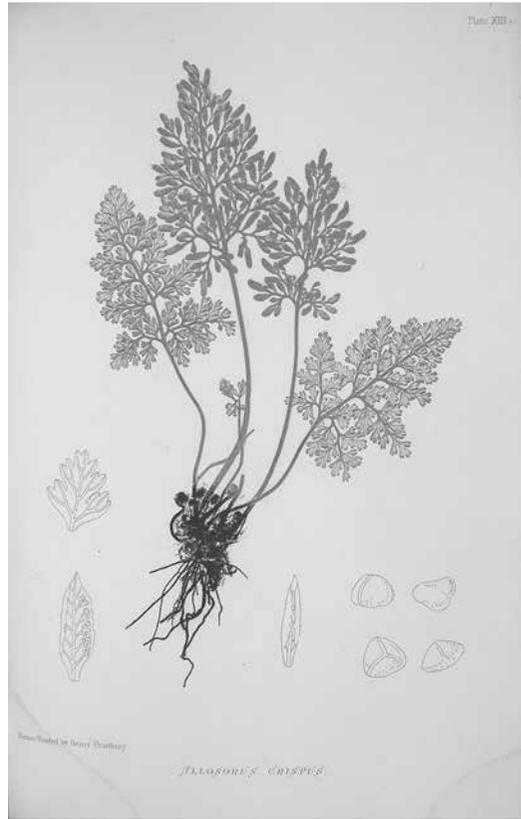


Figure 45. *Cryptogramma crispa*, plate XIII from octavo ferns (Moore 1859/60), showing an example of a complete specimen of a small fern species.

in compensation, all the plates showing the typical form of each species, together with some of the plates showing morphologically distinguishable varieties of the species, are embellished by engravings of clear line drawings of characteristic features, including spores (see also Fig. 23). The reproductive structures could have been observed through a simple lens, but the spores must have been examined through a microscope. These details are usually printed intaglio in the same shade of green as the fronds. The exceptions are sometimes intentional, such as the dark brown scale of *Lastraea (Dryopteris) dilatata* (a characteristic feature of the species) on plate XLIII (43). As with *The Nature-Printed British*

Sea-Weeds (Johnstone and Croall 1859/60), it is not stated within the volumes by whom the original dissections and drawings were executed; the engravings were probably made at the Bradbury & Evans printworks.

Each volume cost 2 guineas (£2.2s.0d or £2.10) when published, equivalent today to almost £200 for the set of two volumes. Both volumes were re-issued in 1863, three years after Henry Bradbury's death, at the lower price of £3.8s.0d (equivalent today to about £160) for the two-volume set. The red cloth cover is the same as the earlier issue, but the date on the spine is changed to "1863." The later issue has the original decorative title pages still dated 1859, but the actual date of publication has been changed to "1863" on the main title pages of both volumes. The name of the printers on both sides of the main title page is again "London. Bradbury and Evans, 11, Bouverie Street." My copy of this re-issue lacks the "Preface to Volume II," "Contents" and "List of Plates" seen in the earlier issue. Otherwise there are no obvious differences in the text, plates or paper, and they were again bound in red blind-blocked cloth. In summary, there are no consistent differences between the two issues, and it seems entirely possible that all the plates were printed at the same time and that those used in 1863 had been printed during the preparation of the 1855/56 issue. The fact that these volumes are more frequently advertised by antiquarian booksellers⁹⁶ than the other publications illustrated by Bradbury indicates that they initially sold in greater numbers.

7. Bradbury Nature-Prints reused in later works

No published or unpublished Bradbury Nature-Prints other than those listed above are currently known but some were reused in later works by other authors. The Nature-Prints bound into Cave and Wakeman (1967) were plates taken from Johnstone and Croall



Figure 46. Bracken, plate XCVIII from *octavo ferns* (Moore 1859/60), showing an unusually small specimen of the largest British fern species. Compare with Fig. 38.

(1859/60), and those in Wakeman (1984) were plates from Johnstone and Croall (1859/60) and from Moore (1859/60). Presumably, plates were taken from dismantled books. In addition, the Nature-Print providing an illustration in the Bodleian Library copy of *The Art Exemplar* by W. J. Stannard, later a.k.a. Harry Sandars (1860), is half of plate 9 (*Polygala*) from Bradbury (1854). The folio copy (said to be the author's personal copy) of Stannard (1860) in the British Museum contains a complete plate from the same source (pl. 27, [*Epilobium*]; Tim Preston, pers. comm.). A half-plate from Bradbury (1854) is also in

each of the copies of Stannard's work held by the British Library (Östlund, pers. comm.) and University of Toronto (Cave, pers. comm.). Stannard probably ordered single prints from Bradbury & Evans.

Conclusion

Auer's *Naturselbstdruck* prints and Bradbury's Nature-Prints represent the pinnacle of achievement in printing from natural objects. The method has not been used commercially in Britain since Bradbury died in 1860, and no other methods of nature printing can match the delicacy, precision and lifelike appearance of prints by the Auer/Bradbury method. Moreover, only originals have all the qualities that distinguish them from other types of print. Copy prints of Bradbury Nature-Prints are available commercially, and photographic or scanned digital images of Nature-Prints exist on the internet and in publications, but without the embossed effect they lack much of the impact and attraction of the originals. Bradbury's works have nothing to fear from ebooks. Looking into the future, it will be interesting to see whether developments in digital 3D-printing will provide a means to produce accurate replicates of original Bradbury Nature-Prints, or even print from original pressed specimens. Perhaps technological developments will initiate advances in nature printing in the 2010s, just as they did in the 1850s.

But what place do Bradbury Nature-Prints have in botanical illustration today? Despite all the alternative methods now available for producing images of plants that can be reproduced to illustrate botanical texts, methods which include photographs, black-and-white drawings, paintings and digital scans, botanists still marvel at the unique qualities of Nature-Prints produced more than 150 years ago. No other type of illustration so

closely mimics the specimen or better records the plant outline, venation and certain surface features like marginal hairs and scales. Because the representation of some features of plant morphology is so detailed and so accurate, the Bradbury Nature-Prints of ferns and seaweeds are of some botanical interest as a record of the species and varieties that were recognised at the time. However, production costs, and the fact that the technique as practised by Bradbury only can be used with pressed specimens reproduced at natural size, will surely mean that it will never be revived on a commercial scale as a method of illustration for books or as an aid to plant identification. Moreover, despite the claims made by Auer, Nature-Prints can never make herbarium specimens unnecessary. Nevertheless, Nature-Prints are of interest to printmakers. They will always have a place in the history of botanical illustration, and the method may well be revived again on a small scale in the future by individual print-making enthusiasts. Because of their attractiveness as decorative objects, Nature-Prints are also of interest more widely to collectors of botanical illustrations.

Because Bradbury's prints were produced in limited numbers over a short period, because a revival of the technique is unlikely to be commercially profitable, and because reproductions currently lack the impact of the originals, the value of Nature-Prints is amplified by rarity. This unfortunately places the books out of the financial reach of many and can lead to their destruction in order to sell as single prints. Fortunately the complete volumes can be seen in several major libraries in Britain and in some institutions abroad. Disappointment that Henry Bradbury's death denied us the pleasure of seeing more Nature-Prints in the seven planned but unpublished works is accompanied by the hope that some of the Nature-Prints being prepared for them, as well as more, early, unpublished Nature-Prints, will yet be found.

Acknowledgments

I am grateful to the following institutions and individuals: Michael St. John-McAlister at the British Library for access to a previously unknown Nature-Print and to prints of Bradbury (1854); Maria Vorontsova for information about prints of Bradbury (1854) held at the Royal Botanic Gardens, Kew; Nicholas Smith for information about copies of Bradbury (1854) at Cambridge University Library; Henry Noltie for information about, and access to, the prints of Bradbury (1854) held at the Royal Botanic Garden Edinburgh; the Wellcome Library for the History and Understanding of Medicine, London, for access to unpublished Nature-Prints and to prints of Bradbury (1854); the Royal Institution Library, the Bodleian Library Oxford, and the Victoria and Albert Museum Print Library for access to their copies of Bradbury (1854), as described in Dyer (2004); and the private owners of Bradbury (1854) for information about their copies. Copies of Bradbury (1854) in New York Public Library and United States Library of Congress were studied online. Thanks are also due to the Royal Botanic Garden Edinburgh Library, the British Library, the Wellcome Library, Dr. R. F. O Kemp, the late Graham Ackers and Michael Hayward for access to, or information about, their copies of Moore (1855/56, or 1857). Copies in the Missouri Botanical Garden Library and the New York Public Library were studied online. I thank the University of Aberdeen, the British Library, National Portrait Gallery London, the Royal Institution, and the Wellcome Library for providing digital images and permission to reproduce them as detailed in the figure captions; Marian Kirton and the Edinburgh Napier University Library for allowing me access to *Autotypography* in the Edward Clark Collection and for permission to reproduce photographs of some of the contents; Jackie Gunn, Ann Offord and Phillip Vanderwarker for help in tracing information about the Bradbury family; Rod Cave, Peter Heilmann, Caroline Marten and Barrie Stevenson for additional information by correspondence; and Pia Östlund for additional information and permission to quote a late draft of her master of arts thesis.

I would like to thank particularly Michael Hayward for much helpful discussion and information as well as for photographs of his copies of Bradbury Nature-Prints and for alerting me to relevant references that I might otherwise have missed.

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for Botanical Documentation for her guidance, assistance and meticulous editing during the preparation of this article for publication.

Appendix—a summary of the contents of *Autotypography* by Henry Bradbury

In 1860 Henry Bradbury published *Autotypography; or, Art of Nature-Printing* (Figs. 47, 48). Only one copy has been traced; the British Library copy was destroyed by bombing in World War II. Because this is a publication by Bradbury that very few people will have seen, a summary of the contents is given here.

According to the title page, it was “Printed for special circulation. 1860.” It was stated at the foot of the last page that it was printed by Bradbury & Evans, Printers, Whitefriars. No author was named on the title page, but it can be safely assumed that it was written by Henry Bradbury. It was small (140 × 90 mm; about a quarter of the size of imperial octavo) and bound in red cloth with the royal coat-of-arms in gold on the front and back covers but no other lettering. In the copy examined, the pages, which are gilt edged, were stitched but are now becoming detached from the spine and the covers; perhaps they were originally attached to the covers by glue or gutta-percha, now perished. The title page was also headed by the royal coat-of-arms. In a rectangle round each text page, including the title page, was a red line border.

Although it contained no Nature-Prints, it was in effect an advertisement for Henry Bradbury’s published and planned books illustrated by Nature-Prints. Claims of patronage of, and letters of appreciation from, several heads of state and leading scientists were given prominence; effusive reviews of the published works were quoted and uninhibited claims made for books to come. An account of Bradbury’s contribution to nature printing, written in the

third person with references to “Mr Bradbury,” was not constrained by modesty.

A Latin quotation on page 2 faced the following statement on page 3 (Fig. 49):

Under the patronage of Her Majesty the Queen, HRH The Prince Consort, The Emperor of Russia, The Emperor of Austria, The Emperor of the Brazils, The King of Prussia, The King of the Belgians, The King of Sweden, The King of Sardinia, The Sultan, His Holiness Pius IX, The President of the United States and of All Societies of Literature and Art.

On page 4 was the announcement: “Her Majesty the Queen, the Emperor of the French, the Emperor of Russia, the Emperor of Austria, the King of Prussia, the King of the Belgians, and the King of Sweden, have honoured with their approbation and acknowledgements, the first Nature-Printed work in this country, entitled *The Ferns of Great Britain and Ireland*.” On page 5 was the text of a letter dated 14 April 1857 from the Austrian Legation stating that the Emperor has accepted “The Ferns of England [*sic*] and Ireland.” Page 6 quoted a review in *The Times*: “The specimen given of this extraordinary process suffice to convince even the most incredulous of the perfect truthfulness of the method” together with an extract from von Ettinghausen’s *Physiotypia Plantarum Austriacarum* printed in Vienna in 1856, extolling the virtues of the process, though this extract no doubt referred to the work of the Imperial Printing Office under Auer rather than to Bradbury’s prints.

Pages 7 to 16 contained an article titled “Nature Printing,” an account of the history of the process and finishing with

In this country, Nature-Printing in its application to the illustration of plants, has been carried out on a large scale by Mr Henry Bradbury, in his Fern Flora of the United Kingdom, entitled *Ferns of Great Britain and Ireland with full descriptions of their different species and varieties* by Thomas Moore. Edited by Professor Lindley. Imperial Folio 51 plates; the *British Sea-Weeds*, royal 8vo, 220 plates by W G



Figure 47. Cover from *Autotypography* (Bradbury 1860a). The diameter of the 50 pence coin is 28 millimetres. Courtesy of Edinburgh Napier University Library.

