

“Agricultural Chymistry is at present in it’s infancy”: The Board of Agriculture, The Royal Institution and Humphry Davy

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Abstract

In this paper I sketch the institutional interactions between the Board of Agriculture and the Royal Institution in the late eighteenth and early nineteenth centuries. This includes analysing the composition of memberships and committees of both bodies in which, inter alia, I challenge Morris Berman’s account of their institutional relations. A key figure was Humphry Davy who, because of his career ambitions, occupied a slightly uncomfortable position as Professor of Chemistry to both organisations. Davy’s lecture notebooks and his subsequent publication Elements of Agricultural Chemistry reveal that he drew almost all his direct knowledge of the subject from Britain and Ireland. Yet, despite such parochial shortcomings that might be expected of an infant science at time of war, the popularity of his book, particularly in North America, provided continuity between the end of the Board of Agriculture in 1822 and the start of the impact of Justus Liebig’s work in the 1840s.

The Board of Agriculture

On 21 January 1793 the deposed King of France, Louis XVI (1754-1793), suffered guillotining on the orders of the Jacobin dominated National Convention of the new French Republic. A few days later, France, already fighting Austria and Prussia, declared war against

Britain, the Netherlands, and Spain. One crucial issue facing the British government, led by the Tory Prime Minister from 1783 to 1801, William Pitt (1759-1806), was whether the country could feed itself or not. This was a particularly pressing problem because of the perception that one contributory reason for the Revolution was the occasional outbreak of famine in France. One response of the British government was the establishment in 1793 of a Board of Agriculture and Internal Improvement.

Although the Board and its work have been discussed in several general histories of the period,¹ suggesting an apparent significance, only two published studies have been devoted solely to the Board: a short book by Ernest Clarke in 1898 and an excellent paper by Rosalind Mitchison published in 1959, as well as an unpublished 1955 MA thesis by Winifred Harrison.² Mitchison, although she referred briefly both to the Royal Institution and Humphry Davy (1778-1829), did not appreciate how precisely they and he related to the Board. On the other hand Morris Berman in his 1978 book Social Change and Scientific Organization,³ overstated, as we shall see, the significance of the Board for the Royal Institution and to some extent for Davy. Berman's study generally enjoyed good reviews,⁴ and so his text has sometimes been used uncritically.⁵ On the other hand, Steven Shapin criticised aspects of Berman's use of evidence,⁶ whilst Maxine Berg severely concluded that

¹ For example, Elie Halévy, Histoire du peuple anglais au XIXe siècle I L'Angleterre en 1815 (Paris, 1912), 212-14; Asa Briggs, The Age of Improvement (London, 1959), 39-40, 163; Boyd Hilton, A Mad, Bad, and Dangerous People? England 1783-1846 (Oxford, 2006), 135, 137.

² Ernest Clarke, History of the Board of Agriculture 1793-1822 (London, 1898); Rosalind Mitchison, "The Old Board of Agriculture (1793-1822)," English Historical Review 74 (1959): 41-69; Winifred Harrison, The Board of Agriculture, 1793-1822 with Special Reference to Sir John Sinclair (University of London MA thesis, 1955).

³ Morris Berman, Social Change and Scientific Organization: The Royal Institution, 1799-1844 (London, 1978).

⁴ For example, Michael Neve, Isis 70 (1979): 623-5; Gerrylynn K. Roberts, British Journal for the History of Science 13 (1980): 154-7; and Charles Webster, Journal of Modern History 51 (1979): 341-3.

⁵ For example, John Gascoigne, Joseph Banks and the English Enlightenment: Useful Knowledge and Polite Culture (Cambridge, 1994), 216-18.

⁶ Steven Shapin, Times Literary Supplement, 4 August 1978, 893.

he “submerged [the Royal Institution] under a series of hasty generalizations about early Victorian attitudes, the ideological uses of science, and the malaise of industrial society.”⁷ The study by Margaret Ray and myself of the involvement of Michael Faraday (1791-1867) in the 1844 Haswell colliery explosion inquest, to which Berman attached considerable significance, implicitly criticised his over-interpretation of the limited evidence he used.⁸ This paper, likewise, draws attention to the inadequacies of Berman’s use of evidence relating to the Board of Agriculture and the Royal Institution.

The Board of Agriculture was the idea of John Sinclair (1754-1835), who at the age of sixteen inherited his father’s estates in Caithness, the northern-most county of mainland Scotland. The estates produced an annual income of £3000, allowing him, after completing his education, to enter Parliament in 1780 as the county member. He remained an MP with only a brief gap until 1811, sitting mostly for his home seat, where he usually had the controlling interest, but at times also representing Lostwithiel (in Cornwall) and Petersfield (Hampshire), both pocket boroughs where he faced no opposition. Originally, sitting as an independent, Sinclair moved towards supporting Pitt, doubtless accounting for his being created a baronet in 1786. But he broke with Pitt towards the end of the decade over the Regency crisis which began in late 1788 and the impeachment proceedings against the Indian administrator, Warren Hastings (1732-1818), between 1788 and 1795.

Sinclair’s interest in agricultural improvement is apparent in his Statistical Account of Scotland, begun in May 1790 and published in twenty-one volumes between 1791 and 1799; the following year, continuing his interest, he established the British Wool Society to

⁷ Maxime Berg, English Historical Review 94 (1979): 456

⁸ Frank A. J. L. James and Margaret Ray, “Science in the Pits: Michael Faraday, Charles Lyell and the Home Office Enquiry into the Explosion at Haswell Colliery, County Durham, in 1844,” History and Technology 15 (1999): 213-31; Berman, Social Change and Scientific Organization, 177-85, for his account of the episode.

improve sheep farming, especially in Scotland.⁹ Thus, as war approached towards the end of 1792, Sinclair had already demonstrated his strong interest in and commitment to understanding the state of agriculture and its improvement. An obvious person to involve in his plans was the well-known agricultural and travel writer Arthur Young (1741-1820). Young also applied scientific knowledge in his farming practice on the family estate at Bradfield, Suffolk. Very early in 1793, Sinclair told Young that he would ask Pitt for a subvention of £10,000 annually to support a Board of Agriculture.¹⁰ However, this seems to have been regarded as far too large a sum and in a letter to Pitt's closest political colleague, the Home Secretary Henry Dundas (1742-1811), Sinclair told him that the Board could be established for a yearly "trifling expense [sic]" of £5200.¹¹ In the end Sinclair successfully negotiated for an annual subvention of £3000 for such a Board – the reduction being the penalty for falling out with Pitt. Sinclair saw the proposal, though with some Whig opposition, through the House of Commons, who approved it on 17 May 1793.¹²

The Board, as constituted, was the sort of body that could probably exist only in England as a hybrid between a department of state, such as the Board of Trade (re-established by Pitt in 1784) and a voluntary association, for instance the Society of Arts (founded in 1754).¹³ The composition of the Board of Agriculture, including its three officers, reflected this nature. The Board's membership was divided between what were called "Official

⁹ Rosalind Mitchison, *Agricultural Sir John: The Life of Sir John Sinclair of Ulbster 1754-1835* (London, 1962), on 120-35 and 112-19 respectively.

¹⁰ John Sinclair to Arthur Young, 5 January 1793, British Library (hereafter BL) Add. MS 35127, fols. 216-17.

¹¹ John Sinclair to Henry Dundas, early 1793, Rothamsted Research (hereafter RR) MS 4, fol. 29. The costings justifying this expenditure follow: fols. 30-3.

¹² Described in Clarke, *History of the Board of Agriculture 1793-1822*, 7-8.

¹³ The surviving papers of the Board now form part of the records of the Royal Agricultural Society of England, held at the University of Reading (hereafter UR). Minutes of meetings of both the Board and its General Committee (recorded chronologically in the same books), exist only from the end of 1797 to May 1808 and from early 1816 until the winding up of the Board in July 1822. Membership records (UR MS SR RASE/B/XI) run from 1793 until 1810.

Members,” “Ordinary Members,” and “Honorary Members,” as well as three officers. At its beginning, Sinclair was President and the Board met and had its offices in his King Street house near the Houses of Parliament, an arrangement that annoyed the Secretary, Young,¹⁴ appointed (with an annual salary of £400) on Pitt’s proposal.¹⁵ The choice of Young is probably best interpreted as part of the government policy of smothering opposition where feasible, by bringing those members of the gentry who had flirted with Jacobinism (as Young had done when in Paris during the early stages of the Revolution) into its service. The third office, that of Treasurer, went to the wealthy nabob John Call (1732-1801).

Official Members mostly comprised fourteen holders of state office, including the most senior members of the government, such as the Prime Minister, Home Secretary and Foreign Secretary, as well as the Archbishops of Canterbury and York and the Bishops of Durham and London. The only Official Member who did not hold state office was the President of the Royal Society of London, a position held for almost the entirety of the existence of the Board by Joseph Banks (1743-1820), who initially doubted the appropriateness of being an official member,¹⁶ but Sinclair wanted his active involvement.¹⁷ Judging by the surviving Board minutes, most Official Members, aside from Banks and the Surveyor General of Crown Lands – a post held by the Tory MP John Fordyce (1735-1809) from 1793 until his death – rarely, if ever, attended meetings.

