Beddoes lectured on chemistry at Oxford in the years that included the French Revolution, the Terror, and the outbreak of war with France, as well as the success in France of the chemical revolution. The very public dispute between Edmund Burke and Joseph Priestley meant that the latter’s study of different kinds of air was politically tainted. Beddoes’s democratic beliefs and his support for the new chemistry of Lavoisier meant that as chemist and physician he had to deal with complaints that he was potentially seditious and pro-French. His medical theories, allied to pneumatic chemistry and building on the work of Priestley, were accordingly suspect. In spite of that, he became the physician and friend to several members of the Lunar Society of Birmingham and to members of their family, and they in return became his patrons. His collaboration with James Watt was crucial for his development of pneumatic medicine. The full extent of Lunar patronage, and especially that of James Keir and Thomas Wedgwood, has hitherto not been recognized, but it was the concealed scale of that patronage that made possible the execution of Beddoes’s ambitious programme of treatment and research.

Keywords: Thomas Beddoes; chemical revolution; French Revolution; James Keir; Pneumatic Institution

INTRODUCTION

Dr Thomas Beddoes died on 23 December 1808. Roy Porter, in his book on Beddoes and the sick trade, found him ‘a source of perpetual interest, puzzlement and pleasure’, although he also described him as a mere bit player.1 Except among historians of science and medicine, Beddoes is better known through his family and friends than in his own right. He had a suicidally depressed son, Thomas Lovell Beddoes, the poet of graveyards and death, who had studied at Göttingen, and obtained his MD in Würzburg.2 His father-in-law was Richard Lovell Edgeworth, a long-distance member of the Lunar Society of Birmingham,3 eccentric educational writer, engineer and inventor, and husband successively to four wives, and father of 22 children, one of whom, Anna Maria, became Beddoes’s wife.
Beddoes’s friends included Erasmus Darwin, reputedly the bulkiest physician in England; James Watt; Josiah Wedgwood; and Samuel Taylor Coleridge. When Beddoes died, Coleridge wrote that ‘Few Events have taken out so much Hope from my Life.’ Humphry Davy, Beddoes’s greatest discovery, had been equally distressed at the time of Beddoes’s death. Later, he wrote more clinically that Beddoes ‘had talents which would have exalted him to the pinnacle of philosophical eminence if they had been applied with discretion.’ Discretion was scarcely in Beddoes’s lexicon, but it was clearly in Anna Maria’s mind in her choice of biographer in the months after Beddoes’s death. She picked Dr John Stock (after apparently having first offered the task to Davy), thereby ensuring a bland and uncontroversial memoir; most of the interesting matter does not appear in his book. Stock was a former political radical and Unitarian who, like Coleridge, later became a Trinitarian. However, by the time Anna approached him, he was respectably tamed, with his radicalism behind him; in 1794 he had fled from his medical studies in Edinburgh to Philadelphia, to avoid being swept up in the treason trials of that year, and was sentenced in absentia, having been pardoned, he returned to Britain, where he could thenceforward be relied on for discretion in matters political.

Coleridge wrote that he could not help assenting to Southey’s remark, that the proper Vignette for the work would be a funereal Lamp beside an Urn, and Dr Stock in the act of placing an Extinguisher on it. I speak thus, because I passed one morning, and a very long Evening with this man: a more meagre mind, a feebler Judgment, a punier frame of moral feeling have rarely inflicted on me... the painful sense of another’s Inferiority.

We are much better placed now. Dorothy Stansfield has given us a fine account of Beddoes, and Michael Neve’s doctoral thesis has been the catalyst for much subsequent work on medicine and the culture of science in the West Country. Neil Vickers has written an important chapter on Beddoes in his study of Coleridge and the doctors, and Mike Jay has very recently published his study of Beddoes and pneumatic medicine.

In what is perhaps the best contemporary thumbnail portrait of him, Richard Lovell Edgeworth described Beddoes as

a little fat Democrat of considerable abilities, of great name in the Scientific world as a naturalist and Chemist—good humored good natured—a man of honour and Virtue, enthusiastic & candid—...if he will put off his political projects till he has accomplish’d his medical establishment he will succeed and make a fortune—But if he bloweth the trumpet of Sedition the Aristocracy will rather go to hell with Satan than with any democratic Devil.