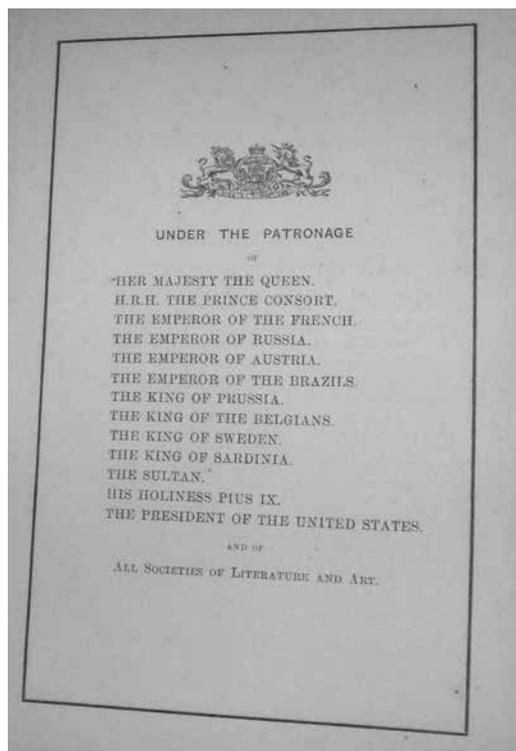
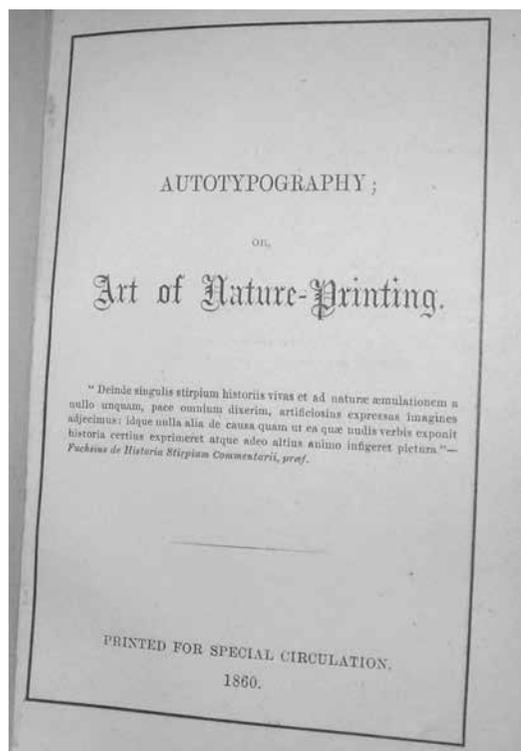
Figure 48. Title page from *Autotypography* (Bradbury 1860a). Courtesy of Edinburgh Napier University Library.

Figure 49. List of patrons from *Autotypography* (Bradbury 1860a). Courtesy of Edinburgh Napier University Library.

Johnstone and Alexander Croall; the *British Ferns* royal 8vo, 120 plates. When these have been executed, it is intended to follow with the *Trees of Great Britain*, edited by Professor Lindley; the *Exotic Ferns*, the *British Mosses*, the *British Lichens*, the *British Grasses and Forage Plants*, the *British Weeds and Wild Flowers*, and the *British Hepaticae*.

There followed on page 17 (Fig. 50) a list of abbreviated titles of the “*Octavo Series of English [sic] Nature-Printed Works*: I. *British Sea-Weeds*, 4 vols.; II. *British Ferns*, 2 vols.; III. *Trees of Great Britain*; IV. *Exotic Ferns*; V. *British Mosses*, 1 vol.; VI. *British Lichens*; VII. *British Grasses and Forage Plants*; VIII. *British Weeds and Wild Flowers*; and IX. *British Hepaticae*”; and, on page 18, part of a poem about the Lady Fern.

On pages 19 and 20 was an extract from the *Quarterly Review* for January 1858 containing fulsome praise of the folio *The Ferns of Great Britain and Ireland*. Pages 20 to



40 contained a brief announcement of the octavo *The Nature-Printed British Sea-Weeds* “now in course of publication,” indicating the contents that will appear in volumes 2–4, followed by effusive complimentary reviews (“Critiques”) of the first volume from the *Morning Chronicle*, *Gardeners’ Chronicle*, *Athenaeum*, *Chambers Journal*, *Microscopic Journal*, *Illustrated London News*, *Morning Post* and *Saturday Review*. Then followed a similar announcement of the companion work, the octavo *Nature-Printed British Ferns*, also “in the course of publication,” but this time followed on pages 41–48 by the text of the preface to the published first octavo volume (dated 31 August 1859), verbatim and complete apart from one paragraph. (The octavo preface itself repeated part of the preface to the folio *The Ferns of Great Britain and Ireland* of 1855/56.) This was followed on pages 48–53 by critiques,

in praise of the first volume of the work, from *Athenaeum*, *Daily News*, *Gardeners’ Chronicle*, and *Morning Post*.

Pages 52 to 60 contained information about the planned further volumes in the octavo series under the headings: *The Nature-Printed Trees of Great Britain—Native and Exotic*, *The Nature-Printed Exotic Ferns*, *The Nature-Printed British Mosses*, *The Nature-Printed British Lichens*, *The Nature-Printed British Grasses and Forage Plants*, *The Nature-Printed British Weeds and Wild Flowers* and *The Nature-Printed British Hepaticae*. Summaries of these statements are given in the main text of this paper.

Pages 60 to 68 contained letters to Henry Bradbury, which, according to the two-page introduction, represented the “highest possible testimonials” regarding the folio *The Ferns of Great Britain and Ireland*, copies of which he had sent to various prominent people. These

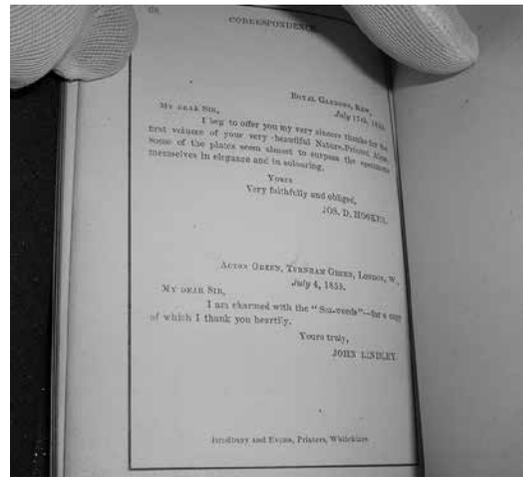
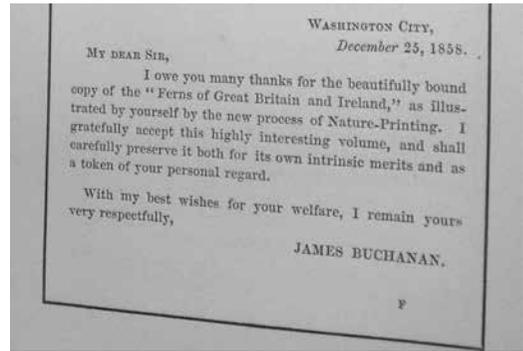
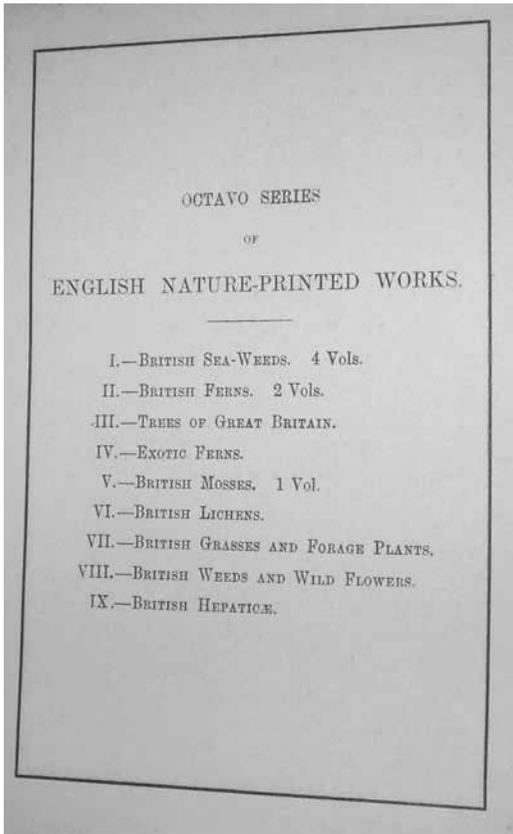


Figure 50. List of projected works from *Autotypography* (Bradbury 1860a). Courtesy of Edinburgh Napier University Library.

Figure 51. Above right, Letter of thanks from President Buchanan of the United States for a complimentary copy of folio ferns (Moore 1855/56) from *Autotypography* (Bradbury 1860a). Courtesy of Edinburgh Napier University Library.

Figure 52. Letters of thanks from J. D. Hooker and John Lindley for complimentary copies of octavo seaweeds, volume 1 (Johnstone and Croall 1859/60) from *Autotypography* (Bradbury 1860a). Courtesy of Edinburgh Napier University Library.

letters of thanks and appreciation were from: Windsor Castle, on behalf of Queen Victoria and Prince Albert, 20 January 1857 (see Fig. 37); King Frederick William, Marianbad, 19 June 1857; Stockholm, on behalf of the King of Sweden and Norway, 15 January 1858; London, on behalf of "Le Roi" (?King of the Belgians), 2 January 1858; James Buchanan (President of the United States), 25 December 1858 [Christmas Day!] (Fig. 51); Palace de Tuileries, on behalf of the Emperor, 18 April

1859; and Rome, on behalf of the Pope, 18 May 1859.

Also included are letters of thanks received for copies of the first volume of the octavo *The Nature-Printed British Sea-Weeds* (published in June 1859) from several leading botanists: W. H. Harvey, Dublin, 27 July 1859; R. K. Greville, Edinburgh, 23 July 1859; J. D. Hooker, Kew, 17 July 1859 (Fig. 52); J. Lindley, 14 July 1859 (Fig. 52).

Notes

1. "Intaglio" applies to printing from plates in which a viscous ink is retained within the recessed image and the remaining flat surface of the plate is wiped clean. This contrasts with relief plates, including letterpress, where only the raised image is in contact with the paper and no wiping of other areas is necessary after ink is applied. For intaglio printing, damp paper is laid on top of the inked plate on a flat bed and then covered with blanket layers before passing the bed between rollers, which apply several tons of pressure in a roller press. The ink is picked up from the recesses, producing a slightly embossed image, while the plate creates a depressed plate mark. Most intaglio plates, usually of copper or zinc, are engravings, etchings, drypoints, mezzotints or aquatints. The inking of relief plates is simpler, particularly if a single colour is employed, and can be done mechanically, so the whole process is quicker and cheaper. However, relief prints lack the embossed effect of intaglio prints, which is so important for nature printing.
2. In a brochure produced by Bradbury, Wilkinson & Co. in the mid-1980s, it was stated that William's antecedents were stonemasons. However, like most men in his family, William's father and at least five of six uncles who survived childhood were shoemakers or cordwainers. According to the parish baptism records, between 1740 and 1830 most of the men in Bakewell were leather workers. After that, commercial directories and baptism records reveal that several families of masons lived in Bakewell, among whom there was a Peter Bradbury (mason, ca.1811-?) and a James Bradbury (marble mason, ca.1821-?). These were perhaps cousins of William, possibly sons of his uncle Joseph (ca.1783-?) or James (ca.1787-?).
3. According to the parish registers of All Saints' Church, Bakewell, Bradbury was a prominent name in the parish throughout the 19th century, and many with that name were related to William, whose male line can be traced back at least four generations in Bakewell to John Bradbury, who died on 13 September 1724, aged 73 (Fig. 53).
William Bradbury's father, John Bradbury (baptised in Bakewell on 14 January 1776), was a cordwainer. John married Elizabeth Hardwick (baptised on 3 September 1774), daughter of William Hardwick (?-1818) and Hannah (née Elliot, 1742-1810), on 24 June 1798 in Bakewell (Fig. 54). William was their oldest child, followed

by Charles (baptised 19 April 1801), Mary (baptised 7 March 1803), Orlando (baptised 23 February 1805) and Philip Alexander (baptised 21 September 1806), all born in Bakewell. I have not traced an address for the family, though Pigot's Commercial Directory for 1835 revealed close relatives who were shoemakers in Church Street and Water Lane, both close to Bakewell's central square, and in Mill Street on the northern edge of the town. Later, John and Elizabeth might have moved from Bakewell, like their son William and daughter Mary did, because I have been unable to find records of their death or burial in the town.

John Bradbury, William's father, was the oldest of 12 children of Ralph Bradbury (1754-1833) and Hannah (née Redfearn, ?1758-1833), both of whom were born, married and died in Bakewell (Fig. 55). Ralph was a schoolmaster at Mary Hague's School, Bakewell, and the parish clerk. He was the fifth of seven children of John Bradbury (1720-1768), a cordwainer, who was also born, married and died in Bakewell, and Hannah, who was born in "Ashford" (probably Ashford-in-the-Water, five kilometres from Bakewell), and died in 1802 in Bakewell. John's father, another John, occupation unrecorded, and mother Margaret, lived and died in Bakewell.