Ordinary Members were a group of thirty men selected initially in 1793 by Pitt and Sinclair.¹⁸ The Board met frequently from the late autumn to early summer, and the five

¹⁴ M. Betham-Edwards, ed., The Autobiography of Arthur Young with Selections from his Correspondence (London, 1898), 219-220; hereafter Young, Autobiography.

¹⁵ Young, Autobiography, 219-22.

¹⁶ Joseph Banks to John Sinclair, 23 April 1793, in The Scientific Correspondence of Joseph Banks, ed. Neil Chambers, 6 vols. (London, 2007), vol. 4, 1186; hereafter Banks, Correspondence, followed by volume and letter number.

¹⁷ John Sinclair to Joseph Banks, second half of May 1793, RR MS 5, fols. 128-9.

¹⁸ Mitchison, “The Old Board,” 42.

worst attendees each year would usually step down and be replaced. Additionally, there existed a smaller General Committee that took executive action subject to the approval of the Board. Among the first cohort of Ordinary Members were landowners well known for their interest in agricultural improvement, including the strong Whigs, opposed to the government, Francis Russell, Fifth Duke of Bedford (1765-1802), with 30,000 acres at Woburn, Bedfordshire; the MP Thomas Coke (1754-1842), with 50,000 acres at Holkham Hall, Norfolk; and William, Second Earl Fitzwilliam (1748-1833), with 80,000 Yorkshire and 50,000 acres of Northamptonshire; as well as George Wyndham, Third Earl of Egremont (1751-1837), with 110,000 acres at Petworth, Sussex. In total, more than half the Ordinary Members had hereditary titles, including no less than three dukes (the other two being Henry Scott, Third Duke of Buccleuch (1746-1812) with his 460,000 Scottish acres, and the former Prime Minister, Augustus FitzRoy, Third Duke of Grafton (1735–1811) with a mere 13,600 acres at Euston, Suffolk), and four other earls. Furthermore, thirteen Ordinary Members were sitting MPs and a further five had been or would be. Although the majority of Ordinary Members supported Pitt, nevertheless there were sufficient numbers of prominent Whigs to make it appear that Pitt was using the Board as a place to locate members of the Opposition to make them feel of use during the war.

Honorary Members, who could attend meetings but not vote, were elected by the Board. In the first three years of its existence more than 300 were elected, but in the following ten years, on average, about twenty-five were added annually. There existed a close connection between Honorary and Ordinary Members. The majority of the initial Ordinary Members became Honorary Members when they left the Board. The same did not hold for Official Members, though Pitt was elected an Honorary Member a year after he lost office in March 1801. Conversely, until 1810 (after which records have not survived) all but two elected Ordinary Members had previously been Honorary Members.

Despite Pitt's initial support, the Board soon ran into trouble. The law officers were not sure of the legal status of this hybrid organisation, though it quickly received a royal charter.¹⁹ And, despite its membership including four bishops as Official Members, as well as Richard Watson (1737-1816), Bishop of Llandaff, who served regularly as an Ordinary Member, the Anglican Church was concerned about tithes, one of its major sources of income, and what the Board might propose regarding them.²⁰ Above all, Sinclair's domineering control of the Board, and the mutual antagonism between him and Pitt, led to the Board having no executive function and little policy influence.²¹ Pitt and Dundas made clear their opinion of Sinclair when his applications for an Irish peerage and for support for election as MP for Newport were refused.²² The latter particularly offended them.²³

All this combined to ensure Sinclair's removal in 1798. Consequently the Board needed new premises, which it found at 32 Sackville Street, just off the eastern end of Piccadilly. Sinclair's replacement, John, Fifteenth Lord Somerville (1765-1819), served for two years. Sinclair then applied to Dundas, by now Secretary of State for War, to be re-appointed in exchange for leaving politics.²⁴ Dundas's reply was glacial: "I am sure nothing could be so uncreditable for either yourself or Government, as to be Parties to a Barter of your Politics for the Chair of the Board of Agriculture."²⁵ Pitt's friend, Robert Smith, First Lord Carrington (1752-1838), became President.

Because of government indifference, if not hostility, the Board, unable to achieve what Sinclair and others had hoped for it, turned to having papers read to it, undertaking

¹⁹ Clarke, History of the Board of Agriculture 1793-1822, 8-9; Mitchison, "The Old Board," 46.

²⁰ Mitchison, "The Old Board," 48.

²¹ Mitchison, "The Old Board," 47.

²² John Sinclair to Henry Dundas, 12 October 1795, RR MS 4, fols. 50-3, and John Sinclair to Henry Dundas, 13 December 1796, RR MS 4, fols. 58-6.

²³ John Sinclair to Henry Dundas, 17 December 1796, RR MS 4, fol. 63. Mitchison, "The Old Board," 54.

²⁴ John Sinclair to Henry Dundas, 23 March 1800, RR MS 4, fols. 77-8.

²⁵ Henry Dundas to John Sinclair, 24 March 1800, RR MS 4, fols. 79-80.

experiments, awarding premiums, and, above all, publishing extensive reports on the state of agriculture for every county in England, Scotland and Wales. During 1793 and 1794 the Board published seventy-six very short (less than one hundred page) county reports; Sinclair having already chosen the authors before the Board was properly formed.²⁶ Longer reports, running to several hundred pages, for which the Board remains famous, did not appear until a number of years later, mostly in the early nineteenth century.²⁷ These reports consumed a disproportionate amount of the government grant, thus preventing the Board from undertaking other activities.²⁸ This was particularly unfortunate as the quality of the reports was extremely variable, as contemporaries recognised.²⁹ Doubtless this accounts for the government in 1801 undertaking its own parish-by-parish survey of the crops planted that year, once again side-lining the Board.³⁰ The suspicion must be that Pitt agreed to the formation of the Board so that the government could say it was doing something about the state of agriculture, but then ignored it, along with Sinclair and other government opponents, such as Bedford, Coke, and Fitzwilliam.

The Royal Institution

By the end of the decade it seems the Board believed that it needed to go beyond its current activities of publications, premiums etc. What followed appears to have been a half-hearted attempt to exploit emergent contingent opportunities as they arose. The key person in

²⁶ Young, *Autobiography*, 242-3.

²⁷ Clarke, *History of the Board of Agriculture 1793-1822*, 18, listed the reports distinguishing between the two types. David Knight, *Natural Science Books in English 1600-1900* (London, 1972), 123-4, also listed the reports, but did not differentiate between the two kinds.

²⁸ Harrison, *The Board of Agriculture, 1793-1822*, 135, and appendix 4, which provides extensive details of the preparation, publication, and costs of each report.

²⁹ Mitchison, "The Old Board," 49-51.

³⁰ Mitchison, "The Old Board," 47.

providing one potential new opportunity was Banks, who on 7 March 1799 chaired a meeting at his Soho Square house to consider a set of Proposals drawn up by the Massachusetts-born adventurer Benjamin Thompson (1753-1814), who, because of his service to the Elector of Bavaria, had been created Count Rumford of the Holy Roman Empire. The meeting decided to establish an

Institution for Diffusing the Knowledge and Facilitating the General Introduction of Useful Mechanical Inventions and Improvements, and for Teaching, By Courses of Philosophical Lectures and Experiments, the Application of Science to the Common Purposes of Life.³¹

The Proposals represented Rumford's interests since they referred to his work on using fuel efficiently, and in improving various industrial and domestic processes, with only a couple of references to agriculture.³² Nevertheless, two Official (Banks and Shute Barrington, Bishop of Durham (1734-1826)) and five Ordinary (including Sinclair and Somerville) Members of the Board of Agriculture formed twelve per cent of the fifty-eight men who that day each pledged the substantial sum of fifty guineas to become the original Proprietors of the new institution.

That meeting appointed a committee of Managers, chaired originally by Banks, to run the new institution.³³ Immediately following its foundation, the Managers set about finding a building in which to undertake the institution's activities. Only two were looked at, both less than a five minute walk from the Board's Sackville Street building: the Bond Street house of

³¹ Proposals for forming by subscription, in the Metropolis of the British Empire, a Public Institution for Diffusing the Knowledge and Facilitating the General Introduction of Useful Mechanical Inventions and Improvements, and for Teaching, By Courses of Philosophical Lectures and Experiments, the Application of Science to the Common Purposes of Life (London, 1799), 43 (hereafter Proposals).

³² Proposals, 28 and 30.

³³ The minutes of Managers' meetings are in Royal Institution (hereafter RI) MS AD/2/B/2/A, followed by volume number. This will be cited here as RI MM followed by date of meeting, volume, and page numbers. The minutes of nineteenth-century meetings were published in facsimile as Archives of the Royal Institution, Minutes of the Managers' Meetings, 1799-1903, 15 volumes in 7 (London, 1971-1976).