Beddoes certainly struck many of his contemporaries as a democratic devil, at a time when democracy was seen in England as downright treasonable.

**Chemistry and politics: Burke and Priestley**

In 1792, a spy sent the Home Secretary a list of seditious persons, including a teacher of Italian, French, and Latin, ‘supposed to be a Jacobin spy—says he is a Presbyterian’; a Frenchman in the Portuguese minister’s service; Dr Thomas Beddoes; and the Reverend Dr Joseph Priestley, who had long been a thorn in the side of established power, a notorious chemist and political radical, and was then in Hackney, where he had succeeded
Richard Price as minister.\textsuperscript{16} Also on the list and from Hackney was another notorious radical, John Hurford Stone,\textsuperscript{17} a member of Price’s Unitarian chapel, democrat, Francophile (he lived mainly in France from 1792 onwards; there he was naturalized, and there he died) and chemist. Reading Edmund Burke, it is sometimes hard to disentangle the new chemistry from the new French politics, a point first made by Maurice Crosland.\textsuperscript{18} As early as 1790, Burke had thrown chemical metaphors around with abandon: ‘The wild gas, the fixed air is plainly broke loose: but we ought to suspend our judgment until the first effervescence is a little subsided, till the liquor is cleared . . .’\textsuperscript{19}

After regicide, the Terror, and war between Britain and France, Burke’s hostility to chemists, French philosophers, and their supporters in general, had intensified. Burke had begun by aiming his chemical metaphors specifically at Priestley, whose discoveries had included soda water; that is, water impregnated with the wild gas of Burke’s tirade. Priestley as political firebrand, chemist, and friend of the French Revolution was a gift to the cartoonist. But Beddoes, although a lesser figure, was tarred with the same brush. He was rightly regarded as a supporter of French chemistry, although his support for it was qualified; he was also rightly regarded as a democrat, although he feared the mob and condemned the Terror; and his proposals for pneumatic chemistry, and the human experimentation that this was likely to imply, seemed to have a French taint. Was not the French Revolution the most ambitious example of human experimentation ever seen? Burke thought so:

The geometricians, and the chymists bring, the one from the dry bones of their diagrams, and the other from the soot of their furnaces, dispositions that make them worse than indifferent about those feelings and habitudes, which are the supports of the moral world. . . . These philosophers, consider men in their experiments, no more than they do mice in an air pump, or in a recipient of mephitick gas.\textsuperscript{20}

. . .

It is not only the geometricians of the republick that find him [the Duke of Bedford] a good subject, the chymists have bespoke him after the geometricians have done with him. As the first set have an eye on his Grace’s lands, the chymists are not less taken with his buildings. They consider mortar as a very anti-revolutionary invention in its present state; but properly employed, an admirable material for overturning all establishments. They have found that the gunpowder of ruins is the fittest for making other ruins, and so ad infinitum. They have calculated what quantity of matter convertible into nitre is to be found in Bedford House, in Woburn Abbey . . . Churches, play-houses, coffee-houses, all alike are destined to be mingled, and equalized, and blended into one common rubbish; and well sifted, and lixiviated, to chrystalize into true democratick explosive insurrectionary nitre. Their Academy . . . with Morveau and Hassenfrats\textsuperscript{21} at it’s [sic] head, have computed that the brave Sans-culottes may make war on all the aristocracy of Europe for a twelvemonth, out of the rubbish of the Duke of Bedford’s buildings.

While the Morveaux and Priestleys are proceeding with these experiments upon the Duke of Bedford’s houses, the Sieyès,\textsuperscript{22} and the rest of the analytical legislators . . . are quite as busy in their trade of decomposing organization . . . ‘\textsuperscript{23}

Burke lumped Priestley with Louis Bernard Guyton de Morveau (1737–1816), a chemist and lawyer from Dijon, and friend of Lavoisier. Burke considered the abbé Emmanuel-Joseph Sieyès (1748–1836), a major theorist of the French Revolution and author of the pamphlet \textit{Qu’est-ce que le tiers état?} (1789), to have provided in politics an analogue to the new theory that Lavoisier had proposed in chemistry: both drew on the analytical
reasoning of Enlightenment philosophy, an intellectual prelude to new French theories in chemistry and politics. Chemistry was obviously dangerous, literally and metaphorically. Burke spoke of ‘a mine that will blow up at one grand explosion all examples of antiquity’. Priestley had discussed gunpowder in his chemical writings. In 1787, Priestley wrote:

We are, as it were, laying gunpowder, grain by grain, under the old building of error and superstition, which a single spark may hereafter inflame, so as to produce an instantaneous explosion; in consequence of which, that edifice, the erection of which has been the work of ages, may be overturned in a moment, and so effectually, as that the same foundation can never be built upon again.