4. Sarah's parents were John Price (?-1855), an "Officer in Excise," and Jane Price (née Riley, ?-1859).
5. Their first child was Letitia Jane Bradbury ("Jane" probably after her maternal grandmother Jane Riley), who was brought back from London on 17 August 1827 to be baptised in the church at Bakewell where they were married, a common custom. She seems to have been named after one of the witnesses at her parents' wedding, perhaps a close friend and godmother, Letitia Pegge Moore. In the parish register William's daughter's name was recorded as Lotitia Anne or, because the handwriting is not clear, possibly Leptitia Anne or Letitia Anne. In the Bishop's transcript it is clearly written as Latitia Anne Jane, with a line crossed through "Anne." Her death certificate in 1839 records her name as Letitia Jane. She died of "lung disease and inflammation of the pericardium" at 1 Clarence Terrace, Stoke Newington, on 28 February 1839, aged 11, and was buried at St. Mary's Old Church, Stoke Newington, on 9 March 1839.
6. Their third child, William Hardwick Bradbury (Hardwick after his paternal grandmother, Elizabeth Hardwick), was born in Lambeth,

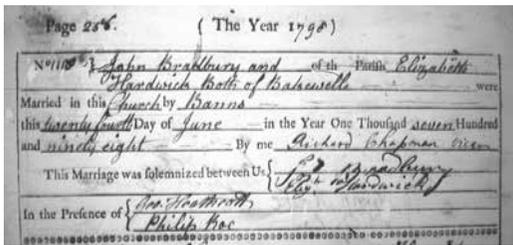
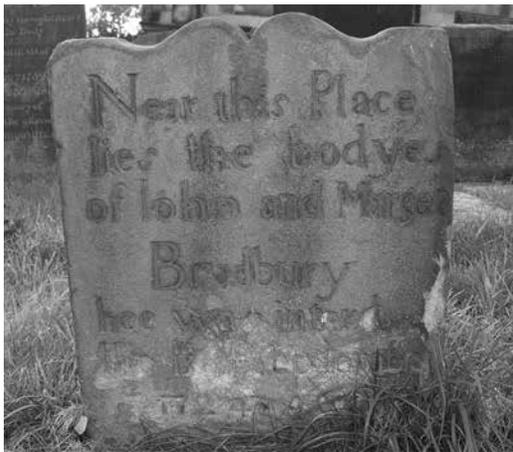


Figure 53. *Above left*, Gravestone of William’s great-great-grandparents, John (?–1724) and “Margret” (Margaret) Bradbury, in the graveyard of All Saints’ Church, Bakewell, Derbyshire, England, photograph by Yvonne Golding.

Figure 54. Parish marriage record of William’s parents, John and Elizabeth Bradbury, at All Saints’ Church, Bakewell, Derbyshire, England.

Figure 55. *Above right*, Gravestone of William’s grandparents, Ralph (1754–1833) and Hannah (?1758–1833), in the graveyard of All Saints’ Church, Bakewell, Derbyshire, England, photograph by Yvonne Golding.

Surrey, on 3 December 1832, but his baptism on 28 August 1833 was at St. Bride’s, Fleet Street, close to 22 Bouverie Street, which was given as the parental address, and the Bouverie Street and Lombard Street addresses for William’s printing firm, Bradbury & Evans. Previously, in 1825, William’s sister Mary had been married in St. Bride’s, the so-called “Printers’ Church” or “Media Church,” which has been associated with printing and journalism in the surrounding area since the early 16th century. (The octagonal tiered spire of the present Christopher Wren-designed building is said to have been the inspiration for the modern tiered wedding cake.)

At the time of the census on 6 June 1841, William Hardwick Bradbury was away at school in Marlborough Place, Brighton. From 1843 to 1848 he attended University College School, Gower Street (Patten 2004b). He was then

intended for the bar, but, before 1850 and after two years working in publishing in Dublin, he entered the family printing firm Bradbury & Evans (Patten 2004b). He moved from publishing to take over supervision of the printing side of the business after his brother Henry died in September 1860. Shortly after, on 6 December 1860, in Eccles Parish Church, Lancashire, he married Laura Agnew (?–1920), daughter of Thomas Agnew (1794–1871) of Fairhope, Eccles, who described himself as a “Print Seller” in 1860 and “Gentleman” in 1864 and was founder of Thomas Agnew and Sons, art dealers, frame makers and print sellers. Laura was sister of: Charles Swain Agnew (1836–1915), who later married William Hardwick Bradbury’s sister Edith; William Agnew (1825–1910), created a baronet in 1895; and Thomas Agnew (1827–1883), who opened a London branch of Agnew and

- Sons in London in 1860. All William Hardwick's parents and surviving siblings had travelled north for the wedding and signed as witnesses to his marriage to Laura, along with Frederick M. Evans and a Charles Hicks, but surprisingly none of the Agnew family signed as witnesses. According to the marriage certificate, William Hardwick lived then at "Upper Holborn Place, St. Pancras." As this street cannot be traced, it is probable that he was still living at his parents' address at Upper Woburn Place, St. Pancras, which was misheard by the Rev. Gooday; Holborn is usually pronounced "Hoeborn," not unlike "Woburn." In the 1860s they lived in Hampstead. By 1866 the Whitefriars business property had been transferred to him after his father retired. In 1870 William and Thomas Agnew and another brother, John Henry Agnew, joined William Hardwick Bradbury, and Bradbury & Evans became Bradbury & Agnew. In 1872 after Frederick Moule Evans resigned, the firm became Bradbury, Agnew & Co. under William Agnew, Thomas Agnew, John Henry Agnew and, as chairman, William Hardwick Bradbury, now a man of means. According to the 1881 census, William Hardwick Bradbury was living with his wife and daughters Lilian (15, who later married the 1st Baron Amulree of Scone, Perthshire), Mabel (13) and Alice Hope (11) at Oak Lodge, 63 Nightingale Lane, Clapham, together with a staff of 5 servants. The firm became a limited company in 1890, and William Agnew became chairman. In 1891 all the Bradbury family were at the same Clapham address, including his son William Lawrence, listed with the same age as Lilian and thus perhaps a twin, and stated to be a printer and publisher like his father. When William Hardwick Bradbury died at Oak Lodge on 13 October 1892, William Lawrence Bradbury became joint managing director with his uncle William Agnew. William Hardwick is buried in West Norwood Cemetery (grave 24,774, square 21); Laura remained at Oak Lodge with her unmarried daughters Mabel and Alice until the early 1900s. In 1901 Alice Hope married Major C. Duncan Murton (solicitor) and in 1911 was living with him and two servants at Cranbrook Lodge, Cranbrook, Kent. In 1911, still on private means, Laura and Mabel with two servants were in a 12-room house, Broadlands, at Sutton, Surrey. Laura died in 1920.
7. William and Sarah's third son, Walter Bradbury, was born on 6 March 1840 at 1 Clarence Terrace, Albion Road, Stoke Newington, and baptised on 7 July 1840 at St. Mary, Stoke Newington. Listed as a scholar in the 1851 census, he was an engineer's pupil and still living with his parents in 1861. In 1871 he was an engineer, married and lodging at the Marine Hotel, 1–4 Pelham Place, St. Mary in the Castle, Hastings, as was Ellen Bradbury (29, born in Arundel, and married) probably his wife. They have not been traced in later census or death records in Britain, perhaps because they went abroad. It may be the same Walter Bradbury whose wife Ellen Howe Bradbury had two children, Charles (born 6 May 1879) and Edith (born 8 July 1881; ?named after Walter's sister) in Odessa, Russia.
 8. The Bradbury's last child, Edith Bradbury (registered soon after birth as Florence but christened Edith), was born on 5 April 1842 at 6 York Terrace, Albion Road (although in the 1841 census her parents' address was given as 6 York Place, Albion Road East, SN), and baptised on 21 November 1842 at St. Mary's, Stoke Newington. Edith married Charles Swain Agnew (1836–1915), a "Merchant," of Eccles on 28 July 1864 at St. Pancras New Church, close to her parents' home. They later lived at Davenham Lodge, Northwich, Cheshire. Edith's brother, William Hardwick Bradbury, had previously married Charles' sister Laura. William Bradbury, William Agnew and Alice Ann Agnew were witnesses. Edith Agnew died in Northwich, Cheshire, in 1910.
 9. An undated letter from William Bradbury to Frederick Evans written from "10 Rodney Terrace" (Bradbury & Evans 1833–1910) may be an indication that the family lived there for a time. On the other hand, William may have been just visiting. Rodney Terrace ran along the north side of the Mile End Road between what is now Tredegar Square and Rhondda Grove, three–four miles northeast of Fleet Street and, in the 1830s, on the fringes of London.
 10. It has not been confirmed whether the Bradbury family were living in Lambeth at the time of William Hardwick's birth or whether Sarah Bradbury just stayed with friends or relatives for the birth in order to escape the unpleasant conditions of central London. Circumstantial evidence suggests that they were living there. William Bradbury's brother-in-law and previous business partner, William Dent, was living in Southwark, near Lambeth, in the early 1830s. William Bradbury's business partner at the time, Frederick Mullett Evans, and his family were also then living in Lambeth. The Bradbury and Evans families were close friends and for many years lived near each other. Both families were living in Stoke Newington from the late 1830s until some time

- in the 1840s and then both moved to St. Pancras where they lived throughout the 1850s and 1860s.
11. Number 22 Bouverie Street will have been close to the building marked "Printing Office" in the 1873 OS map. Sawyer, quoted in Patten and Leary (2004a), referred to Bradbury's daughter (Letitia) who "used to play between the two rooms in Bouverie Street," suggesting that there might have been living accommodation at that address close to one of the Bradbury & Evans premises at 11 Bouverie Street.
 12. William Hardwick Bradbury was at University College School, Gower Street, close to Upper Woburn Place, from 1843 to 1848 (Patten 2004b), suggesting that the move might have taken place in late 1842 or early 1843.
 13. Highgate West Cemetery (opened 1839) is now probably the best known of the seven major cemeteries in a ring around London opened between 1832 and 1841 when church graveyards became too crowded and unhygienic. It is now famous for the large number of prominent London citizens buried there, including the parents, wife and brother of William Bradbury's erstwhile friend, Charles Dickens.
 14. William's address is probably an error; all other references give the house number as 13. In the 1871 census Sarah's address is given as 73 Adelaide Road so "70 Adelaide Road" may also be an error.
 15. The National Archives Currency Converter gives a figure for equivalence in 2005. For consistency, this value is used throughout this article, unless stated otherwise. On this basis, a guinea (originally a gold coin minted from 1717 to 1813 with a value fixed at £1.1s. and later used colloquially until the 1970s to refer to the same value) in 1854 is equivalent to £53 today. Other estimates of modern equivalents based on average earnings are considerably higher. On this basis, a guinea in 1854 is equivalent to £667 in 2010, according to the Web site www.measuringworth.com. The annual wage of a living-in scullery maid would have been less than £10; that of an agricultural labourer, the commonest occupation, £25-£35; that of a skilled printer, about £75; that of a teacher £90-£100; that of an engineer, about £500; and that of a barrister, £1600. An annual income of £400 was sufficient for a couple with three children to employ three servants (see <http://privatewww.essex.ac.uk/~alan/family/N-Money.html>).
 16. After leaving Upper Woburn Place, Sarah Bradbury first moved to live in Hampstead, with two servants; her address was given as 73 Adelaide Road in the 1871 census. It may be just coincidence that this address is relatively close (about two miles) to the Highgate Cemetery where her husband and oldest son were buried. By the time of the 1881 census she was living with two servants at 1 Endlesham Road, Clapham, south of the River Thames. Endlesham Road is a turning off Nightingale Lane in which her second, and oldest surviving, son, William Hardwick Bradbury, lived at that time. In the 1891 census her address was given as 2 Endlesham Road where she was still "Living on own means" with a cook, parlour maid and housemaid. Her husband William had clearly left her well provided. She died in Clapham on Christmas Day 1898, aged 95, 29 years after the death of her husband William and 6 years after the death of her son William Hardwick.
 17. Felix Joyce was one of 10 children born to Mary (née Fagg) and Joshua Joyce of St. Clement Danes, London. When Felix was born, Joshua was a wax chandler of Essex Street, off the Strand. He might have known a William and John Dent, stationers in the Strand in the 1790s. Felix Joyce was christened on 19 September 1800. In 1841 he was a stationer and living next door to William Dent and family in Clerkenwell. He died in 1865.
 18. William Dent (ca.1796-1858) came from London and was described in 1828 and 1835 as a "printer" and in 1841 as a "stationer." There may be a family connection with William and John Dent, stationers, who were in the Strand in the 1780s and 1790s, and with Thomas Dent, engraver, in Lombard Street (now Lombard Lane, and where Bradbury & Evans later had their printing works), off Fleet Street, in the 1770s. William Dent married Mary Bradbury (7 March 1803-1868), William's younger sister, in St. Bride's Church, Fleet Street, on 4 June 1825. William Bradbury was a witness at the marriage. Maybe he met William Dent through mutual business interests in the Fleet Street area and then introduced Dent to his sister Mary, who had also come to London from Bakewell. For at least ten years William and Mary Dent's changes of address closely paralleled those of William and Sarah Bradbury, and it appears that the two families chose to live close to each other. William and Mary Dent's first son, Edward John (born 4 March 1826), and second son, William Henry (born 26 May 1828), were baptised together on 20 July 1828 in St. Andrew's Holborn. Perhaps the Dent family were living in St. Andrew's Parish when the boys were born. William was also living in this parish at the time of his wedding in 1826; it is possible that he was

living with his married sister. By the time of the christening of Edward John and William Henry in July 1828, the Dent family was living in St. James', Clerkenwell, no more than half-a-mile from William Bradbury's address in 1829 when Henry Bradbury was born. When the Dent's third son, Orlando Philip, born 7 August 1834, was baptised on 7 June 1835 (in "St John the Evangelist, Middlesex," presumably what is now St. John's, Smith Square) they were living at 3 Gray Terrace, Southwark, which could not have been far from the address in Lambeth where William Bradbury's son William Hardwick Bradbury had been born in 1832. In 1841, like the Bradburys, the Dents were once more living north of the river at 3 Clarence Place, St. James', Clerkenwell. Edward John Dent married in 1860 and became an insurance cashier living with his wife Hannah and children in Deptford, Kent. William Henry Dent married in 1860 and became a milliner and ladies outfitter living with his wife Harriett and children in Lee, Kent. Orlando Philip Dent, named after Mary Bradbury's two younger brothers, died in 1852 and was buried in Highgate Cemetery, where later Mary's brother William, sister-in-law Sarah and nephew Henry were buried.