George Hobart, Third Earl of Buckinghamshire (1731-1804), and 21 Albemarle Street.³⁴ The latter, dating back to the early eighteenth century and on the market because the previous owner had been killed by a highwayman, was purchased by the new institution for £4850 in the middle of 1799.³⁵ There is no evidence to decide one way or the other whether the geographical proximity was deliberate, but Banks would later seek to take advantage of it.

With such an expensive building, the Managers needed to secure further funds by electing new Proprietors (who actually owned the new institution) as well as Life and Annual Subscribers. In the middle of 1799 they were helped when the King, George III (1738-1820), agreed to be patron of the new body, thus making it the Royal Institution. The King's attention had been drawn to the Institution by its President, an Ordinary Member of the Board and cricketer, as well as Lord of the Bedchamber, George Finch, Ninth Earl of Winchelsea (1752-1826). By the end of 1800, nearly two years after the Royal Institution's founding, the number of Proprietors had reached 302. Of these there were three Official and nine Ordinary (including Bedford and Carrington) Board Members. Around a third of the elected Board had thus contributed significantly to the new Institution, but they only constituted three per cent of the Royal Institution's Proprietors. Of these, forty-three were also Honorary Members of the Board, a number that might have (mis)led Berman, together with his tendency to lump distinct groups together into single categories that the actors themselves would not have recognised, into over-emphasising the significance of the agricultural interest within the Royal Institution.³⁶ There were other interest groups involved in forming the Royal Institution, such as those stemming from the Society for Bettering the Condition of the Poor or from Banks's extensive imperial connections.

³⁴ RI MM, 9 March 1799, vol. 1, 4.

³⁵ Frank A. J. L. James and Anthony Peers, "Constructing Space for Science at the Royal Institution of Great Britain," *Physics in Perspective* 9 (2007): 130-85, on 142-3.

³⁶ Berman, *Social Change and Scientific Organization*, 41.

Furthermore, Berman made great play with the number of landowners who were what he termed “governors” of the Royal Institution³⁷ – that is, those men who belonged to the Managers and another committee, the Visitors, who performed a sort of audit role. Some major landowners were indeed Managers for significant periods of time during the first decade of the Royal Institution’s existence. These included Egremont, a Manager for ten years; George Leveson-Gower, later First Duke of Sutherland (1758-1833), for six years; Heneage Finch, Fourth Earl of Aylesford (1751-1812), for nine years; Thomas Pelham, later Second Earl of Chichester (1756-1826), for nine years; and George, Second Earl Spencer (1758-1834), for seven years. However, when their attendance record at meetings is examined, something Berman seems not to have done, a rather dismal picture emerges. Aylesford was the worse with an attendance of seven meetings out of a possible 332 (2.1%) followed by Pelham (5.2%), Leveson-Gower (7.3%), Egremont (8.1%) and Spencer (13.3%). Quite why these individuals continued to be elected is not clear, unless it was to provide some sort of aristocratic veneer for, and possibly useful connections to, the Royal Institution. Such low attendance rates may also contribute to explaining why the number of Managers increased from nine to fifteen after May 1803.

Such lack of engagement by the landed interest may well explain the lacuna of agricultural content in the activities of the Royal Institution during its opening years, evinced by its absence in the first lecture courses delivered by the chemist and physician Thomas Garnett (1766-1802). The lack of interest in agricultural matters continued in February 1801 with the appointment of the twenty-two year old Humphry Davy as “Assistant Lecturer in Chemistry, Director of the Chemical Laboratory, and Assistant Editor of the Journals of the Institution” at an annual salary of 100 guineas plus accommodation.³⁸ Davy had been born in Penzance, originally apprenticed there as an apothecary, before working at the Medical

³⁷ Berman, *Social Change and Scientific Organization*, 45.

³⁸ RI MM, 16 February 1801, 2: 134.

Pneumatic Institution in Bristol under Thomas Beddoes (1760-1808), where he had discovered the physiological properties of nitrous oxide – laughing gas.³⁹ This made his initial scientific reputation and justified his appointment to the Royal Institution, but it can hardly be interpreted as being in line with an institution dominated by landed interests.

Although evidently far more spectacular and engaging, the content of Davy's first lectures in the Royal Institution, on galvanism and pneumatic chemistry, continued what Garnett had been doing.⁴⁰ Davy was as nearly carried away with his own success as a lecturer than anyone who came under the influence of nitrous oxide: "I have been nobly treated by the managers, God bless us I am about 1.000.000 times as much a being of my own volition as at Bristol. My time is too much at my own disposal – So much for egotism – for weak glorious, pitiful, sublime, conceited egotism.–"⁴¹

Nevertheless, during June 1801, the Royal Institution Managers, presumably guided by Banks and Rumford, "propose[d] in the autumn to examine the state of the arts and to begin with the process of tanning."⁴² Producing leather in increasingly large quantities was of crucial strategic importance during the war, then in its ninth year, because of its use for soldiers' uniforms and tackle for horses. Davy already had some acquaintance with tanning while in Bristol due to his friendship with Thomas Poole (1766-1837), a tanner of Nether Stowey, Somerset.⁴³ By the end of June, Davy had agreed to deliver a lecture course on tanning during November, but in exchange was granted three months' leave, starting in July, "for the purpose of making himself more intimately acquainted with the practical part of the

³⁹ David Knight, *Humphry Davy: Science and Power* (Oxford, 1992; 2nd ed., Cambridge, 1996), 26-41.

⁴⁰ RI MS HD/22/B, pp.137-8. "Royal Institute [sic] of Great Britain," *Philosophical Magazine* 9 (1801): 281-2.

⁴¹ Humphry Davy to John King, 22 June 1801, Bristol Record Office MS 32688/31.

⁴² Thomas Poole to Josiah Wedgwood Jr, 25 and 26 June 1801, Wedgwood Museum (hereafter WM) MS MC 55.

⁴³ C.H. Spiers, "Sir Humphry Davy and the Leather Industry," *Annals of Science* 24 (1968): 99-113; see also Knight, *Davy*, 45-7; and Gascoigne, *Joseph Banks and the English Enlightenment*, 218-22.

business of tanning,”⁴⁴ work that led to his first published paper in the Royal Society of London’s Philosophical Transactions.⁴⁵ Furthermore, the Royal Institution’s Managers also “instructed” Davy to prepare lectures for delivery in December on dying, staining and printing various cloths;⁴⁶ none of these were delivered.

In this context, with the Royal Institution seeking to implement those of its original goals that related to industrialisation, Davy commenced his first lecture series of 1802 at 2 pm on Thursday 21 January 1802 with his famous “Discourse Introductory to a Course of Lectures on Chemistry.” He devoted much of the lecture to emphasising that chemistry “applies to most of the processes and operations of common life,” exemplifying this by reference to agriculture (“intimately connected with chemical science”), metallurgy (“a branch of technical chemistry”), bleaching and dyeing (“purely chemical”), tanning (“chemical processes”), porcelain and glass (“chemical arts”).⁴⁷ In the Syllabus for his evening lectures, Davy in turn covered these and other subjects, such as heating and lighting.⁴⁸ Commencing on 9 February, his first lecture concluded with a peroration emphasising the values of science, adopting a partly Rumfordian rhetoric: “The common workman when informed to a certain extent by science, must rise into a new state of existence. His moral character will be improved.”⁴⁹ Thus Davy sought to combine two agendas: the goal of practically applying scientific knowledge and methods, with the Enlightenment value of knowledge in itself.

⁴⁴ RI MM, 29 June 1801, 2: 198.

⁴⁵ Humphry Davy, “An Account of some Experiments and Observations on the constituent Parts of certain astringent Vegetables; and on their Operation in Tanning,” Philosophical Transactions 93 (1803): 233-73.

⁴⁶ RI MM, 29 June 1801, 2: 198.

⁴⁷ Humphry Davy, Discourse Introductory to a Course of Lectures on Chemistry delivered in the Theatre of the Royal Institution, on the 21st January, 1802 (London, 1802), on 11, 11, 12, 13, 13, 14 respectively.

⁴⁸ Humphry Davy, A Syllabus of a Course of Lectures on Chemistry Delivered at the Royal Institution of Great Britain (London, 1802), 69-91.

⁴⁹ “Mr. Davy’s Lectures on Chemistry,” Journal of the Royal Institution 1 (1802): 109-12, on 111.