Three years later, Priestley again used this metaphor, now linking it to the French Revolution. If orthodoxy and the established hierarchy argued intemperately for ill-founded opinions, they are assisting me in the proper disposal of those grains of gunpowder, which have been some time accumulating, and at which they have taken so great an alarm, and which will certainly blow it up at length; and perhaps as suddenly, and as completely, as the overthrow of the late arbitrary government of France.

Here, for Burke, was a serious indication of ‘a determination to proceed step by step till the whole of the church establishment was levelled to the foundations.’ Those who had stormed the Bastille were ‘modern philosophers’. ‘When you say that of them’, Burke continued, ‘you express everything that is ignoble, savage, and hard-hearted.’ The politicians gave practical direction, but ‘the philosophers were the active internal agitators, and supplied the spirit and principles.’ Moreover, Burke regarded the French Revolution as ‘a revolution of doctrine and theoretic dogma…. [The French are] a people who attempt to reverse the very nature of things.’ ‘Men of letters (hitherto thought the peaceable and even timid part of society) are the chief actors in the French revolution.’ Burke’s fear was that tradition and order would be swept away by dangerous innovations, of which the French Revolution was the latest manifestation; the spirit of calculation was vital to new industry and commerce, but antithetical to tradition in hierarchy and institutions. French social theorists, from the Enlightenment onwards, embodied the destruction of the old order, and the replacement of experience and order by theory and revolution.

Priestley and Burke had formerly been in sympathy in their support for the American colonists, even in their war with Britain. Now they were firmly opposed. Priestley had answered Burke’s Reflections on the Revolution in France vigorously and at length. Burke did not attack Priestley by name until this dangerous radical had left England for Philadelphia in 1794. Priestley, an avowed friend of France and no respecter of hierarchies, a man who accepted honorary French citizenship in 1793, was every bit as bad as the French.

BEDDOES, CHEMISTRY, AND DEMOCRACY: EDINBURGH, OXFORD AND BRISTOL

The case of Priestley was extreme, but he was not alone in combining natural science and radical politics. Beddoes had been sensitized to the heavy hand of Pitt’s government in the treason trials; he was in Birmingham in November 1791 and was appalled at the destruction that resulted from the ‘King and Country’ riots; he was present at the seditious Derby meeting reported by the Home Office spy in 1792, and through the 1790s
he published a stream of pamphlets in defence of democracy and, after 1793, against the war
with France and the policies of Pitt’s government. Beddoes had been an undergraduate at
Pembroke College, Oxford, where he published translations of works on chemistry and
natural history. He moved to Edinburgh to study medicine in 1794, at a time when the
town was buzzing about treason trials, and whence young John Stock had lately fled to
escape those trials. Having been trained as a physician and chemist in Edinburgh,
Beddoes collected his MD from Oxford, and then went abroad. He met Lavoisier and
Guyton de Morveau in Dijon, and debated and explored the new chemistry with Guyton.
He came to Oxford in 1787, where he lectured until 1793, demonstrating the truths of the
new French chemistry. He would soon stand out in the Tory university for his enthusiasm
for the French Revolution and for French chemistry. To conservatives and monarchists,
his republicanism made all his ideas suspect; that he was an advocate for French
chemistry was just part and parcel of his subversive ideas. In 1792 he exulted:

our rich... Aristocrates begin now to tremble & sing low. ... The Nth. of England &
Scotland all democratic—London rapidly democratizing—Vive l’egalite, vice G— S—
the K— ever inscribed on its patriotic walls. No cause of apprehension but in the
wretched state, moral & physical, which our happy C—n in Ch— & State has left
the poor.