19. The name Twigg features prominently in the Bakewell Parish records (many times in the 17th and 18th centuries but rarely thereafter), though whether that is significant in relation to Bradbury's acquisition of 76 Fleet Street is not known.
20. In 1829 a firm called Samuel Manning & Co. was based in the same area at London House Yard, St. Paul's. Perhaps there is a link with William's partner Manning.
21. Dunstan Court, which still exists as St. Dunstan's Court, is on the north side of Fleet Street, about 100 metres west of 76 Fleet Street. Bolt Court is the adjacent opening off Fleet Street, 20 metres to the east of Dunstan Court. London street maps of Bradbury's day (Greenwood's, ca.1830; Stanfords, 1862) show a single building between the two courts; it is conceivable that the building they occupied had doors in both courts. The open courtyards today are similar in plan, but the surrounding buildings may have been replaced.
22. Oxford Arms Passage was a lane off Warwick Lane, so it is possible that both these addresses refer to the same establishment. Oxford Arms Passage, which is no longer there, was between Warwick Square and Amen Corner, which, like Warwick Lane, still exist although few buildings in that area survived the World War II bombing.
23. Some aspects of the life and career of Frederick Mullett Evans have been described in detail by Patten and Leary (2004c). Frederick Mullett Evans was born in the City of London on 29 January 1804, son of Joseph Jefferies Evans and his wife Mary Ann (née Mullett). After school in London, he entered the printing trade with a firm in Southampton before returning to London and entering into partnership with Bradbury and marrying Maria Moule. In the early 1830s the family lived near the Whitefriars address of the firm (his son Frederick Moule Evans was born in Lambeth, just across the river, in about 1833, according to subsequent census returns, although late in life he gave his birthplace as Blackfriars). From the mid-1830s until the late 1840s, the family lived in Stoke Newington, in 1841 at Church Row, close to the home of his business partner William Bradbury. Patten and Leary (2004c) referred to twelve children of which four died young, including an unnamed daughter who died, aged five, in Worthing. The names of nine children have been traced: Frederick Moule Evans (ca.1833-?), Thomas M. Evans (ca.1835-?), George Evans (ca.1836-?), Margaret Moule Evans (ca.1838-?), Elizabeth ("Bessie") Matilda Moule Evans (1840-?), Mary Jane Moule Evans (ca.1843-?), Frances Joan Moule Evans (ca.1845-?; died aged 1), Lewis M. Evans (ca.1847-?) and Gertrude Moule Evans (ca.1848-?). Patten and Leary (2004b) referred to another son, Godfrey. Although I have not been able to confirm the birth of a son Godfrey from the records, the 1861 census lists a Godfrey Flynn Evans whose occupation was given as a "Publisher of Punch" at a date when Bradbury & Evans were the proprietors of that magazine. (Godfrey Flynn Evans was born in Bristol in ca.1835, and in 1861 was living at 38 Georgiana Street, St. Pancras, close to the homes of Frederick Mullett Evans and Frederick Moule Evans. The 1851 census revealed that aged 17 he was living with grandparents Joseph and Mary Evans in Bristol where he was apprenticed to a hatter. Also living in the house was Joseph's son Hugh Caleb Evans, younger brother of Frederick Mullett Evans. Perhaps Godfrey's uncle Hugh, who was a printer

- and bookseller, influenced Godfrey's change of career, and his uncle Frederick obtained a job for him with *Punch*. Godfrey F. Evans later became a commercial traveller selling books and living in Lewisham.) In about 1850 Maria Evans died, and in 1851 the family was scattered, with Frederick Mullett Evans in a hotel in Ramsgate with his son Thomas, and Lewis and Gertrude in lodgings in Brighton. By 1861 Frederick Mullett was living with his daughter Elizabeth and his older sister Jane M. Evans at 19 Queen's Road West, St. Pancras, in the district of St. Mark's, Regents Park and about 1 mile from William Bradbury's home next to St. Pancras New Church. Frederick Mullett Evans retired from Bradbury & Evans in 1865, and in June 1870 he died aged 67 at the nearby home of his son Frederick Moule Evans at 18 Albert Road, St. Pancras.
24. In 1841 a Thomas Bradbury from Sheffield, a producer of Sheffield-plate, also had an address in Bouverie Street, but no family relationship has been established.
 25. William Bradbury was one of the first to carve his initials in the famous *Punch* table used for these gatherings for approximately 150 years from about 1850. In his latter years he attended only occasionally, but he was in the chair for the Bradbury & Evans Annual Dinner at the Sun Hotel, Kingston-upon-Thames on Saturday, 4 August 1860, just 4 weeks before Henry died (Bradbury & Evans 1833–1910).
 26. The paper struggled initially, and the firm lost money, but the *Daily News* existed until 1912 and then, after several mergers, became incorporated in the *News Chronicle*.
 27. Lombard Street and Bouverie Street are adjacent streets opening off the south side of Fleet Street. All the various addresses for Bradbury & Evans are within about 200 yards or so of each other.
 28. They also produced hand-coloured steel engravings, as in "Mr. Facey Romfords Hounds" by R. S. Surtees (no date) and the striking reproductions of illuminated manuscripts in *Palaeographia Sacra Pictoria* (1843–1845) by John Obadiah Westwood, published by William Smith, London, and printed by Bradbury & Evans, which were chromolithographs finished by hand and heightened with gold.
 29. Joseph Paxton (1803–1865) was first a gardener for Sir Gregory Page-Turner at Battlesdon Park, then at the Horticultural Society's Chiswick Gardens, where he would have met John Lindley, who was appointed assistant secretary there in 1822, and then, at the age of 20, head gardener for the Duke of Devonshire at Chatsworth House.
- At the same time, amongst other projects, he was the publisher of several botanical works, some of which contained illustrations done by him. He was a friend of William Bradbury and cooperated with him in producing periodicals including the *Horticultural Register* and *The Gardeners' Chronicle*. Paxton was the architect of Mentmore Towers and the Crystal Palace, built for the Great Exhibition. He was also a director of the Midland Railway.
30. Alexander Bassano was a society photographer of Piccadilly, London.
 31. At the end of 1858 Dickens stopped using Bradbury & Evans as printer or publisher after the firm refused to publish in *Punch* an announcement of his separation from his wife Catherine after he had become infatuated with Ellen (Nellie) Ternan. The implication is that William Bradbury and Frederick Mullett Evans disapproved of Dickens inconsiderate treatment of Catherine, whom they knew well. In response Dickens replaced previously friendly relations with the Bradbury and Evans families with attempts to sever all contact, and he strongly disapproved of the friendship of his son Charley with "Bessie" Evans. Dickens refused to attend their marriage, at which time he said Bessie's name was "odious to me."
 32. In 1861 Frederick Moule Evans was living with his wife Amy at 8 St. George's Terrace, St. Pancras, close to his father's address. His occupation is given as "printer and publisher." Ten years later Frederick, Amy and his sister Gertrude were still living in the same area, at 18 Albert Road. However, in 1872 Frederick resigned from Bradbury, Evans & Co., and by 1881, now a master printer, he had moved with Amy and Gertrude to Beckenham, Bromley. In 1891, still listed as a printer, he was living with his wife and his widowed sister Margaret Orridge at 43 Crystal Palace Road, Beckenham. In 1901 he was retired and living with Amy at 3 St. Augustine's Road, Chartham Terrace, Ramsgate, Kent, where he died the following year.
 33. Wakeman (1984) correctly stated that Henry Bradbury was born in 1829, but according to C.W.S. (1886), Desmond (1994), Marshall (2003), Patten (2004a) and all those quoting them, he was born in 1831.
 34. Alois Auer (who translated his first name as Louis in English translations of his publications) was the director of the Staatsdruckerei (in full, the kaiserlich-königlich Hof- und Staatsdruckerei), the Austrian State Printing House in Vienna. Auer had become interested in nature printing

- in 1849, and the printworks initially produced nature prints from fossil fish using gutta-percha to make the mould and then electrotype copies from which to print (Harris 1970).
35. Patent no. 1164 communication dated 11 May 1853, sealed 28 June 1853 and filed in the Great Seal Patent Office on 11 November 1853.
 36. The Royal Institution of Great Britain in London, the oldest independent scientific research and education body, was founded in 1799. Still located in its first premises at 21 Albemarle Street where key scientific discoveries were made, it continues to bring science to the people. In the 1850s it was the leading institution for introducing new technologies and teaching science to the general public and would have provided the best opportunity for Henry Bradbury to publicise his Nature-Printing.
 37. Robert Wilmot Wilkinson was born circa 1828 in St. Sepulchre Parish, London. He was the second son of Henry Wilkinson, born in Bethnal Green, and Ann Wilkinson. In 1851 the family lived with a servant at 20 Brudenell Place, Shoreditch. Robert was described as a stationer, his older brother Henry as a plate printer and his father Henry as a master plate printer. In 1861 Robert, now in sole charge of Bradbury & Wilkinson after the death of Henry Bradbury, was described as an engraver and was living with his father, aunt, three cousins and a servant at 93 Charrington Street, Pancras. His father employed ten men and three boys. In 1871 Robert, now described as an engraver and printer, his wife Susannah and three young children, lived at 13 Upper Park Road, St. John Hampstead in some style with a nurse and two servants. By 1881 he was a bank note printer living at Copthorne, Hornsey Lane, Hornsey, with his wife, the two youngest of his four children and one servant. By 1891, still a printer, he had moved with his wife and daughters to Brooklyn, Hornsey Lane, Hornsey, and taken on three servants.
 38. These should not be confused with the British £1 and 10s. treasury notes that were commonly called *Bradburys* or *Bradburies*. Treasury notes were issued between 1914 and 1927 as emergency replacements for gold sovereigns and half sovereigns. The early ones were named after Sir John Bradbury, Secretary to the Treasury, whose signature they bear. No family relationship with William Bradbury has been established.
 39. It is not clear whether "Late" referred to his move to Fetter Lane or, if the book was published posthumously by Bradbury & Evans at the end of the year, after his death in September 1860.
 40. This book was printed for private circulation. The original of the digitised version that can be viewed on Google Books is a presentation copy with a Bodleian Library stamp. There is very little text. At the start there is the following statement: "The following exemplars are respectfully submitted to the attention of Merchants and Bankers of all Countries, as the result of the combination of artistic design and improved machinery used (exclusively) in the Engraving of Bank Notes, by Henry Bradbury, Bank Note Manufacturer. London 1860." At the end is a brief statement by T. H. Saunders about the paper used, with a sample "B & E bank note" included. Between these two texts are 51 plates (numbered I to XLVII with some numbers repeated) of examples of complex linear, elliptical, circular and spiral engraved patterns, and of watermarks, backgrounds (in colour), crests and vignettes, followed by 12 printed images of specimen notes, mostly for Brazilian denominations, presenting possible designs.
 41. After Henry Bradbury's death, Robert Wilkinson took control of Bradbury & Wilkinson, which then became Bradbury, Wilkinson & Co., and he remained chairman for over 40 years as the firm expanded. An order from Uruguay worth £1600 in 1871 was for 5,808,000 notes. Bradbury, Wilkinson & Co. continued to print postage stamps (first produced in 1871), traveller's cheques, bonds, share certificates, bills of exchange, passports and identity documents, as well as bank notes, for Britain and countries throughout the world, until they were taken over by Thomas De La Rue in 1983 (the name Bradbury, Wilkinson & Co. was still in existence, though no trading was recorded under that name, until 2005). In 1874 the firm moved to a specially constructed five-storey building on Farringdon Road, London. In 1881 the firm employed 60 men. In 1919 after Robert Wilkinson had died, the firm moved to a new building tailored to their needs in New Malden, in Surrey. Bank notes of the National Commercial Bank of Scotland and of the Royal Bank of Scotland as recently as the early 1980s bear the name "Bradbury, Wilkinson & Co." Further information on the activities of Bradbury, Wilkinson & Co. is limited by the lack of access to any archives. There is reference to "archives of Bradbury, Wilkinson & Co. Ltd." in Marshall (2003), but in a letter, Marshall, the archivist for De La Rue and previously for Bradbury, Wilkinson & Co. (pers. comm., 2003), stated that no Bradbury, Wilkinson & Co. archives are available for consultation, no

visits are allowed, and no Bradbury portraits remain and that the archives do not include any Nature-Prints from Bradbury & Evans. According to Gavin Bridson (pers. comm., 1987), Bradbury, Wilkinson & Co. were involved in security printing for so long that they treated their archives as strictly secret, and some archives were destroyed rather than have them stored in a repository with the risk of accidental release of confidential information. However, it has also been claimed that their archives were auctioned many years ago (see http://rushstamps.co.uk/gb/essays_e7.htm). Stamps from the Bradbury, Wilkinson & Co. archive were sold in 1991 and subsequently donated as the Davies Collection on public display at the British Library.