Davy at the Board of Agriculture

Davy's extraordinary popularity as a lecturer at the Royal Institution, partly due to his audience supporting the rhetoric he deployed, did not prevent the Institution's first major financial crisis during 1802/3, when it nearly closed.⁵⁰ Under a financial cloud, Rumford, taking advantage of the Peace of Amiens (25 March 1802), left abruptly for France, attending his last Managers' meeting at the end of April 1802.⁵¹ Banks, immediately re-elected to the Managers, then became directly involved in discussions between the Royal Institution and the Board of Agriculture. The outcome was an agreement that Banks would propose to the Royal Institution that they should arrange a course of lectures for the Board on agricultural chemistry.⁵² However, before Banks reported this request to the Managers on the last day of May, he proposed that Davy should be promoted (with no extra pay) to be Professor of Chemistry.⁵³ The minutes from the meetings of Board of Agriculture and its General Committee were then read. It was agreed that the lecture theatre would be lent to the Board for lectures on agricultural chemistry, on condition that Proprietors and Subscribers could attend them, and offering the services of the Royal Institution's professors, now including Davy, if necessary.⁵⁴ Quite how this arrangement would help the Royal Institution's finances is not clear, except, perhaps, that it would bring new people into the building, while opening the lectures to Proprietors and Subscribers would provide an extra incentive for new visitors to join the Institution.

⁵⁰ John Hippisley to Third Earl of Hardwicke, 9 April 1820, RI MS AD/3/A/1, folder 10.

⁵¹ RI MM, 26 April 1802, 3: 7.

⁵² Board of Agriculture minutes, 25 May 1802, and General Committee minutes, 27 May 1802, UR MS SR RASE/B/VI, on 327-8 and 329 respectively.

⁵³ RI MM, 31 May 1802, 3: 43.

⁵⁴ RI MM, 31 May 1802, 3: 43-5.

Shortly afterwards, the Board's General Committee meeting authorised Banks to agree with Davy the terms for lectures to the Board to be delivered during the following season, and at its meeting on 8 June 1802 they were approved.⁵⁵ The following month, the prospect of these lectures gave Davy the perfect excuse to successfully ask permission from the Royal Institution Managers "to spend a few weeks during the summer in the country ... [so that] he may be able to collect some information that may be useful in the lectures to be given on agriculture in the Spring."⁵⁶ Davy also commenced a series of experiments on the fertility of various types of soil, and asked his former patron in Cornwall, Davies Giddy (1767-1839), to send him some specimens of Cornish soil for the purpose.⁵⁷

The meeting of the Board in early February agreed that Carrington would discuss the details of the lectures with Davy.⁵⁸ Davy confirmed that he did not wish to lecture until the spring when plants would be in vegetation,⁵⁹ and indeed he did not commence the series until May, when he delivered them in the Board's rooms. He did, however, give some thought as to what he would say and submitted a prospectus. The General Committee and the Board (with Banks present) approved the text and ordered 500 copies to be printed.⁶⁰ In this fourteen-page pamphlet, entitled Outlines of a Course of Lectures on the Chemistry of Agriculture, Davy described the content of the six lectures he would deliver.⁶¹ They would be entirely on vegetable chemistry, as he had already decided shortly after his return to

⁵⁵ Board of Agriculture General Committee minutes, 2 and 8 June 1802, UR MS SR RASE/B/VI, on 334-5 and 341 respectively.

⁵⁶ Humphry Davy to Royal Institution Managers, 5 July 1802, RI MM, 5 July 1802, 3: 51-2.

⁵⁷ Humphry Davy to Davies Giddy, 26 October 1802, in John Ayrton Paris, The Life of Sir Humphry Davy, 2 vols. (London, 1831), vol. 1, 156-9.

⁵⁸ Board of Agriculture minutes, 8 February 1803, UR MS SR RASE/B/VI, 348.

⁵⁹ Board of Agriculture minutes, 15 February 1803, UR MS SR RASE/B/VI, 351.

⁶⁰ Board of Agriculture General Committee minutes, 29 April 1803, and Board of Agriculture minutes, 3 May 1803, UR MS SR RASE/B/VI, on 412-13 and 415 respectively.

⁶¹ Humphry Davy, Outlines of a Course of Lectures on the Chemistry of Agriculture. To be delivered before the Board of Agriculture, 1803 (London, 1803).

London.⁶² Although Davy did not say so explicitly, at the end of his Outlines he implied that better chemical knowledge and theory might be important for agriculture.⁶³

Although Banks had engineered Davy's lectures to the Board of Agriculture, it was not until after Davy had started delivering them, on 10 May 1803, that the Board gave any attention to his status with regard to it. On 13 May the meeting of the General Committee decided to offer £40 to permit Davy to purchase apparatus to illustrate his lectures. They also recommended that the new President of the Board, John Holroyd, First Lord Sheffield (1735-1821), should consult with Banks about how much Davy should be paid for his lectures and whether in future he should be given an annual salary "for his Lectures & attendance on the Board."⁶⁴ This proposal suggests that the Board had more in mind for Davy than simply delivering lectures. A couple of days later, Young noted that the two lectures so far delivered had been well attended and that it was intended to retain Davy.⁶⁵ The meeting of the General Committee, with Banks present, on 27 May, the day that Davy delivered his sixth and final lecture in the course, agreed that as his lectures had met with "great satisfaction" he would be paid sixty guineas for them and be appointed Professor to the Board at an annual salary of £100. For this he would deliver an annual course of lectures, as he did until 1811, and also analyse chemically substances as requested by the Board. Davy's agreement to these terms was reported at the following Board meeting when he was also elected an Honorary Member.⁶⁶ In the meantime Banks negotiated, in a letter to Young, the Board's agreement for Davy to repeat his lectures at the Royal Institution.⁶⁷ This must have been arranged at very

⁶² Humphry Davy to Davies Giddy, 26 October 1802, in Paris, Davy, 1: 156-9.

⁶³ Davy, Outlines, 14.

⁶⁴ Board of Agriculture General Committee minutes, 13 May 1803, UR MS SR RASE/B/VI, 419.

⁶⁵ Memorandum by Young, 15 May 1803, published in Paris, Davy, 1: 178-9.

⁶⁶ Board of Agriculture General Committee minutes, 27 May 1803, and Board of Agriculture minutes, 31 May 1803, UR MS SR RASE/B/VI, on 427-9 and 430 respectively. Carrington had previously nominated Davy to be an Honorary Member: Board of Agriculture minutes, 17 May 1803, UR MS SR RASE/B/VI, 422.

⁶⁷ Joseph Banks to Arthur Young, 27 May 1803, in Banks, Correspondence, 5: 1738.

short notice since Davy started the course on the last day of May, finishing on 10 June.⁶⁸ Although Banks assured Young that he had been asked by the Royal Institution to arrange this repetition, there were no Managers' meetings at the time, suggesting that Banks had acted on his own authority, or perhaps following informal consultation. Either way, it illustrates the dominant role that Banks believed he enjoyed in the Royal Institution following Rumford's departure.

But this was illusory. Banks attended the meeting of the Royal Institution's Managers immediately following Davy's repetition of his lectures.⁶⁹ Then, despite having nearly two more years to serve as a Manager, Banks attended only one further meeting (out of a possible seventy-four; up to then his attendance rate had been 61.1%). He told Rumford in mid-1804 that "the Institution has irrevocably fallen into the hands of the Enemy, & is now perverted to a hundred uses for which you & I never intended it."⁷⁰ This would seem to be a reference to the roles of the lawyer and philanthropist Thomas Bernard (1750-1818) and the chemist Charles Hatchett (1765-1847) who, together with the Secretary, the nabob John Auriol (*ca.* 1753-1824), dominated the running of the Royal Institution for the remainder of the decade. Among other things they decided to diversify the lecture programme, including not only science, but also courses on history, music, literature, art, and so forth, in an attempt to improve the Institution's still precarious financial situation by attracting larger audiences. This moved away from the original practical goals of the Royal Institution, and it should be no surprise that Banks would object strongly to this.

Such a situation put Davy in a difficult position both at the time and later. On the one hand, he derived the majority of his income from the Royal Institution, but he also needed to

⁶⁸ Advertised in *Morning Post*, 31 May 1803, 1b.

⁶⁹ RI MM, 6 June 1803, 3: 141.

⁷⁰ Joseph Banks to Count Rumford, 6 June 1804, in Banks, *Correspondence*, 5: 1750. See also Gascoigne, *Joseph Banks and the English Enlightenment*, 222-3.

retain the support of Banks if he wished to continue pursuing a successful career in London. That he had secured Banks's patronage is indicated by his election to Fellowship of the Royal Society of London in mid-November 1803. Davy's nomination form, which was first read to the Society on 21 April 1803, and thus submitted after his appointment but before his first lectures to the Board, described him as "Professor of Chemistry in the Royal Institution" and referred to his only paper in Philosophical Transactions on tanning.⁷¹

That he had problems during this period is suggested by a letter he wrote to Poole at the beginning of May where he asked him to "Be not alarmed, my dear friend, as to the effect of worldly society on my mind."⁷² Following an extended visit to the West Country (including his home town of Penzance) during the summer of 1803, paid for by the Board to examine "various soils,"⁷³ matters had not improved. His old friend Tom Wedgwood (1771-1805) told Poole, the day after dining with Davy, that "Poor Davy's head has got an unhappy twist – I wish it may even straighten again. Oh that we cou[I]d do any thing towards so desirable an object – he is trying to worship God & Mammon."⁷⁴

If some of the problems that Davy faced during 1803 were due to tensions and suspicions involving Banks, the Board of Agriculture, and the Royal Institution, they were not helped three years later by an episode that occurred immediately after Sinclair's re-election as President of the Board in March 1806 (the Whigs had formed the government following Pitt's death). Sinclair wrote to Winchelsea asking if Davy's course of lectures to the Board, due to start at the end of April, could be delivered in the Royal Institution. The Managers, whilst not categorically declining, stated that the lectures would have to be open to

⁷¹ Davy's election certificate, Royal Society of London (hereafter RSL) MS EC/1803/3.