In spite of such sentiments, Beddoes was all but promised a Regius Chair in Chemistry at
Oxford. Then a government spy reported to the Home Secretary that Beddoes was ‘a
most violent Democrate’, who took pains to seduce young men into the same political
principles. He had been sowing sedition. The Home Secretary informed the Vice
Chancellor of Oxford of Beddoes’s political unsuitability for a Regius Chair, and Beddoes
soon realized that he had no future at Oxford. He decided to resign, and became a
physician; the chemistry that he had learned from Joseph Black in Edinburgh would now
be applied to the practice and theory of medicine. He celebrated his removal from Oxford
by penning a two-page pamphlet arguing against the relief in England of Catholic
priests fleeing from France; they were the enemies of liberty and democracy. It is unlikely
that Beddoes was intent on whipping up anti-Catholicism; intolerance applied to religion
ran counter to what would be a lifetime’s support of freedom of speech, including
freedom of religion. But he, like the sans-culottes, clearly identified the French priesthood
with the ancien régime.

JAMES WATT AND THOMAS BEDDOES: PNEUMATIC MEDICINE AND PNEUMATIC CHEMISTRY

One of the key figures to support Beddoes’s medical and chemical research was James Watt,
who may first have heard about him from their mutual friend Erasmus Darwin. By the time
he met Beddoes in the early 1790s, Watt had cause to be exasperated with English
Jacobinism. His son, James Watt Jr, visited France in 1792, ostensibly to drum up
business, but he also took greetings from democrats in Manchester to the Jacobin Club in
Paris. He returned to England to face paternal anger. James Watt wrote to Joseph Black that

My Son James’s conduct has given me much uneasiness, though I have nothing to accuse
him of except being a violent Jacobin, that is bad enough in my eyes, who abhor
democracy, as much as I do Tyranny, being in fact another sort of it. Young men will
however presume to think for themselves & of all their father’s possessions set least
value upon their experience. I much dread the consequences of the opinions on
Government which have been propagated [sic] of late with so much industry. The Rabble of this country are the mine of Gunpowder that will one day blow it up and violent will be the explosion.43

Burke could not have put it more pithily; indeed, Watt seemed to be echoing him.44 When Beddoes persisted in speaking out for democracy while advocating chemical theories not too far removed from Lavoisier’s, Watt was primed for further exasperation. However, this dates from the second half of the decade, when Watt saw that Beddoes’s politics were harming his medical researches. Back in the summer of 1793, he wrote to Black: ‘We have had no philosophical news since the affair of the frogs electricity except that Doctor Beddoes is applying the antiphlogistic Chemistry to Medicine Azote & other poisonous airs to cure Consumptions & oxigene for spasmodic asthmas he is at Bristol wells for the greater practice.’45

Watt had faced personal loss, most painfully in the case of the early death of his beloved daughter Jessy, and for her and for others in the family he consulted numerous physicians, including his close friend Erasmus Darwin, and Beddoes. He soon became Beddoes’s patron, patient and collaborator, and was finding Beddoes to be both a resource and an embarrassment. In the archives in Birmingham there is an entire manuscript volume of his correspondence with medical men; his correspondence with Beddoes is also voluminous but is distributed among his main letter books. Among Watt’s medical correspondents was Dr James Lind, a Scot living at Windsor, where he became physician-in-ordinary to the royal household. As one might expect from his appointment, Lind was gallophobic and a friend to established order. Joseph Banks said approvingly of him that he was ‘a man accustomed to Obedience & well acquainted with the Station of an inferior’.46 In 1795, Lind wrote to his fellow Scot, James Watt, about their mutual friend Jean André de Luc, a Swiss-born natural philosopher then also living in Windsor. Lind was delighted that Watt’s pneumatic experiments had reinforced de Luc’s opposition to French chemistry:

He being no friend to Theories, either Philosophical or Political that are founded on falsehood, and are propagated by force, and such he thinks French Chemistry and Politics to be, Indeed there seems to have been [such] a wonderful coincidence in sentiments, of some of the modern Chemists in this country that I have declined taking a part in the Pneumatical practice of Medicine from a detestation of having any connexion with such a set of miscreants. Notwithstanding I am induced to believe from several reasons [triple underlining] that in many Diseases [including breast cancer], the practice will be of <real> Use.47