42. This date was confirmed in *The Times* obituary and on the death certificate, but C.W.S. (1886), Desmond (1994), Patten (2004a) and Cave (2010) stated 2 September. His age at death was correctly stated in the death certificate and in Marshall (2003) but incorrectly given as 29 years by Cave (2010) and C.W.S. (1886, using information supplied by Henry's friend John Leighton) and as 31 years by Wakeman (1984), on the memorial on his grave, and in the brief notice in *The Times*, no doubt supplied by a distracted father, which read: "On Saturday last, the 1st inst., suddenly, aged 31, Henry, eldest son of William Bradbury, of Whitefriars" (*The Times*, 5 September 1860, p. 1).
43. According to Greenwood's map of circa 1830, "World's End," Chelsea, on what is now the King's Road, Chelsea, was on the edge of open country. The "World's End" public house dates from the mid-17th century; it was rebuilt in 1860, at which time it was close to the northeast corner of the Cremorne Gardens, and rebuilt again in 1897. The name is now perpetuated in the district of Chelsea around this public house and in the World's End Estate, part of which overlaps the site of Cremorne Gardens, between Edith Grove and Blantyre Street.
44. John Snow's map for 1859 and the Ordnance Survey map for 1865 show that Cremorne Gardens, which opened in 1846, occupied a site of about 10 acres between the King's Road and the river, and the 1865 map includes a detailed plan (http://upload.wikimedia.org/wikipedia/en/a/a5/Cremorne_Gardens_1865_OS_map.JPG). The nearest existing equivalent is probably the Tivoli Gardens, Copenhagen, Denmark. Illustrations of Cremorne Gardens in the mid-19th century showed abundant trees, and there were wide lawns and extensive plantings of ornamental flowers, but the gardens also offered

a variety of spectacular entertainments and popular attractions including a fernery (next to a circus in the northwest corner), pagoda, bowling saloon, gypsy's grotto, maze, marionette theatre and "stereorama." The gardens were well known for band contests and displays of hot-air ballooning. In the 1850s and 1860s, the gardens opened at 3 PM and, during the afternoon and early evening, were enjoyed by many middle-class families. Later in the day, the "smart set" arrived from the coffee-rooms and theatres of the West End to enjoy the dancing, drinking and dining in the hotel and tiered "supper-boxes." Lemonade, sherry and beer were popular drinks. The grounds were illuminated after dusk when dancing began on an ornate circular platform with a central kiosk for the band; at the end of the evening there was a fireworks display before the garden closed around midnight. Several artists recorded in paintings the gardens' popularity, with up to 2,000 attending each evening (see "The Dancing Platform at Cremorne Gardens" by Phoebus Levin on Wikipedia). After later gaining a reputation for rowdiness and misbehaviour, with accusations that many of the women visitors were prostitutes, the gardens were closed in late 1877 by the then lessee, John Baum. The assets, from a theatre to boxes of claret, were sold on 8 April 1878, and within a year or two, the owner, Mrs. Simpson, had leased it out as building plots. By 1894 the area was covered with streets of small terraced houses. The area was redeveloped after being heavily bombed in World War II. The present junction of Cremorne Road and Edith Grove is close to where the centre of the gardens was; the present Chelsea Theatre is close to the site of the northeast corner of Cremorne Gardens. One of the original gates has been restored and installed at the site.

45. Robert Orridge was born in Cambridge, the son of Ann and Charles Orridge, a chemist and druggist. In the early and mid-1860s, Robert was practising in London as a Barrister-at-Law of the Middle Temple, prosecuting in the Central Criminal Court. At 41 Camden Square, St. Pancras, close to Margaret Evans' home, lived William Orridge, also born in Cambridge and, like Charles Orridge, a chemist and druggist. William, who was probably Robert's older brother, was a witness at Robert's wedding and perhaps provided the initial link between the Evans and Orridge families. After Robert's death only six years after they were married, Margaret went to live with her sister Elizabeth Dickens and family in Gloster Road, St. Pancras,

- London, later becoming housekeeper for the three younger children of Charles Dickens at 3 Albert Road, Brighton, Sussex, and then living with her brother Frederick Moule Evans in Beckenham, Kent.
46. Other witnesses were Frederick M. Evans (bride's father), Thomas M. Evans (bride's brother), Elizabeth Matilda Moule Evans (bride's sister), William Orridge (probably the groom's brother) and Richard Lloyd. Rev. Henry Moule was Margaret Moule Evans' uncle. He was vicar of Fordington, Dorset, from 1829 to 1880, and patentee of the Moule earth closet. He was the older brother of Maria Evans, née Maria Moule, the mother of Margaret Moule Evans. He married Mary Mullett Evans, older sister of Frederick Mullett Evans.
 47. Critiques of the first volumes of *The Nature-Printed British Sea-Weeds* and *The Nature-Printed British Ferns* together with references to other volumes to follow indicate that these reviews were assembled for inclusion in Bradbury (1860a) after October 1859 but before reviews were available for volume 2 of the *Sea-Weeds*, which was published in November 1859. This would suggest publication early in 1860. However, the review of *The Nature-Printed British Sea-Weeds* published in the *Microscopic Review* refers to "the late Mr Johnstone," and W. G. Johnstone died on 22 September 1860, just after Henry Bradbury. Unless the reviewer was misinformed about Johnstone's death (Johnstone had been seriously ill since the beginning of the year and at some point went into prison, so perhaps premature assumptions were made, or false rumours were generated, of his death before it occurred), this would imply a publication date after Henry Bradbury died even though much or all the content had been prepared earlier in the year.
 48. Cecilia Glaisher (1828–1892), using Fox Talbot's "photogenic drawing" process first developed in 1839, produced salt-print photographs of British ferns at natural size for a projected work, *The British Ferns Represented in a Series of Photographs from Nature*. It was planned as a companion to the standard works of the time, with specimens selected and identified by Edward Newman, at that date one of the most prominent fern experts. In a letter dated 2 May 1855 to his brother, Newman said he was preparing a new work that was "in reply to Lindley and Moore" [i.e., Moore, 1855/56] (Marten 2002). Evidently, Newman, and probably Bradbury also, saw photography as a challenger to Nature-Printing as a method for accurate botanical illustration. A prospectus for Newman and Glaisher's book, issued in 1855, stated "The process of photography is admirably adapted to making faithful copies of Botanical Specimens, more especially to illustrating the graceful and beautiful class of Ferns: it possesses the advantage over all others hitherto employed of displaying, with incomparable exactness, the most minute characters; producing absolute fac-similes of the objects, perfect in artistic effect and structure details." Twelve of Glaisher's fern prints were exhibited at the Glasgow photographic exhibition in September 1855, but the series was not completed (Marten 2013). According to Cave (2010), the first fascicle was published, but Caroline Marten, who has made a study of Glaisher, has not been able to confirm this (Marten, pers. comm., 2013). Perhaps there is confusion with the portfolio of ten mounted prints, which was presented by Newman to the Linnean Society in December 1855 (Marten 2013). The whole series was promised at a price not exceeding 4 guineas (£4.4s.0d; i.e. £4.20, equivalent now to about £205). This was expensive compared with contemporary fern publications but similar in price to Bradbury's Nature-Printed publications. Perhaps the impact of the first issues of the folio *The Ferns of Great Britain and Ireland* discouraged Mrs. Glaisher from continuing with the project, especially if there were difficulties in producing consistent prints in adequate quantities or in raising subscriptions. Bradbury and Mrs. Glaisher were both producing fern illustrations in London at the same time, but it is no mere guess that Mrs. Glaisher must have been aware of Henry Bradbury's work. Mrs. Glaisher was the first owner of the set of Bradbury Nature-Prints identified as "MF" in Dyer (2004) and now owned by her relatives in New Zealand (Caroline Marten, pers. comm.). This set is a 14-print selection referred to under Bradbury (1854) but was probably issued a few years later. A collection of Mrs. Glaisher's salt-print photographs is referred to in the online catalogue of The Fitzwilliam Museum, Cambridge, United Kingdom.
 49. Paul Pretsch (1808–1873) was born in Vienna and apprenticed as a printer under Anton von Huykul (Morgan 2009, 2010). He travelled round Austria, Belgium, Germany, Holland and Rumania studying techniques at several printing establishments before returning to Vienna, and employment at the Staatsdruckerei, in 1842. He became head of the photography department and began to develop a method of making photographs that could be transferred, using

electrotype copies, to copperplates for printing in quantity. He came to London for the 1851 exhibition, returning to Vienna some months after the exhibition closed, and was there during Henry's visit of 1852/3. Pretsch returned to London in 1854, opening his Photo-Galvano-Graphy Company in Holloway with several partners to continue improving his technique. In October 1854 he applied for a patent (no. 2373) for "Improvements in producing copper and other plates for printing." His method for printing reproductions of photographs in quantity was a technological success, but the firm was not a commercial success and collapsed later in the decade. Amid various disputes, he returned to Vienna during the 1860s.

50. In 1863 H. Fox-Talbot published a short article on photoglyphic engraving with an illustration (pl. 14) of a fern frond prepared by this method in the *Transactions of the Botanical Society of Edinburgh* (vol. 7, pt. 2, pp. 568–569).
51. In a method first used in 1849, successive layers of gutta-percha, a natural latex, were first applied to the surface of the exposed fossil on a stone. After coating the gutta-percha with graphite, the mould obtained was then covered with copper by electrolysis ("electrotyping") to form a plate with the outline of the fossil once more in relief. When inked and printed in a typographic press, an exact image, a form of nature print, of the fossil is produced.
52. Henry was not in Vienna in 1850 as stated by C.W.S. (1886), and when he did go, he was not aged 19 as recorded in the Bradbury, Wilkinson & Co. history book (Marshall 2003) or "just 21" as stated in Cave (2010) but 22 when he left London and 23 when he returned.
53. Gutta-percha is a natural latex from *Palaquium* species, trees native to Southeast Asia, which became available in the West in 1842. The latex hardens in air but is soft and malleable after immersion in hot water. It was most widely known from its use in the manufacture of "gutties," moulded gutta-percha golf balls, from about 1850 to about 1900.
54. This small book, authorship not stated but attributed to Henry Bradbury (Bradbury 1860a), is very rare. The copy once held by the British Museum is recorded as having been destroyed by enemy bombing during World War II, although it currently still appears in the online catalogue of the British Library. I have located only one extant copy, in the Edward Clark collection at Edinburgh Napier University Library (classified at 686.2209). In the 1930s this copy was purchased with money from the Edward Clark Fund for the Library of the Printing Department of Heriot-Watt College. This library was later transferred to Napier University. A price of 5 shillings is written inside the front cover in pencil.
55. A thin (0.5 mm) copperplate (9.6 × 12.5", 245 × 316 mm) was sold at auction by Sotheby's to Pickering & Chatto on 22 November 1977 (lot 285). This plate had been loosely inserted in a copy of Moore (1855/6). It appears to be a plate for the planned book on trees (Gavin Bridson, pers. comm., 1987), advertised as the third publication in the octavo series. This same plate appeared again in a sale of the library of the 17th Earl of Perth (1907–2002) by Christie's on 20 November 2003 and is now in the Houghton Library, Harvard College, United States. It formed part of lot 36, together with some Auer Naturselbstdruck prints. The Earl of Perth was a customer of Pickering & Chatto in the 1970s, and that fact, and the similarity of the dimensions and illustrations of the plate given in the 1977 and 2003 catalogues, confirms that the Houghton Library plate is the same as the one sold earlier by Sotheby's. The 2003 catalogue reveals that it is the initial electrotype copy taken from the original lead plate impression of the leaves, with a raised (relief) image. An electrotype copy of this would have to be made to produce the intaglio plate for printing. A colour photograph of the plate was reproduced in Cave (2010, p. 112, fig. 5.15).
56. George Lawson (1827–1895) was born in Forgan, Fife, grew up in Dundee and died in Halifax, Nova Scotia. After abandoning law as a career, in 1848 he began to study science at the University of Edinburgh and furthered his wide interest in plants while working as assistant curator for the Botanical Society of Edinburgh, assistant librarian at the Royal Society of Edinburgh, and demonstrator of botany and histology for J. H. Balfour, the professor of botany and keeper of the Royal Botanic Garden Edinburgh. In the 1850s he was a resident fellow and assistant secretary of the Botanical Society of Edinburgh. He was awarded the degree of doctor of philosophy from Giessen University in 1857. Frustrated by the lack of career progress in Edinburgh, in late 1858 he moved to Queen's College, Kingston, Upper Canada, as professor of chemistry and natural history, although still publishing in the *Proceedings of the Botanical Society of Edinburgh*. After five years he moved to Dalhousie, eventually becoming known as the "Father of Canadian Botany."
57. William Lauder Lindsay (1829–1880), F.R.S.E., F.L.S., was born in Edinburgh, obtained his