⁷² Humphry Davy to Thomas Poole, 1 May 1803, in Paris, Davy, 1: 176-7.

⁷³ Board of Agriculture General Committee minutes, 3 June 1803, UR MS SR RASE/B/VI, p.433. This authorised the expenditure of £50 for travelling expenses, paid the following March: Board of Agriculture cash book, UR MS SR RASE/A/II (unpaginated).

⁷⁴ Tom Wedgwood to Thomas Poole, 11 September 1803, WM MS MC 67.

all the Royal Institution's Proprietors and Subscribers, making them "apprehensive that what is proposed in his [Sinclair's] Letter cannot be accepted."⁷⁵ At one level such a refusal could be taken as evidence for Berman's contention of the drift away from the Royal Institution of the agricultural interest. A problem with this view is that he dated the breach to between 1809 and 1811⁷⁶ and in any case, as argued above, it was never as influential as he believed.

What seems more plausible is that the Royal Institution's negative response was related to Banks's attempt to dominate it following the resolution of the financial crisis in 1803. In terms of the 1806 application to use the theatre by the Board, the Managers may have viewed it as an attempt by Banks to regain some sort of influence within the Royal Institution, to bring it back into the Banksian fold. This interpretation of the relationship between the Board of Agriculture and the Royal Institution removes the puzzlement that Berman expressed about why members of the professional middle class, represented by Bernard and Hatchett (though not Auriol), displaced the landed interest in running the Royal Institution:⁷⁷ no such displacement occurred. There existed, however, a clear connection, outlined here, between the Board of Agriculture and the Royal Institution. The relationship was marginal to the latter and did nothing for the reputation of the former.

Davy sought to circumvent the issues provoked by the rejection of Sinclair's proposal by delivering to the Royal Institution in November and December 1806 a course of eight lectures on "Vegetable Chemistry," with content derived entirely from his lectures to the Board.⁷⁸ By such tactics, subversive of the Royal Institution's Managers' intentions (and this was not the only example⁷⁹), he retained Banks's patronage. For example he became a

⁷⁵ RI MM, 31 March 1806, 4: 160.

⁷⁶ Berman, *Social Change and Scientific Organization*, 98.

⁷⁷ Berman, *Social Change and Scientific Organization*, 101.

⁷⁸ The lectures were reported in *The Director* 1 (1807): 23-4, 48-56.

⁷⁹ Davy's establishment of the Royal Institution's mineralogical collection is another instance that I will discuss elsewhere.

Secretary of the Royal Society of London in January 1807, a paid position. Davy remained at the Royal Institution and continued as Professor of Chemistry to the Board of Agriculture until he married, in April 1812, a wealthy widow, the daughter of an Antigua merchant. His subsequent decision to resign from all three of his paid positions has usually been ascribed to having access to his wife's annual income of about £4000 and £60,000 capital. However, he appears to have been uncomfortable with being so obviously dependent on her and did at times (see below for an example) seek to earn his own significant income. Perhaps his immediate resignation from all his positions should also be linked to wishing to extricate himself from the institutional and personal tensions inherent in holding them simultaneously.⁸⁰ With his resignation from the Board, he deputed the task of delivering the six 1812 lectures to the chemist William Thomas Brande (1788-1866). Although Brande “performed the task highly to the satisfaction of the Board,”⁸¹ as far as the surviving evidence indicates, the Board discontinued lectures on agricultural chemistry thereafter.

Lecture Content

Judging by his six notebooks for the lectures that have survived from 1805, it would seem that Davy concentrated on vegetable chemistry, as he had stated he would do in his Outlines, although the precise content gradually evolved over time.⁸² In the lectures, Davy began by “shewing that the various parts and organs of plants are constituted by different arrangements

⁸⁰ Knight, Davy, 91, who described Davy's career in London as “arduous.”

⁸¹ Arthur Young to Humphry Davy, 1 June 1812, UR MS RASE/B/XIV, 138. Nevertheless, the Board paid Davy his usual half-yearly salary of £50 on 4 July 1812: UR MS RASE/A/III (unpaginated). No payment to Brande is recorded.

⁸² The notebooks, in order of lecture delivery, are RI MS HD/19/F, 18/A, 18/B, 18/C, 18/D, and 18/E. They are all watermarked 1802 and the primary text is the hand of an amanuensis. Alterations, sometimes substantial, mostly, but not all, undatable, in Davy's hand suggest an evolution of content. The evidence that the primary text can be dated to 1805 is from RI MS HD/18/C, 65 where Davy altered “last year” to “1804.”

and chemical combinations of a few simple principles which are for the most part oxygene or the base of pure air Hydrogene or inflam[m]able air and Carbon or pure charcoal and the metal[l]ic bases of the Earths and Alkaline substances.”⁸³ A more original part of Davy’s work for the Board was his development of a small apparatus to analyse the chemical composition of soils. The analysis involved adding acid to a soil sample, passing the gas produced into a bag placed in water and measuring the amount displaced. Davy’s description of this apparatus and method appeared in the Board’s Communications in the autumn of 1805, followed by a separately paginated off-print.⁸⁴

Most of the content of Davy’s lectures in terms of direct observational and experimental knowledge was highly specific to the British Isles, as one might expect from someone who did not make his first overseas journey until the summer of 1805, when he visited Ireland. Indeed his lecture notebooks contain only one reference to anything beyond the British Isles and that was to guano found on Pacific islands off the coast of South America. Long known to the inhabitants of Peru and Chile as a powerful fertiliser, its existence and properties greatly impressed Alexander Humboldt (1769-1859), who towards the end of 1802 was there to observe the transit of Mercury. On his return across the Atlantic to Europe in August 1804 he gave guano samples to various French chemists, such as Louis Vauquelin (1763-1829) and Antoine Fourcroy (1755-1809), who published their results in 1806.⁸⁵ However, by early 1805 the Board of Agriculture had obtained a sample and sent it to

⁸³ RI MS HD/19/F, 77.

⁸⁴ Humphry Davy, “On the Analysis of Soils, as connected with their Improvement,” Communications to the Board of Agriculture 4 (1805): 302-18, republished in the October issue of the Philosophical Magazine 23 (1805): 26-41. An example of this apparatus is in the Museum of the History of Science, Oxford, inventory number 45012.

⁸⁵ Gregory T. Cushman, Guano and the Opening of the Pacific World: A Global Ecological History (New York, 2013), 25-6. This, of course, reminds us that research, especially in vegetable chemistry, was also being conducted elsewhere in Europe, but is outside the scope of this paper, though Davy did draw on some of this

Davy. In a note dated 12 March he provided the Board with a description of where guano came from and its value as a manure.⁸⁶ The content of this note can only have originated from Humboldt but, as with the sample, how such knowledge arrived in London is obscure. The same day, Davy presented his somewhat qualitative chemical analysis of guano to the Board. He “found that one third of it consisted of Ammoniacal Salt;- that there were some other salts;- also some Carbon and Oil.”⁸⁷ He thereafter added a discussion of guano to his lectures.⁸⁸

Aside from this single reference, however, Davy’s lectures concentrated on demonstrating the chemical significance of the atmosphere, soil, and manure for agriculture in Britain and Ireland. His notes refer to the analyses of earths that he had collected on the journeys he made round the four countries each summer from 1804 to 1806, specifically for the purpose, including peat from Loch Ness,⁸⁹ and soils from Somerset, Sussex and Devon.⁹⁰ In addition he referred to weeds in the latter county as well as Cornwall,⁹¹ wheat mildew (a particular problem in 1804),⁹² and so on. He concluded the course by referring in various ways “to the infancy of the science,” but hoped that his work would “assist the views of the Board in the improvement of the most useful & important of all Arts.”⁹³ Indeed, the Board itself, following Banks, recognised that “Agricultural Chymistry is at present in it’s [sic]

work. For a brief summary see G.E. Fussell, Crop Nutrition: Science and Practice before Liebig (Lawrence, 1971), 151-81.

⁸⁶ BL Add MS 35129, fols. 210-11. The note is in the hand of an amanuensis.

⁸⁷ Board of Agriculture minutes, 12 March 1805, UR MS SR RASE/B/VI, 518-19. The laboratory notebook at the Royal Institution had yet to commence, so there is no surviving record of Davy’s analyses.

⁸⁸ RI MS HD/18/C, 60. Cushman, Guano and the Opening of the Pacific World, 28-9, though he noted Davy’s interest from the published version of his lectures, does not seem to have appreciated quite how quickly the Board and Davy obtained a sample of and information about guano following Humboldt’s return.