Larry Stewart48 has suggested that Lind’s comments here may be derived from reports from Bath of Dr John Ewart’s treatment of breast cancers by the inspiration of carbonic acid.49 By 1795, when Lind wrote this letter, the collaboration between Watt and Beddoes had been announced by the publication of their joint researches on pneumatic medicine.50 Lind’s comments about French politics and chemistry, which were echoed by other physicians, induced Watt to urge Beddoes to curb his pen and tongue when it came to politics and theory. Watt wrote pithily:

Doctors in London in General condemn the practice [of pneumatic medicine] in toto & some other people are sure it must be bad 1st because you believe in Lavoisier’s theory, 2d because you have the character of a Jacobin 3dly because they have found out from some expressions in your tracts on air that you are a Materialist 4thly because
in trying to do good some animals may be suffocated & some men get some new and unheard of diseases.... To this I have answered... that I never am too scrupulous in inquiring into the theories either in religion politicks or chemistry of those who are able & willing to do me or society any good, that I am no Jacobin nor Materialist, nor believe in Lavoisier’s theory; but that I have an unaccountable tendency to believe in facts which pass under my own observation...the lungs can absorb oxygene or carbone &...the vital & carbonic airs are powerful stimulants of the whole nervous system....[Y]our republicanism may do more hurt by preventing the Pneumatic practice than it ever can do good, leave chemical or medical theory as much out of play as possible but ply them hard with facts—these are understood by every body & all the Doctors in London cannot overturn them. If they write against you answer them with more facts....

As Watt’s letter indicates, he remained attached to the old phlogiston theory, although not dogmatically, whereas Beddoes was broadly in agreement with Lavoisier’s theory. But theory, for Watt and also for Beddoes, was less important than practice. Beddoes wrote to Watt in early 1795:

I do not believe in my own theories for instance, I do not believe in the hyperoxygenation of the system in Consumption—My first speculations were merely attempts to put facts together, & to deduce such conclusions as might be put to the test of expt. I endeavoured to draw these speculations up in a plausible form; otherwise how wd. they have gained attention?

That became true for Lind as well; a year after rejecting Watt’s breathing apparatus and pneumatic medicine, Lind was using the apparatus in the practice of pneumatic medicine. So, too, were many physicians, especially in the North of England and in Scotland. However, in spite of Beddoes’s confidence that democracy and pneumatic medicine were triumphing in those regions, there was plenty of opposition. Pneumatic medicine based on a pneumatic chemistry tainted by French theories was scarcely countenanced by London physicians. Beddoes admitted to Watt that ‘my politics have been very injurious to the airs.... Yet as every stroke aimed at liberty, equally threatens science, morals, & humanity, it requires great self-denial to look on patiently & silently, when such great interests are at stake.’ Beddoes continued to attack politicians, especially the prime minister. He also spent a good deal of ink and credit in complaining about the medical establishment, which frequently sacrificed ‘the advantage of the patient... to the interest, ease, or pride of the practitioner’. Watt despaired of Beddoes, writing to Black: ‘In his politicks he is incorrigible, at least by me who have given him up in that line, and I am sorry to see that he is publishing another hit at the Doctors which I agree with you can do nothing but procure him enemies, who will be absurd enough to make war upon his doctrines in revenge.’