- medical qualification at Edinburgh University, and for most of his professional career practised as a physician at the Murray Institute (a “lunatic asylum”) in Perth until the year before his premature death in Edinburgh. For recreation he pursued his scientific interests, first in mineralogy and then, after exposure to J. H. Balfour’s teaching, botany. At Balfour’s suggestion, he studied lichens, then very neglected. He was an excellent draughtsman, winning prizes for his illustrated accounts of grasses and lichens while in Edinburgh. He collected plants in Great Britain, Iceland and New Zealand. He published in the *Proceedings of the Botanical Society of Edinburgh*. The Royal Society of Edinburgh awarded him their Neill gold medal for his work on lichens. Among Lindsay’s many publications with his own drawings was *A Popular History of British Lichens* (1856), illustrated with 22 coloured plates with up to 27 figures on each, all drawn by him. The lithographs were prepared by Fitch, and the book was published by Lovell Reeve, who later also published *Baildon’s Nature Printed Ferns* (Moore 1869). Lindsay dedicated it to the Hookers of Kew, father and son. The whole book has been digitised and can be viewed online in Google Books. This attractive and very readable account did much to popularise the study of lichens, and it may be this book that brought Lindsay to Bradbury’s attention.
58. Benjamin Carrington (1827–1893), F.R.S.E., F.L.S., was born in Lincoln and died on his 66th birthday in Brighton (Pearson 1893). A master’s degree in Edinburgh was followed by fellowship of the Royal Society of Edinburgh and of the Linnean Society in 1861. During his studies in Edinburgh, he impressed Greville, Hooker and Balfour with his illustrated monograph of British grasses. He practised medicine in several places, including Lincoln, Yeadon (near Leeds) and Southport, and was medical officer of health for Eccles for 18 years. He was a leading authority on hepatics (liverworts) and worked at the Manchester Herbarium, becoming president of the Manchester Cryptogamic Society. He produced several publications, some in the *Proceedings of the Botanical Society of Edinburgh*, but increasingly poor health over the last 20 years of his life prevented him from completing a major work on British Hepaticae. His letters are at Kew and the British Museum, and other assorted papers are at the Botany Department of Manchester Museum.
59. Haidinger, also in Vienna, was the first to suggest that the same method could be used for making Nature-Prints from botanical specimens.
60. It seems that he did not class his earlier set of prints (Bradbury 1854) as “a botanical publication” but merely a promotional exercise.
61. Edward Palmer was born in the parish of St. Bartholomew-by-the-Exchange, London, in July 1803. He later moved to St. Olave’s Parish, Southwark. He married Jemima Closs Law (1804–?) in the church of the parish where she was born, St. Giles, Camberwell. In 1830, when their only child Jemima was born, they were living in St. Giles, Southwark. In 1837 he opened a business selling “Chemical and Philosophical Apparatus” at 103 Newgate Street and advertised for an apprentice “of a decidedly mechanical genius.” In 1841 he was living at Newgate Street, Christ Church with his wife and daughter; also at that address were William Thornthwaite and Thomas Willats, both aged about 20 and probably apprentices with Palmer, two female servants, William Bolton a “shop boy” aged 15, and Martha Pope, aged 7.
- In 1839 and 1840 he was widely advertising (along with a range of optical instruments including projection microscopes, model steam engines, balances, barometers, globes, sunglasses, etc.) electrotyped pictures, equipment for producing electrotypes and books on electrotyping. He also printed books, probably produced using electrotyping. He produced a large illustrated catalogue in 1840 (see issue 189 for July 2011 in *Miscap Magazine*, www.microscopy-uk.org.uk). He advertised “New and Powerful Batteries” together with apparatus for electrotype copying of copper-plate engravings in the *Edinburgh Review* for April 1840. In another 1840 advertisement he stated, “Electrotype, or the Art of Procuring, in the most simple manner, by means of Galvanic Action, perfect Facsimiles of engraved Copper-plates of all sizes, even of the most elaborate workmanship; also correct copies of Medals, and all kinds of Metallic Ornaments; specimens of which may be seen, and the Apparatus had, of all sizes, of E. Palmer, Philosophical Instrument Maker, 103, Newgate Street, London. Prices 5s., 7s.6d., 10s.6d. and upwards.”
- In 1841 he published, with Longman & Co., Smee’s book on *Elements of Electrometallurgy* and a series of illustrations of the Art of Electrotype for multiplication of engraved copper and steel plates. He produced pamphlets on Electrotint (1841), Glyphography (1843) and Photography (1843). He was awarded a patent “Improvements in producing printing surfaces . . .” which included electrotyping, on 12 June 1841. Having energetically developed and diversified his

business for several years by employing his wide range of chemical and engineering skills, in 1844/45 Palmer sold the business to an employee, William Henry Thornthwaite (later author of one of the first books on photography), and Fallon Horne. The firm became Horne, Thornthwaite & Wood in 1846 and traded under that name for many years.

It seems that Palmer gave up his scientific work when he sold the business. In 1841 he called himself a “Chemical; and Philosophical Instrument Maker” but in 1851, an “Auctioneer and Estate Agent” living at 73 St. John Street, St. James Clerkenwell; in 1861 a “Commercial Traveller” living at 41 Thornhill Square, St. Mary Islington; and in 1871 an “Accountant,” visiting his daughter and family at their home at 3 Moorland Road, Leeds. Jemima had married John Jones, an Irish clerk, later accountant, in 1855 and by 1871 they had six children: Edward P., J. Alfred, Jemima M., Elizabeth T., Augusta and Frank H. They moved to Leeds from London about 1870. Edward Palmer’s 1871 visit to Leeds was either prolonged or repeated, perhaps because of illness. He died there in late 1872.

62. Given his reputation as first an artist, then a wood engraver and then a successful colour printer, William Dicks is unlikely to be mistaken about the process attributed to Palmer, and there is no reason to suspect that he was misinformed or had incorrectly remembered the processes that he had seen when he wrote about them more than 20 years later. It is not clear from his letter whether Dicks watched Palmer carry out the process or saw the resulting nature prints or just relied on Palmer’s reports, but Dicks is unlikely to have committed himself in a public statement if he was uncertain.
63. Palmer seems to have abandoned his scientific activities in the mid-1840s, when Henry Bradbury was still only in his mid-teens and the Bradbury family were living some distance away in Stoke Newington. However, Palmer’s business address in Newgate Street from 1837 to 1845 was only about 800 yards from Bradbury & Evans’ premises in Bouverie Street and Lombard Street, so William Bradbury may well have been aware of Palmer’s widely advertised shop. Alternatively, he might have heard of Palmer from Dicks, whom he could have known in the mid-1840s when Dicks worked in Fleet Street, close to Bradbury & Evans.
64. In addition to his activities as a medical practitioner, Branson lectured in Sheffield on electricity. He would have been well qualified to develop new applications of electrotyping.
65. The Wellcome Library (<http://images.wellcome.ac.uk/indexplus/image/V0043930.html>) has another Branson nature print in black and signed at the bottom in manuscript “Ferguson Branson Ph D, Feb^{ry} 3rd 1854.” Portrayed are three flowering plants: *Convallaria majalis*, one probably a *Geranium* sp. (though catalogued as anemone) and an unidentified plant, possibly *Lysimachia* sp. or *Cerastium* sp. The print has fine detail but is not embossed, has no plate mark and appears to have been produced by his lithographic method. This involved taking an impression in lithographic ink from the Brittonia metal plate and then transferring it to a lithographic stone, which was then used to produce an almost indefinite number of nature prints.
66. The same statement with minor differences appeared in Bradbury (1855b, 1856a). The second half of this statement also occurred in Lindley’s preface to the folio *The Ferns of Great Britain and Ireland* (Moore 1855/56) dated two months before Bradbury gave his lecture.
67. This print was selected for an exhibition *Printmaking in the Service of Botany* at the Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, in 1986. The informative catalogue, with the same name, was written by Gavin D. R. Bridson and Donald E. Wendel. Unusually, the print was accompanied in the exhibition by the intact dried specimen from which the impression was taken. Specimens were usually damaged or lost, if not at the time of removing from the lead plate when taking the impression, then in subsequent years. It was one of 23 mid-19th-century nature prints apparently prepared for a never-published book on ferns for the United States Department of Agriculture. It is printed in green ink on a 38.5 × 28 cm sheet without a plate mark. The place of printing and the printer are unknown, but they appear to have been made by the Auer/Bradbury technique but not necessarily in London or Vienna. The prints were, in 1986, held in the United States National Herbarium.
68. A “photoglyphic” engraving by Fox-Talbot appeared in an article by Piazzi-Smyth dated March 1859 and published in the *Transactions of the Botanical Society of Edinburgh* (1860, vol. 6, pl. 6). It was reproduced in Bridson and Wendel (1986).
69. Bradbury (1855a) quoted Kyhl’s published description of his complicated drying technique but did not state that he adopted the method.

- Kyhl's technique involved drying the plant specimen by placing it between layers of paper under sand and a weight in a warm oven, soaking it in water for 15 minutes and then repeating the process 4 or 5 times.
70. This is essential because with intaglio plates, unlike relief plates in letter-press machines where only the raised image touches the paper, the areas of the plate outside the image are in contact with the paper and the plate has to be wiped entirely free of ink except in the recessed image. This is only possible if the surface of the lead plate, and of any electrolytically produced copies, is entirely free of irregularities.
 71. Östlund (pers. comm., 2011) has elaborated on these observations on the basis of her experience of reconstructing the method. The lead oxidises rapidly, especially in moist air. As a consequence, the plate is no longer smooth and is thus difficult to wipe clean. Moreover, the tarnish leaves a dark residue on the paper during printing. Oxidation of the lead surface is accelerated by the application and wiping of ink. Further problems created when printing from the lead plate include lengthening of the plate each time it is exposed to the pressure of the rollers, and the tendency of the lead plate to pick up the texture of the paper and to scratch and bend easily.
 72. The Bradbury & Evans patent stated that the solution of copper sulphate was "by preference," implying that other solutions had been tried and rejected. According to Hayward (pers. comm., 2011), John Urquhart stated in his 1881 book on electrotyping that a saturated solution of copper sulphate acidified with sulphuric acid was normally used to deposit copper on blacklead moulds or metals other than iron and zinc.
 73. No information about this was given in the Bradbury & Evans patent application or in Henry Bradbury's publications describing his method (Bradbury 1855a, 1855b, 1856a). Blacklead, also called "Plumbago," consisted of finely powdered graphite, with, according to Urquhart in 1881, some iron, and this seems to be the most commonly employed treatment (Hayward, pers. comm., 2011). After applying with a brush and blowing off the excess, graphite allows electrotype copies to be made and separated without loss of detail. An article in Wikipedia states that wax dissolved in turpentine was also used (Hayward, pers. comm., 2010). Spencer's electrotyping patent specifies graphite for producing a conductive surface on wooden picture frames to aid deposition but describes the use of oil when electrotyping copper onto metal, followed by gentle heat to effect separation.
 74. Intaglio printing requires special inks that ensure binding to the paper without offsetting onto any sheets lying on top of it. Perhaps the best medium or vehicle for intaglio inks, and one of the cheapest, is linseed oil after it has been boiled, and the volatile oils burned off, to increase viscosity. In about 1850 new steam-driven ink mills led to the industrial production of inks, but coloured inks were expensive and sometimes had to be used fresh, and so many intaglio colour printers continued the tedious process of mixing their own. Although there were several ink manufacturers near the Bradbury & Evans printworks in the 1850s (including Benjamin Smith, 7 Wine Office Court, Fleet Street; George Stanbury, 4 Dean Street, Fetter Lane; Blackwell & Co., King Street, Clerkenwell), it seems likely that a firm as large as Bradbury & Evans would be able to mix their own inks, particularly as they were attempting to imitate the colours of the live plants. (According to their own brochure, Bradbury, Wilkinson & Co. were making their own inks for bank notes and other documents well after this date.) Colour at the time was provided by insoluble pigments derived from inorganic earths and metal compounds, initially natural but later synthesised, or by soluble dyes ("Lakes") derived from organic plant or animal products, which were then precipitated onto a mineral base such as alum, before incorporating into the ink. Most blue, brown and natural green colours (as distinct from greens produced by mixing) were inorganic pigments; several of the commonly used reds and yellows were organic dyes. The first aniline dye from coal tar was synthesised by W. H. Perkins in 1856, probably too late to be used for any of Bradbury's Nature-Prints. A wide range of pigments and dyes was nevertheless available in the early 1850s, but the choice depended on several factors, including their cost, their physical properties, their permanence, and their interactions with other pigments and with the copperplates. In 1841 an organic dye like crimson lake was nearly 300 times as expensive as an earth pigment like yellow ochre. Each ink had to be made to suit the different characteristics of the pigment, such as the ability to absorb oil. Organic dyes, including indigo and gamboge, were in general less permanent and light-fast than the inorganic pigments like Indian red and yellow ochre. It is necessary that the ink has no acid reaction with the copperplate that would damage the surface, and no interaction with other inks: vermilion (mercuric sulphide) turns black in contact with lead pigments, which include chrome yellow and