⁸⁹ RI MS HD/18/C, 104.

⁹⁰ RI MS HD/18/A, 30.

⁹¹ RI MS HD/18/C, 34.

⁹² RI MS HD/18/B, 27 and 31.

⁹³ RI MS HD/18/E, 72.

infancy,⁹⁴ suggesting that all parties did not have unduly high expectations of immediate benefit from Davy's work.

Beyond the Lectures

Davy's success with his lectures to the Board had a number of consequences. In 1804, the Board even ordered the printing of 1000 copies of An Explanation of Terms used in Chemistry by Davy's assistant at the Royal Institution, John Sadler (1779-1838), a text having no direct connection with the Board.⁹⁵ Three years later Young invited Davy to write the Board's survey of Cornwall, but he felt himself unqualified. He thought, however, that he might write on the county's geology and mineralogy for the report.⁹⁶ Despite the Board later granting him £100 for the purpose,⁹⁷ Davy never wrote this, although the proposal was noted in the introduction to the Cornish volume published in 1811.⁹⁸

His lectures for the Board immediately put Davy into contact with many of the leading landowners and agricultural improvers in the country. For example, just over a week after completing the repetition of his first course, Davy attended the annual sheep shearing event at Holkham Hall, Coke's Norfolk seat.⁹⁹ Taken together with the sheep shearing at Bedford's Woburn estate (also attended on occasion by Davy, and where in 1812 he

⁹⁴ Board of Agriculture General Committee minutes, 27 May 1803, UR MS SR RASE/B/VI, 428. Joseph Banks to Arthur Young, 27 May 1803, in Banks, Correspondence, 5: 1738

⁹⁵ Board of Agriculture General Committee minutes, 11 May 1804, UR MS SR RASE/B/VI, 476-7.

⁹⁶ Humphry Davy to Arthur Young, 30 April 1807, BL Add. MS 35129, fol. 400.

⁹⁷ Board of Agriculture General Committee minutes, 18 March 1808, UR MS SR RASE/B/VII, 231.

⁹⁸ G.B. Worgan, General View of the Agriculture of the County of Cornwall (London, 1811), xi.

⁹⁹ "Holkham Sheep Shearing," Annals of Agriculture 40 (1803): 604-30, on 606, records Davy's presence there on 20 June 1803.

responded to a toast¹⁰⁰), these events, begun in the latter part of the eighteenth century, were major sites for promoting agricultural improvement during the early nineteenth century. Their significance is evinced by the attendance of many members of the social elite. For instance, visitors from outside Norfolk to the 1808 Holkham sheep shearing included, besides Davy (whom Coke described in his speech as “the first chemist in the world”), figures such as Bedford and Banks.¹⁰¹ All these events and others that Davy attended, including Somerville’s dinner at the Freemason’s Tavern given on the occasion of his spring cattle show,¹⁰² illustrate just how well Davy’s work for the Board had commended him to the leading landowners in the country; his social rise can in part be attributed to such connections, not just to knowing the wealthy Proprietors of the Royal Institution.

Another immediate consequence of Davy’s work for the Board of Agriculture was that Bernard (elected an Honorary Member in May 1805) provided him with a field attached to his villa at Roehampton for his exclusive use for agricultural chemical experiments.¹⁰³ Interestingly, Davy seems not to have used the Board’s own experimental farm at Brompton.¹⁰⁴ He presented the outcomes of some of his Roehampton experiments in his lectures to the Board. For example, during his 1805 course he reported moistening “in Feb[ruar]y last at Roehampton some ground sewn with cresses and Radishes with Ammoniac dissolved in 40 times its weight of water and I found that these plants were much more vigorous than those in the common soil.”¹⁰⁵

¹⁰⁰ The Morning Chronicle, 20 June 1804, 3a, reported Davy’s presence there two days earlier. “Woburn Sheep-Shearing,” Leicester Journal, 26 June 1812, 2b-d, reported the toast; Davy noted the speech in Humphry Davy to Jane Davy, 15 June 1812, RI MS HD/25/29.

¹⁰¹ “Holkham Sheep-Shearing,” Bury and Norwich Post, 29 June 1808, 4b-d.

¹⁰² “Lord Somerville’s or the Spring Cattle Shew. – Monday March 2d, 1807,” Universal Magazine 7 (1807): 321-4, on 323.

¹⁰³ Paris, Davy, 1: 188.

¹⁰⁴ Clarke, History of the Board of Agriculture 1793-1822, 26-7.

¹⁰⁵ RI MS HD/18/C, 51.

However, with agricultural chemistry being in its infancy, Davy did not appreciate or understand that a piece of scientific knowledge developed in the specialised environment of the laboratory, or in theory, or even in a field trial, could be applied effectively and consistently in the messiness of the outside world, even if it worked on occasion. During 1804 Davy corresponded with Edmund Cartwright (1743-1823), Superintendent of the Woburn model farm, about destroying turnip fly chemically.¹⁰⁶ The following year, Davy recommended to the Sussex landowner John Marten Cripps (1780-1853)¹⁰⁷ that he should apply a mixture of urine and lime to turnips to kill the fly; Cripps reported to the Board that his trial was a “great success.”¹⁰⁸ The following May, the Board asked Davy to provide an account of the various methods of destroying turnip flies, and at their following meeting he read a report reprising the various methods that had been tried, suggesting that in addition to lime and urine, weak oxymuriatic acid would also be effective.¹⁰⁹ The Board ordered that Davy’s report should be printed, and by the start of June 1806 it had been issued as a four-page pamphlet to all members, following which it was widely reported in the press.¹¹⁰ The following month Egremont wrote a very angry letter to Young complaining that he had obtained “six Gallons of Mr Davies [sic] mixture to accelerate vegetation, & I steeped All my Turnip seed in it & the consequence is that not one seed has vegetated & I have the trouble of sowing a hundred acres over again.”¹¹¹ Egremont’s reference to accelerating vegetation suggests that he did not quite understand what Davy’s method was intended to achieve, and

¹⁰⁶ Paris, Davy, 1: 394.

¹⁰⁷ Cripps, already an Annual Subscriber to the Royal Institution, would be elected an Honorary Member of the Board of Agriculture in 1806.

¹⁰⁸ Board of Agriculture minutes, 20 May 1806, UR MS SR RASE/B/VII, 121-2.

¹⁰⁹ Board of Agriculture minutes, 13 and 20 May 1806, UR MS SR RASE/B/VII, on 118 and 121-2 respectively.

¹¹⁰ Humphry Davy, Hints on the Preservation of Turnips from the attacks of the Fly (London, [1806]). Both The Times, 7 June 1806, 4c, and The Morning Post, 7 June 1806, 4a, were among the papers to publish extracts from the pamphlet.

¹¹¹ Third Earl of Egremont to Arthur Young, 22 July 1806, BL Add MS 35129, fols. 350-1.

illustrates the pitfalls of communicating scientific knowledge and processes through printed media to individuals who did not have the requisite skills and knowledge. Nevertheless, Davy did later have the grace to admit publicly the mistake, though without acknowledging his responsibility.¹¹²

But Davy's main additional work for the Board centred on chemical analysis, presumably undertaken in the Royal Institution's laboratory. When, in 1804, Richard Pennant, First Lord Penrhyn (*ca.* 1737-1808), later an Ordinary Member of the Board, wanted some slate analysed, the Board sent it to Davy.¹¹³ A perceived need for analytical work may have prompted the Board to consider building a laboratory in the basement of their Sackville Street building; they had already purchased various pieces of equipment for Davy's lectures, such as an air pump and chemical apparatus.¹¹⁴ Towards the end of May 1805, just under a year before the Royal Institution declined to host its lectures, the Board, with Banks present, decided to consult with Davy about constructing a laboratory.¹¹⁵ The Board worked very quickly and three days later, following Davy's advice that it would cost less than £100 to fit up a laboratory, the General Committee recommended to the Board that they instruct Davy to issue the orders for the work.¹¹⁶ This development was strange, since during the first half of the year the Royal Institution had been expanding its own laboratory facilities, appointing Davy as Director of the Laboratory¹¹⁷ and specifying its public remit. This gave Davy the authority to undertake "analysis of such Substances as ... the Professor of

¹¹² Humphry Davy, Elements of Agricultural Chemistry in a Course of Lectures for the Board of Agriculture (London, 1813), 190.

¹¹³ Board of Agriculture General Committee minutes, 23 March 1804, and Board of Agriculture minutes, 27 March 1804, UR MS SR RASE/B/VI, 458 and 460 respectively.

¹¹⁴ Board of Agriculture cash book, UR MS SR RASE/A/II, 1 February 1805, 27 March 1805, and 25 May 1805 respectively (unpaginated).

¹¹⁵ Board of Agriculture minutes, 21 May 1805, UR MS SR RASE/B/VII, 28.