flake white. Two other pigments commonly used in printing inks, orpiment (a yellow pigment) and ultramarine (blue), also contain sulphur. Some of the colours widely used in printing inks were Prussian blue, gamboge yellow, orpiment and verdigris. Chrome yellow is a good base for mixing greens. The comparatively restricted palette provided by the chosen pigments can be extended by mixing two or more, either before or after blending with the medium, to produce a range of intermediates according to the proportions. At about the same time as Bradbury Nature-Prints were being produced, John Connon, in a letter to the editor of the *West of Scotland Horticultural Magazine* (July 1864), provided a list of pigments he used for ectypa (direct contact nature prints). For several years during the 1860s, Connon was head gardener to the Duke of Montrose at Buchanan Castle. At the annual show of the Glasgow and West of Scotland Horticultural Society in the City Hall on 8 June 1864, Connon exhibited an unusual variety of *Athyrium filix-femina*. This fern was almost certainly the variety later called "Victoriae." This had been found in 1861 on the Buchanan Castle estate by James Cosh (1838–1900), then a student at Glasgow University, whose family lived nearby. Alongside the plant, Connon exhibited a direct nature print of a frond. He stated that the most useful pigments for fern fronds were chrome yellow, Prussian blue, yellow ochre, burnt sienna, raw sienna, terra verte, Naples yellow and raw umber. For autumn colours in *Rubus* leaves, he also used light red. All these are the more stable inorganic pigments. To obtain a range of green colours he mixed Prussian blue with chrome yellow, yellow ochre, raw sienna or Naples yellow, or mixed terra verte with chrome yellow. Dead spots on the fronds were coloured with raw or burnt sienna, black stipes with raw umber.

75. At the same date (mid-1850s), similar copperplates were being formed by electrolytic deposition in order to make printing plates from photographs by the Photo-Galvano-Graphic Company founded by Pretsch and others (Morgan 2009, 2010). Four or five hundred good impressions could be obtained, but the plates did deteriorate, mainly as a consequence of the wear caused when cleaning off the ink before re-inking (William Bosely, manager of Pretsch's Photogalvanographic firm, quoted by Morgan 2010).
76. I have found no confirmation of colour change after printing, but notes accompanying some Nature-Prints from Bradbury (1854) now held in the *Punch* archives at the British Library revealed

that during conservation there was "some ink migration" because, with prolonged washing, some red and purple pigments are slightly fugitive. It is the red and purple inks that are most likely to have been derived from a soluble dye.

77. Shillingsburg (1992) referred to ledgers in the Bradbury & Evans archives held by Bradbury, Agnew Publishers, London, as a source of information on their accounts, but I have not been able to trace these archives. There is a collection of correspondence sent to Bradbury & Evans and some later letters and other papers (1833–1900) that were given to the Bodleian Library, Oxford in 1977 (call no. MSS.Eng. lett.d.396–398).
78. The cause(s) of "foxing," brownish spots and patches that appear when the paper is stored under humid conditions, is still debated, but there is general agreement that growth of fungi is usually if not always involved and that this is more likely to occur in paper with high acidity and/or a high iron or organic content as a consequence of the production process. The thick paper, which Bradbury used for Nature-Prints, seems to be particularly susceptible, and many examples show foxing, including the set of 14 plates of Bradbury (1854) held by Wellcome Library (see, for example, <http://images.wellcome.ac.uk/V0043911>).
79. A set of 16 "large Bradbury plates," under the title of "Bradbury (1854)" was offered for sale for 12 shillings, or single plates at 1 shilling each, in a bookseller's advertisement in a supplement of *The Western Flying Post, or Yeovil & Sherbourne Mercury*, for 16 June 1856, but this is considered (M. Hayward, pers. comm.) more likely to be the remainder of a set of 21 than a third issue of the plates in sets of 16.
80. Henry Craven Baildon (1806–1881) was a prominent pharmacist in Edinburgh with premises at 73 Princes Street. His method involved chromolithography, and, although not the first to use lithography in this way, on 15 May 1867 he registered a patent (no. 1432) for his method, which had little in common with Bradbury's technique. On 11 July 1867 Baildon exhibited to the Botanical Society of Edinburgh "a series of beautiful nature-printed ferns by a new process which he had discovered [which] is to be the subject of a patent." On 9 December 1867 he communicated his patented improvements in nature printing to a meeting of the Royal Scottish Society of Arts. The account in the society's proceedings (1867–1868, pp. 169–171) reported that Baildon stated the advantages of his

method, quoted Thomas Moore's complimentary remarks about a sheet of fern and selaginella prints sent to him by Baildon, and presented an extract from the patent specification, which detailed the process. Four Baildon folio nature prints illustrating 12 exotic fern species and native varieties, together with a few pages of descriptive text by Thomas Moore, were published in 1869 (Moore 1869). The plates were printed in several colours by Schenk & Son, a highly regarded firm of Edinburgh lithographic printers, in an attempt to reproduce the natural appearance of the specimens. However, the separately printed colours were sometimes out of register, and the ink was thick and opaque, obscuring detail, and the effect is disappointingly flat and lifeless, and far inferior to the Nature-Prints achieved 14 years earlier by Bradbury. This appears to have been a trial publication of one fascicle to test the market; Baildon stated in his introduction: "I hope to be able to turn this adaptation of Nature-Printing to practical account by the issue of further illustrated publications, should the specimen now submitted to public approval meet with sufficient support and encouragement to warrant me in believing that I can do so with a fair prospect of success." He was to be disappointed; very few copies of Moore (1869) were released (it is now one of the rarest Victorian botanical books), and the project was abandoned.

81. Heilmann (1980) included an illustration of plate 17 (as numbered on the RI list) with a date given as 1863. The basis for this date was not stated and may be a mistake; the absence of a printed plate number indicates that it is not the same issue as the Wellcome Library 14-plate set.
82. In 2001 a set of 33 prints was offered by Marlborough Rare Books at £7500, and since then two 21-print sets have been sold. One of these, an unbound set, was sold for £6,250 by Christie's in 2009. A set of 30 prints, including plates 34 and 35 absent from the RI set, was in the Sotheby's London sale (no. L12405) on 15 November 2012, with an estimate of £5,000–£7,000. It had been previously bought by the Earl of Perth for £800 in 1980.
83. They are present in the copy in the Library of the Royal Institution, London.
84. The plate contains seven specimens including at least three species. David Long (ex-head of cryptogams at the Royal Botanic Garden Edinburgh) has identified the central three specimens as *Palustriella commutata* (previously named *Cratoneuron commutatum*); at top right is a *Bryum* sp., possibly *B. pseudotriquetrum*; at bottom right is *Rhizomnium* sp., possibly *R. pseudopunctatum* (previously named *Bryum pseudopunctatum*). The identification of the other two specimens is uncertain, but they could be additional examples of *Bryum* and *Rhizomnium*. The three identified species are not closely related but could all have come from the same habitat; they are characteristic of wet sites, with *Palustriella* restricted to calcareous habitats. Perhaps all were collected together from a fen or from wet calcareous rocks. They are unlikely to have been on walls around London, so Bradbury probably relied on one of his collaborators to provide the plants.
85. Thomas Moore (1821–1887), F.L.S., was born near Guildford, Surrey, and as a young man had experience of practical horticulture and editing before Lindley's influence enabled him to become, in 1848, the curator of the Society of Apothecaries Botanic Garden (now the Chelsea Physic Garden). He stayed there until he died on New Year's Day 1887 and was buried at nearby Brompton Cemetery. He specialised in ferns but had wide interests and was heavily involved in horticultural journalism and in the Royal Horticultural Society. His insight into the taxonomy of British ferns is exemplified by the inclusion of a Nature-Print of *Polypodium* (now *Gymnocarpium robertianum*) as a distinct species when other authorities, apparently including William Hooker (1855), considered it as merely a glandular form of the common oak fern, now *Gymnocarpium dryopteris*.
86. During the 1850s, John Lindley (1799–1865), F.R.S., was honorary secretary of the Horticultural Society and professor of botany at London University, and, from 1836 until 1853, Praefectus Horti at the Chelsea Physic Garden. The reference to "Corresponding member of the Institute" on the title page might refer to the Royal Institution, to whom Henry Bradbury presented a copy of Moore (1855/56) soon after the last fascicle was issued. A highly regarded botanist and a prolific author and editor, said to be "very kind to young men" (G.S.B. 1893), Lindley was advertised (in Bradbury 1860a) as the author of the projected third octavo work, on native and exotic trees of Great Britain, to be illustrated with Nature-Prints and to be published in 1861.
87. Christie's sold a copy in 2007 for £6000 (sale 7467, lot 32); Bloomsbury Auctions sold a copy on 23 September 2010 (sale 744, lot 294) for £6,200, which had been bought in 1965 for £32. In 2013 a copy in the United States was advertised online at nearly £6,000.

88. Cave (2010) stated that Auer sent very large albums as gifts to the major courts and learned societies of Europe. According to Hayward (pers. comm., 2013), at least the octavo issue of Auer (1853) with 12 Quarto Naturselfbdruck prints was given away to academics. Östlund (2013) described an undated cloth-bound box labelled "Naturselfbdruck" containing about 50 loose folio Naturselfbdruck prints and a copy of "Die Entdeckung..." (Auer 1853, 1854) and referred to "box sets" being sent free to learned societies and potential clients.
89. Unlike Bradbury's other collaborators, William Grosart Johnstone (1825–1860) rarely features in published accounts of botanists' lives and even then all that is reported is that he died about 1860 and was author of only one published work, *The Nature-Printed British Sea-Weeds*. Because so little information about him is readily available, the result of researching in old parish and census records and other documents is presented in some detail below.

He was born William Grosart on 22 August 1825, son of William Grosart and Mary Balloch, who lived at Stirling Port, St. Ninian's Parish, Stirling. As William Grosart Junr., he was married to Jane Douglas Johnstone on 3 June 1846 in Falkirk by the Rev. William Welsh, minister of the Relief Chapel there. At the time he was living in Barony Parish in Glasgow, and Jane lived in Gorbals Parish (once part of Govan, Lanarkshire, but part of Glasgow from 1846), and in both parishes the proclamations were read three times on the one day (May 31) rather than on three successive Sundays, which was unusual and suggests that the wedding was hurriedly arranged. Jane Douglas Johnstone (birth recorded as "Johnston" but in other records her name is given as "Johnstone"), daughter of Christopher Johnston(e), "Wood forester," and Agnes Stevenson, was born on 30 October 1822, at Kenbridge, Balmacellan, Kirkcudbrightshire, possibly where her parents were born and raised. William's name was again given as William Grosart when his son William Johnstone Grosart (later recorded as William Grosart Johnstone) was born on 1 September 1847 at Govan, Lanarkshire. However, William Grosart then seems to have adopted his wife's surname and was recorded as William Grosart Johnstone when their daughter Mary Grosart Johnstone was born on 3 June 1849 and again later when two subsequent children were born. Mary was born at Maryholm Cottage, Terregles, near Dumfries. Neighbouring Maryholm (Farm) still exists, but the Cottage

has gone from the site beside the north bank of the River Nith, now undeveloped land near Nithside on the northern fringe of Dumfries. The Johnstones were still at that address in March 1851 when William was recorded as "Landed Proprietor." Another daughter, Jane Douglas Johnstone, was born on 20 July 1851 at Dawson's Cottage, Dumfries; a third daughter, Jessie Johnstone, was born on 11 August 1853 in "Dumfries," at which time William is recorded as "Bookseller." All three daughters are recorded in the 1861 census as being born in Dumfries. These records suggest that William did not move to London until after 1853. This is confirmed in 1854 by announcements in the *London Standard* (4 August 1854) and the *Dundee Chronicle* (9 August 1854) that, under the heading of Sequestrations, "William Grosart Johnstone, bookseller of Dundee" was declared bankrupt.

Johnstone appears to have had some botanical credentials. "F.B.S.E." after his name on the title page of *The Nature-Printed British Sea-Weeds* (Johnstone and Croall 1859/60) no doubt refers to "Fellowship of the Botanical Society of Edinburgh" (now the Botanical Society of Scotland). In the 1858 and 1860 membership lists of that society, he was listed as an "ordinary member" although by then living in London. In 1858 (12 March, according to a signed inscription on a title page), he donated a copy of the text of Bradbury's lecture (Bradbury 1856a) to the "Edinburgh Botanical Society Library" (later absorbed into the Library of the Royal Botanic Garden Edinburgh where it can still be found). There are no separate lists of fellows but a minority of the men ("Lady Members" was a separate category) in the list of ordinary members was identified as a "Resident Fellow" or as one of "those who, though Non-Resident, continue to pay as a Resident Fellow." An application for election as a resident fellow requires support from at least two existing resident fellows. Johnstone is not recorded as a resident fellow in either list. Whether or not Johnstone was a fellow in 1860 when he put "F.B.S.E." after his name, he had before then collected a few herbarium specimens, in the hills of Dumfriesshire, which still survive. He seems to have specialised in rare ferns and flowering plants, and there is no confirmation of an interest in seaweeds. His specimens at Manchester University herbarium include one of *Primula scotica*, one of the hybrid fern, *Asplenium ×alternifolium*, and three of Britain's rarest fern species, *Woodsia ilvensis* (see <http://herbariaunited.org/199396, 199419, 200592, 215749 and 215843>).

The *Woodsia* specimens were collected in 1853 and 1855, probably at the site in the Moffat Hills described by Johnstone in the companion work *The Nature-Printed British Ferns* (Moore 1859/60, 2:281). Perhaps it was Moore who introduced Johnstone to Bradbury.

The *Woodsia* collection dates indicate that he was probably still living in southwest Scotland in 1855 but moved to London in 1856 or 1857. According to the *Proceedings of the Old Bailey* (Ref. Nos. t18600813-710 and t18600813-710), he was taken on, without a testimonial on the recommendation of a customer, as a clerk to Robert Wyllie, warehousman, of 21 Watling Street (next to St. Paul's Cathedral) on 25 January 1858. The 1858 membership list of the Botanical Society of Edinburgh, gave his address as 13 Harley Street, Battersea, London. At the end of the advertisement dated circa 1858 for the octavo book on seaweeds, his address was given as Prescott Cottage, Harley Street. (Harley Street was a side street to the west off Battersea Bridge Road almost opposite Ethelberga Street; the site now lies within the Surrey Lane Estate.) It seems likely that Johnstone came to London without his family. Shortly before he was arrested, he returned to Dumfries, presumably to his family home. In London he was a friend of Thomas Moore and his wife Elizabeth from early 1859, and his work colleagues knew that he was working on a book. Perhaps he came to London in order to facilitate the link with Bradbury during the production of the books on seaweeds; he appears to have been in some way associated with Bradbury's work by March 1858 when he presented a copy of Bradbury's lecture (Bradbury 1856a) to the Botanical Society of Edinburgh. However, it is not clear what Johnstone's contribution was to the production of *Nature-Printed British Sea-Weeds*. According to Howden, in an appreciation of Johnstone's co-author Croall (quoted in Anonymous 1885), "The microscopic drawings were by himself (i.e., Croall) as was also the letterpress." Perhaps, as a clerk/accountant, Johnstone managed the finances of the project. If by then Bradbury was having difficulty in meeting the cost of producing *Nature-Prints*, maybe Johnstone was involved in the financial management of the seaweed publication. The address "14, Park Place, Liverpool Road, Islington, May 31st, 1860" given at the end of the authors' preface in volume 4 may be an indication that by that date he had moved to that address even though the Botanical Society of Edinburgh still gave the Battersea Road

address in the 1860 membership list. (Park Place was a terrace of small houses along Liverpool Road opposite the entrance to Barnsbury Park.) When he died after a nine-month illness on 22 September 1860, three weeks after the death of Henry Bradbury, he was in Millbank Prison. Millbank Prison, on the site now occupied by Tate Britain, was London's largest prison, accommodating up to 1120 prisoners including all those from throughout Britain who were facing deportation. Johnstone's prison record has not been traced, but the *Proceedings of the Old Bailey* (ref. nos. t18600813-710 and t18600813-711) reveal that on 13 August he was found not guilty of stealing three books from his employer but guilty of embezzling three sums of money totalling £22.9s.2d. (equivalent to about £1,000 today) from the business and sentenced to four months penal servitude. In his employment he was entrusted with a lot of responsibility for financial management and stock taking while Robert Wyllie was out of London and had been considered of the "highest character for honesty." The money he embezzled was payments to Wyllie's business from Elizabeth Moore (wife of Thomas Moore) and her sister; he issued receipts but did not enter the transactions in the cash books and ledgers. By that time, in April and May 1860, he was very ill, "almost unable to write," having fallen ill about March after several weeks with a sore throat. The missing books were the cash books and ledgers in use at the time. They were found to be missing on 5 June, the day after Johnstone left Wyllie's employment and was then traced to Dumfries and finally Edinburgh, where his brother, a minister, lived. (The minister was possibly Alexander B. Grosart, born 1828/29 in Stirling, who was a student in Edinburgh in 1851 and a United Presbyterian clergyman in Kinross in 1861.) Later investigation of available records revealed a deficiency of over £2,000 (equivalent to more than £90,000 today). William's wife, Jane D. Johnstone, who was recorded as present at his death, gave her address then as "196 North Street, Glasgow." The census revealed that in April 1861, Jane, an "accountant's widow," and her four children were living, with a servant, at 2 High Street (now next to Dollar Museum), Dollar, Clackmannanshire. Jane was not working, the children were all attending school and they had a servant girl, all indicating that William had left them comfortably provided for. Twenty years later she was back at Balmacellan where she was born, living with her youngest brother, Anthony Stevenson Johnstone, at Johnstone's Cottage, a

two-room cottage on the road (now the A713) between Ken Bridge and Garpelfoot (Garpelfoot), perhaps their original family home. She was still there living on her private means with her brother in 1891. She died in Dalry village on 27 September 1892.

90. Alexander Croall (1809–1885) was born in Brechin, Angus (Anonymous 1885). He displayed an interest in books and natural history from an early age but was apprenticed as a joiner. Having abandoned his trade he studied at Aberdeen University and became a schoolteacher at a succession of schools in the Montrose area. It was at this time that he began seriously to pursue his interests in several branches of natural history. He was interested in mineralogy and geology and was a good zoologist concentrating on conchology and entomology, but he devoted most attention to botany, making special studies of fungi, lichens and mosses as well as algae. Together with his knowledge of the local flowering plant flora, this made him one of Britain's leading botanists, albeit a very modest and unassuming one. "A.B.S.E." after his name on the title page referred to his election as an associate of the Botanical Society of Edinburgh in 1838. Those elected as an associate were "persons who have acquired a claim on the Society by sending communications or by contributing to the Herbarium." In 1860 there were 23 associates including Alexander Croall. As a recognised botanical authority, Croall corresponded with Darwin, Hooker and Balfour among others. In about 1855 he was invited by William Hooker, director of Kew Gardens, to compile a herbarium of plants around Balmoral for Queen Victoria. In 1859 he was teaching at the Sessional Schoolhouse, Montrose, and writing *The Nature-Printed British Sea-Weeds* in the evenings. At this time he was living at 77 Castle Street, Montrose. His herbarium of flowers and ferns is mainly in Manchester and Bolton, but his collection of seaweeds, about 1500 items, is in the Stirling Smith Art Gallery and Museum, Stirling. In 1863 he became the first librarian and keeper of the herbarium at the City of Derby Library and Museum and then in 1873 the first curator of what was then the Smith Institute, Stirling.
91. Amelia Warren Griffiths (1765–1858), often referred to by contemporaries as "Mrs Griffiths of Torquay" moved to Torquay from Cornwall with her five children in 1829 after her husband, the Rev. William Griffiths, died. She was an amateur phycologist and a close friend and correspondent of William Henry Harvey, who dedicated his *Manual of the British Algae* to her. With her friend

Mary Wyatt, she produced *Algae Danmoniensis* (1833) in 2 volumes, each of 50 different pressed seaweed species that she had collected. In subsequent years, she produced volumes 3 and 4. The red alga genus *Griffithsia* was named after her by Carl Agardh.

Robert Kaye Greville (1794–1866), M.P., cryptogamic botanist, microscopist, artist, illustrator and antislavery campaigner, lived in Edinburgh for the last 50 years of his life and wrote several botanical, mostly cryptogamic, works including *Flora Edinensis* (1824), *Icones Filicum* (with W. Hooker, 1829–1831) and, significantly in the present context, *Algae Britannicae* (1830). He had a special interest in diatoms. His surviving letters reveal a regular correspondence with William Jardine. He was one of the founders in 1836 of the Botanical Society of Edinburgh and honorary secretary of the society in the late 1850s. A more detailed account of his life can be found in the *Oxford Dictionary of National Biography* (2004).

The Hon. William Henry Harvey (1811–1866) was an Irish botanist with an interest in algae and mosses since childhood. Among other publications, he wrote *A Manual of the British Algae*, ed. 1 (1841) and *Phycologia Britannicae* (1846–1851). William Hooker was his mentor and life-long friend. His entry in the *Oxford Dictionary of National Biography* (2004) provides more information.

William Jardine of Applegirth (7th Baronet, 1800–1874), F.R.S., F.R.S.E., was best known for his interest in, and publications on, fish and birds. After attending Edinburgh University he lived at Jardine Hall, Applegirth (also referred to as Applegarth), about 15 miles northeast of Dumfries. He was a friend of R. K. Greville and a member of the Botanical Society of Edinburgh, and his writings appeared in the society's proceedings. See the *Oxford Dictionary of National Biography* (2004) for a more detailed account of his achievements.

Accompanying William Jardine's obituary in the *Proceedings of the Berwickshire Naturalists Club* for 1873–1875 is an extract of a Dr. Johnston's journal of a visit to Jardine Hall in 1844 in which it is recorded that Sir William had relatives called Johnstone living "close at hand." Parish records reveal Johnstone/Jardine marriages in the Dumfries area in the 1820s. In 1849 W. G. Johnstone, born W. Grosart and one of the authors, his wife, born Jane Douglas Johnstone and their children were living in Terregles Parish, close to Dumfries and only about six

- miles from Applegirith. Jane was born about 20 miles away. Thus, until records prove otherwise, the possibility remains that there was a family connection between Jane Douglas Johnstone and Sir William Jardine, and that this in some way had a bearing on the dedication of volume 4.
92. Before this work was published, Dresser had criticised the method on the grounds that it damaged “tender” plants (Dresser 1857), but Bradbury responded (Bradbury 1857a) by stating “Specimens certainly have been shattered through unskilful manipulation, but this by no means constitutes a defect in the process; with regard to his [i.e., Dresser’s] assertion that this is a defect specially resulting in the case of tender plants, I can only reply that the most tender plants are the most applicable to the metal pressure process. Take the whole of the seaweeds, and also the most delicate fronded ferns, the perfectly undisturbed reproduction of which fine substances is truly marvellous.”
93. I bought a set of 4 volumes in 1960 for £3.10s.0d (£3.50, equivalent today to about £55); through the 1980s and 1990s, it occasionally appeared on dealers’ lists at £300–£400 and, more recently, at higher prices. In an auction by Bloomsbury Auctions in April 2008, a set sold for £750; another re-bound set sold in 2010 (Bloomsbury Auctions, 23.9.2010, sale 744, item 295) for £450. At an auction in the United States in 2009 the estimated sale price was \$1000–\$1500, but it has recently been offered for sale by antique book dealers in the United States at \$2,500 and \$6,000. Individual plates were offered at \$45 each in 2007.
94. One copy seen has a different main title page in both volumes: there is no date, and “Bradbury and Evans” is replaced by “Bradbury, Evans, and Co.” on both sides. Both volumes have been re-bound (not using gutta-percha), probably before 1900. It seems that a title page has been replaced some time after 1865, the year that the firm changed its name to Bradbury, Evans and Co. The new title page appears to have been specially printed. Perhaps the book was sent to Bradbury, Evans, and Co. for re-binding.
95. A set sold by Bloomsbury Auctions (sale 744, 23.9.2010) is described as being in the “original publisher’s de luxe binding.” It is bound in red leather with the same gold-blocked fern-decorated lettering as the cloth version, which confirms that it is by Bradbury & Evans, but the blind-blocked wave and shell motifs are absent. There is no indication whether it was a “one-off” special order or a generally available but rarely chosen luxury alternative to the cloth binding.
96. I bought a set of the 1863 re-issue in 1960 for £1.10s.0d (£1.50, equivalent today to about £23). A set of the 1859/60 first issue was bought in 1990 for £150 (equivalent today to about £230). Sets recently advertised on the internet are priced in the United Kingdom at £300–£650 (the set featured in note 94 above was valued at £650) depending on condition and binding, sometimes more in the United States. On one site, individual plates are offered at £37 each. Copy prints are also available commercially.

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- of nature printing” in English, German, French and Italian in a book together with two other pamphlets, “Debates on the rights of property with new inventions” and “The conduct of a young Englishman named Bradbury at the Imperial and Government Printing Office.” This was the only version offered for sale.]
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