¹¹⁶ Board of Agriculture General Committee minutes, 24 May 1805, UR MS SR RASE/B/VII, 30.

¹¹⁷ RI MM, 28 January 1805, 4: 17.

Chemistry shall deem of Scientific or Public Importance.”¹¹⁸ Since both laboratories would be used mainly by the same chemist, the Board might have considered the wisdom of having two laboratories in such close geographical proximity, possibly explaining why nothing happened in Sackville Street. The following year the Board accepted, with Banks present, Davy’s proposal, made by letter, “that the Experiments in Chymistry for the Board should be made in the Laboratory of the Royal Institution.”¹¹⁹ This was not noted in the Managers’ minutes, so presumably Davy acted on the authority granted him the previous year. The Royal Institution’s laboratory notebook, which began to be kept at the same time, recorded the marked increase in analytical work that Davy undertook for the Board as a result of its decision,¹²⁰ despite the Institution declining at the same time to host Davy’s lectures to the Board.

Publication

Following his resignation from all his paid positions after marriage, Davy concentrated on writing. The first (and only) volume of his Elements of Chemical Philosophy, published by Johnson in the late summer of 1812,¹²¹ was followed the next year by his lectures to the Board, entitled Elements of Agricultural Chemistry. Since both the Board and the Royal Institution were membership organisations, their lectures, including Davy’s, were not generally open to the general public or to journalists. Some lectures were summarised in short-lived periodicals closely connected with the Royal institution, such as its Journal (1800-

¹¹⁸ RI MM, 11 March 1805, 4: 40.

¹¹⁹ Board of Agriculture minutes, 4 March 1806, UR MS SR RASE/B/VII, 57-8.

¹²⁰ The Royal Institution Laboratory Notebook for October 1805 to July 1809, RI MS HD/6, 13-21, records a large number of soil analyses and other work that Davy undertook during 1806. See also Humphry Davy to Arthur Young, 15 June 1806, BL MS add 35129, fol. 346.

¹²¹ RI MM, 7 September 1812, 5: 320, recorded Davy’s presentation of a copy to the Royal Institution.

1803, but mostly 1802) and The Director (1807), but they were not reported in newspapers, journals such as the Philosophical Magazine (except for some early reports), or even Young's own Annals of Agriculture. Thus most of Davy's lectures were known only to a comparatively few people. The possibility that Davy should publish his agricultural chemistry lectures had been considered by the Board right from their start in 1803¹²² and again at the time of Davy's third series in May 1805. Then he reported that "he should be ready to publish his Lectures immediately after the next Course"¹²³ - that is, in the middle of 1806. Despite making the same promise to Sinclair four years later,¹²⁴ nothing came of any of these proposals – perhaps confirming Rumford's early view of Davy's "natural disposition to be idle and to procrastinate."¹²⁵ Following Davy's resignation from the Board, Young urged him to publish his lectures "with as little delay as possible."¹²⁶ A strong incentive to do this came immediately after he completed the text of volume one of Chemical Philosophy, when in June 1812 Longman offered Davy the enormous sum of 1000 guineas for the right to print 1500 quarto copies of Agricultural Chemistry.¹²⁷ This lucrative commission might have contributed to Davy not producing any further volumes of Chemical Philosophy, although there exist three copies with extensive manuscript revisions, mostly in Faraday's hand.¹²⁸

Although divided into eight lectures, Agricultural Chemistry covered only what Davy had given to the Board during the nine courses of six lectures delivered between 1803 and

¹²² Board of Agriculture General Committee minutes, 27 May 1803, UR MS SR RASE/B/VI, 429.

¹²³ Board of Agriculture Minutes, 21 May 1805, and Board of Agriculture General Committee minutes, 24 May 1805, UR MS SR RASE/B/VII, 28 and 30.

¹²⁴ Humphry Davy to John Sinclair, 9 September 1810, in The Correspondence of the Right Honourable Sir John Sinclair, Bart., ed. John Sinclair, 2 vols. (London, 1831), vol. 1, 432.

¹²⁵ Count Rumford to Joseph Banks, 21 September 1801, RSL MS MM/9/7.

¹²⁶ Arthur Young to Humphry Davy, 1 June 1812, UR RASE/B/XIV, 138.

¹²⁷ Humphry Davy to John Davy, June 1812, Science Museum MS 333/12; Longman, Impression Book, UR MS 1393 1/H8, 42.

¹²⁸ Two are in RI MS HD/24/A and B whilst a third was auctioned by Christie's on 21 May 2014 (lot 26).

1811, though he thought, mistakenly, he had begun in 1802.¹²⁹ In the book's "Advertisement," dated 21 March 1813, he noted that he had varied the lectures each year to keep pace with chemical developments.¹³⁰ Davy's text came out at 323 pages (plus a sixty-three page appendix on grass experiments at Woburn) and Longman initially printed 1000 copies in early May. It sold so well that two months later the remaining 500 copies were printed,¹³¹ and by mid-January 1814 Longman had just under two hundred copies left in stock; by the beginning of February just over one hundred.¹³² In June Longman published an octavo edition, in a print run of 2000 copies, for which Davy, now on the Continent, received a further fifty guineas.¹³³ This stock lasted until 1821, when Longman issued a third edition with a print run of 750 copies.¹³⁴ During those eight years, Agricultural Chemistry, as table 1 shows, was translated into German, Italian, Hungarian, and French, as well as crossing the Atlantic to appear in one French and one Spanish edition as well as three English.

<i>Elements of Agricultural Chemistry</i>	London	1813
<i>Elemente der Agrikultur-Chemie: in einer Reihe von Vorlesungen gehalten vor der Gesellschaft zur Beförderung des Ackerbaues</i>	Berlin	1814
<i>Elements of Agricultural Chemistry</i>	London	1814, 2 nd ed.

¹²⁹ Davy, Agricultural Chemistry, v.

¹³⁰ Davy, Agricultural Chemistry, v-vi.

¹³¹ Longman, Impression Book, UR MS 1393 1/H8, 42.

¹³² Longman to Constable, 10 January 1814, and Rees to Constable, 2 February 1814, UR MS 1393 1/98/118 and 128.

¹³³ Longman, Impression Book, UR MS 1393 1/H8, 143.

¹³⁴ Longman, Impression Book, UR MS 1393 1/H10, 127. Davy received another payment of fifty guineas for this.

<i>Elements of Agricultural Chemistry</i>	New York, Philadelphia, Alexandria, Baltimore, Fredricksburgh	1815
<i>Elementi di chimica agraria in un corso di lezioni per il pensionato di agricoltura</i>	Florence	1815
<i>A földművelési kémia gyökere Egymásból fojó Letzkékben</i>	Vienna	1815
<i>Eléments de chimie agricole en un cours de leçons</i>	Paris	1819
<i>Elements of Agricultural Chemistry</i>	Hartford, CT	1819, 2 nd ed.
<i>Traduction libre et abrégée des leçons de chimie, données par le chevalier Humphrey Davy, à la Société d'agriculture de Londres</i>	Montreal	1820
<i>Elémens de chimie appliquée à l'agriculture</i>	Paris	1820
<i>Elements of Agricultural Chemistry</i>	Philadelphia, Baltimore	1821
<i>Elements of Agricultural Chemistry</i>	London	1821, 3 rd ed.
<i>Elementos de quimica, applicada a la agricultura</i>	New York	1826
<i>Elements of Agricultural Chemistry</i>	London	1827, 4 th ed.
<i>Osnovaniia zemledel'cheskoi khimii izlozhenniya</i>	St Petersburg	1832
<i>Elements of Agricultural Chemistry</i>	London	1836, 5 th

		ed.
<i>Nouveau manuel de chimie agricole, traduit sur la cinquième édition anglaise des élémens de chimie agricole</i>	Paris	1838
<i>Elements of Agricultural Chemistry</i>	Petersburg, VA	1839
<i>Elements of Agricultural Chemistry</i>	London	1839, 6 th ed.
John Davy, ed., <i>The Collected Works of Sir Humphry Davy, Bart.</i> , 7: 169-391, 8: 1-152	Nine volumes, London	1839-40
<i>Elements of Agricultural Chemistry</i>	Glasgow	1844
<i>Elements of Agricultural Chemistry</i>	New York	1844
<i>Elements of Agricultural Chemistry</i>	London	1846

Table 1: Publication of Davy's *Elements of Agricultural Chemistry*, 1813 to 1846. For further details of some of these editions, see June Fullmer, *Sir Humphry Davy's Published Work* (Cambridge, MA, 1969), 70-3. Note that, although published with different imprints in the places listed, the American editions were essentially the same book. I have not found any independent reference to the Russian edition.

While such impressive dissemination might suggest widespread interest, the practical value of the book is open to question. Some commentators in summarising the content of the book¹³⁵ have suggested that it presented “in attractive form the best of the knowledge of the

¹³⁵ For example, Henry B. Wheatley, “Sir Humphry Davy, Bart., P.R.S.,” *Journal of the Royal Agricultural Society of England* 65 (1904): 1-25; E.J. Russell, *A History of Agricultural Science in Great Britain 1620-1954* (London, 1966), 70-6 and 107-9, where he summarised Davy's soil analysis methods; Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840-1880* (New Haven, 1975), 12-19; Knight, *Davy*, 48-50.

seventeenth and eighteenth centuries”¹³⁶ – indeed some of the illustrations were reworked seventeenth-century drawings.¹³⁷ However, when the poet Percy Shelley (1792-1822), heir apparent to the estate of Field Place in Sussex, was calculating potato production rates per acre, probably in April 1820, he made copious notes on Davy’s text.¹³⁸ Nevertheless, it might be suggested that most landowners and farmers would have regarded some of Davy’s observations, such as the fact that land with better soil commanded higher rents,¹³⁹ as pretty obvious. It is therefore no surprise that the copy of the first edition of Agricultural Chemistry held by the National Trust at Tatton Park, the seat of the major landowner Wilbraham Egerton (1781-1856), remains uncut!¹⁴⁰

However, on the other side of the Atlantic, Agricultural Chemistry seems to have enjoyed greater prestige. A few months after stepping down in March 1817 from his term of office as fourth President of the United States, James Madison (1751-1836) was sent a copy of Davy’s book,¹⁴¹ and in a lecture the following year to the Agricultural Society of Albemarle, Virginia, he referred to Davy’s discussion on plaster or gypsum as a fertiliser.¹⁴² It was precisely this topic (although whether he was aware of Madison’s interest is not

¹³⁶ Russell, A History of Agricultural Science, 70. Rossiter, The Emergence of Agricultural Science, 12-13, said much the same.

¹³⁷ Pointed out by Davy Knight, “Agricultural Chemistry in Britain around 1800,” Annals of Science 33 (1976): 187-96, especially on 192.

¹³⁸ Carlene A. Adamson, ed., The Bodleian Shelley Manuscripts (New York, 1997), vol. 5. Shelley’s calculations on potato production are on 9-19 and his notes on Davy’s book are on 356-322. The latter are discussed in Sharon Ruston, Shelley and Vitality (Basingstoke, 2005), 95-101.

¹³⁹ Davy, Agricultural Chemistry, 160-1, thus prompting Knight, “Agricultural Chemistry,” 196, to refer it as a “conservative work in the main.”

¹⁴⁰ <http://www.nationaltrustcollections.org.uk/object/3068851> (accessed 28 November 2014).

¹⁴¹ Charles Waugh to James Madison, 8 September 1817, in The Papers of James Madison, Retirement Series. Volume 1, 4 March 1817–31 January 1820, ed. David B. Mattern, J.C.A. Stagg, Mary Parke Johnson and Anne Mandeville Colony (Charlottesville, 2009), 127.

¹⁴² James Madison, Address to the Agricultural Society of Albemarle, 12 May 1818 (Richmond, VA, 1818), reprinted in The Papers of James Madison, 260-85.

known) that engaged the interest of the Virginia farmer Edmund Ruffin (1794-1865) and provides the one example of Agricultural Chemistry having a practical effect, though it also highlights the parochial weakness of the text. Following service in the United States army against Britain in the war of 1812, Ruffin returned at the start of 1813 to Virginia to take over the 1600 acre family farm bequeathed to him by his grandfather.¹⁴³ Ruffin characterised the quality of his land at Coggin's Point on the south side of the James River, in Prince George County, about twenty-five miles south-east of Richmond, as sterile, and he initially sought unsuccessfully to improve it using the then recommended methods.

In 1817, shortly after its publication in America, Ruffin read Agricultural Chemistry, “with delight, notwithstanding my then total ignorance of chemical science.” He believed his land was similar to that of Banks's Lincolnshire estate, which Davy had described improving by providing a top-dressing of lime.¹⁴⁴ Davy's description in Agricultural Chemistry of the process for undertaking chemical analyses of soils¹⁴⁵ was sufficiently clear to allow Ruffin, with no chemical training at all, to construct his own apparatus to analyse his own soil. Much to his surprise, he found it to be entirely different from that of Banks's land, in that Ruffin's contained vegetable acids. Further, Ruffin expressed surprise that his “oracle,” “the highest authority,” had not noted the existence of such soil in Britain. It would seem that, because of Davy's limited geographical experience, it had not occurred to him that soils might be different elsewhere in the world. Nevertheless, Davy's chemical descriptions were sufficient for Ruffin to understand that by ordering his slaves to apply marl (something he possessed

¹⁴³ This and the following paragraph are based on Edmund Ruffin, “First Views Which Led to Marling in Prince George County,” Farmers' Register 7 (1839): 659-67, reprinted in Incidents of my Life: Edmund Ruffin's Autobiographical Essays, ed. David F. Allemendinger (Charlottesville, 1990), 189-209. See also David F. Allemendinger, Ruffin: Family and Reform in the Old South (New York, 1990), 23-32, and Benjamin R. Cohen, Notes from the Ground: Science, Soil, and Society in the American Countryside (New Haven, 2009).

¹⁴⁴ Davy, Agricultural Chemistry, 177.

¹⁴⁵ Davy, Agricultural Chemistry, 138-40.

abundantly in the form of fossilised shells) to his land, he would increase its fertility markedly; a deduction which proved correct. Struck by this success, he began to publicise it, opening the way to a subsequent career in agricultural journalism. This may well have contributed to the popularity, though not without criticism, that Davy's work enjoyed in the United States during the 1820s and 1830s.¹⁴⁶ Thanks to the work of Davy and Ruffin, Margaret Rossiter argues, it seems "likely" that by the time of the work of Justus Liebig (1803-1873) Americans already knew enough about agricultural chemistry that they were able to react so strongly to Liebig.¹⁴⁷

The spectacular sales of Agricultural Chemistry (the last American and English editions appeared in 1844 and 1846 respectively) could be taken to suggest that Davy's chemical work came to be seen as highly significant to agricultural practice. But the paucity of accounts of its practical effect rather suggests the contrary; Ruffin's use in the United States is a single exception. Nevertheless, Davy's text outlived the Board from which it stemmed by more than twenty years. The scrappy content of its surviving archive suggests that the Board was already teetering towards the end in the late 1810s. This decline seems to have prompted one of the Royal Institution Managers, John Hippisley (*ca.* 1746-1825), to suggest in April 1820, apparently on his own initiative, to the Board's President, Philip Yorke, Third Earl of Hardwicke (1757-1834), that the Board should move into a building neighbouring the Royal Institution that had just become available in Albemarle Street, with a view to closer collaboration and a possible Parliamentary grant to the Royal Institution; the Institution, once again, being in financial difficulty. Hardwicke, it seems, approved of the scheme, but the Board itself felt that it should continue independently.¹⁴⁸ A few months after

¹⁴⁶ Wyndham D. Miles, "Sir Humphrey Davie, the Prince of Agricultural Chemists," Chymia 7 (1961): 126-134. This refers only briefly to Ruffin.

¹⁴⁷ Rossiter, The Emergence of Agricultural Science, 11.

¹⁴⁸ John Hippisley to Third Earl of Hardwicke, 9 April 1820, RI MS AD/3/A/1, folder 10.

Banks's death in June 1820 the government withdrew the Board's annual grant, and despite the Board's attempting to turn itself into a membership subscription organisation, it was wound up two years later.¹⁴⁹

But the end of Board did not signal that there existed little interest in scientific agriculture.¹⁵⁰ Otherwise Davy's Agricultural Chemistry would not have maintained its steady sales and new editions, nor would the Royal Agricultural Society of England, founded in 1838 with its motto "Practice with Science," have seen itself as continuing the work of the Board of Agriculture.¹⁵¹ Rather, Davy's text represented a continuity, a transition from infancy to adolescence as it were, between the Board and the new attempts in the 1840s, particularly in the work of Liebig, to use chemical methods and knowledge to improve agricultural practice.

Acknowledgements

I thank the following institutions for access to their manuscript collections: The Royal Institution, the University of Reading, the British Library, Wedgwood Museum, the Royal Society of London, Rothamsted Research, Bristol Record Office and the Science Museum. Letters written by Davy are freely available on-line at www.davy-letters.org.uk, as part of the project to publish them by the end of the decade. In the meantime this paper cites their archival or printed locations. Earlier versions of this paper were read to the *Situating Chemistry* workshop held in Berlin and to the SHAC/CESIMA/CLE *Crossing Oceans*

¹⁴⁹ Harrison, The Board of Agriculture, 1793-1822, 130-3.

¹⁵⁰ As asserted in Hilton, A Mad, Bad, and Dangerous People?, 137.

¹⁵¹ Nicholas Goddard, Harvests of Change: The Royal Agricultural Society of England 1838-1988 (London, 1988), 7-8.

meeting held in São Paulo, and I am grateful for the comments that I received at those meetings. I also thank Harriet Lloyd for many valuable discussions whilst completing this paper, and I am grateful for the helpful comments of two anonymous referees.

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