JAMES KEIR: PATRONAGE, POLITICS, CHEMISTRY, AND THE LAW

Patronage and politics went hand in hand, as did patronage and money. Thomas’s father Richard Beddoes inherited a profitable tannery, and built upon his inheritance; he was successful enough to send his son to study at Oxford, and to leave a substantial estate on his death. Thomas’s expenses as a student were neither exorbitant nor extraordinary, as he reported to his father. Once he had his MD, he lectured on chemistry at Oxford, and having left that city he needed funds to establish himself as a professional physician,
and to marry and maintain a wife and family. More ambitiously, he would need funding for the prosecution of his researches and for the expenses of two successive medical institutions. He told his mother on 5 June 1794: ‘I beg you to put from your mind all anxiety about my taking too much of my father’s property. It cannot be better laid out than in establishing me’. There was a frank but cordial discussion with Richard Lovell Edgeworth about what he would settle on Anna Maria, and what Beddoes needed to bring to the marriage. He asked his father’s advice about the proper jointure for Anna. Meanwhile, he was circulating copies of his latest publication on the treatment of pulmonary consumption by pneumatic medicine, and beginning to plan for an institution where pneumatic medicine could be practised and assessed. His *Letter to Erasmus Darwin* went to Darwin’s friends in the Lunar Society, and to many others, including the ironmaster William Reynolds. Because both Reynolds and Darwin were friends of the chemist and one-time medical student James Keir, the overwhelming probability is that Keir also saw Beddoes’s book on pulmonary consumption. For all that I have no direct proof, I would argue that probability becomes certainty when one examines a document dated 1793 (later revised to 1794), in which Beddoes bound himself to James Keir and William Reynolds.

Keir is the key figure here. He was born in Edinburgh, where he attended the university to study medicine. He gave up medicine for the army, and, finding little intellectual stimulation there, resigned his commission as a captain, and soon moved to Birmingham, where he could pursue industrial enterprises and enjoy the conversation of his friend Erasmus Darwin and other members of the Lunar Society. Keir built on his chemical studies in Edinburgh, translated Macquer’s *Dictionary* and started work on his own dictionary, basing it on Macquer’s text and on Leonhardi’s addition to his German translation of Macquer. He made his indebtedness explicit, while indicating how far he had gone beyond his sources. *The First Part of a Dictionary of Chemistry, &c.* was published in Birmingham in 1789, and like Macquer’s work it adhered to the phlogiston theory. His timing could have been better, because 1789 also saw the publication of Lavoisier’s textbook and manifesto of his antiphlogistic theory of chemistry. Keir struggled for a while to complete the work, reporting to Josiah Wedgwood that ‘My dictionary goes on very slowly, as I have been much engaged some time past, but it still goes on & a little of the 2nd part is printed.’ Keir’s chemistry was literary, but also experimental, industrial and political. In the preface, Keir observed that

> the age in which we live, seems to me ... the most distinguished for the sudden and extensive impulse which the human mind has received, and which has extended its active influence to every object of human pursuits, political, commercial, and philosophical. The diffusion of a general knowledge, and of a taste for science, over all classes of men ... seems to be the characteristic feature of the present age.

If knowledge was power, then power resided in the people. The message was not as overtly threatening as Priestley’s warning that tyrants had reason to tremble at an air-pump, but its implications were the same. Keir was writing shortly before the fall of the Bastille; and when he observed that ‘[T]he pneumatic chemistry has been particularly productive of new theory’, and that it was brilliantly advanced in France, with its combination of passion for novelty and philosophical ardour, he was innocently providing advance ammunition for Burke’s literary and political attack on the French Revolution.

Keir tried a series of different manufactures and different partnerships. By the 1790s he was running what may have been the largest soap factory in the world, and also producing
red and white lead. On 14 July 1791, he was in the chair at the Revolution Dinner, on the second anniversary of the fall of the Bastille. Although the dinner was a quiet affair, at which Keir proposed the loyal toast, the occasion served as the ostensible cause for the ‘King and Country’ riots that cost Priestley his home, and with it his laboratory and library. Keir handled the rioters with courage and decisiveness, and ‘saved his house by taking measures for a vigorous defence’. His service as a captain in the 61st Foot Guards in the army would have come in handy. The rioters had numbers on their side, but members of the Lunar Society had muskets, pistols and—in the case of Boulton’s and perhaps Keir’s factory—cannons. Young Gregory Watt wrote of going to the Manufactory and seeing ‘the guns blunderbusses and Cutlasse’s’. In November that same year, Beddoes was in Birmingham, and decided to make Keir’s acquaintance. Keir was at home. ‘As our opinions in chemistry were different & in politics the same, only that I had scourged more of the rust of prejudice off my mind, & as he is the intimate friend of Darwin...’ we shd. have been unlucky indeed if we had wanted conversation during the two days I passed with him.’ They shared their disappointment about English politics and the government’s hostility to French democracy. Keir showed Beddoes around his factory; they discussed chemistry at length, Keir remaining sceptical about the new French chemistry, and Beddoes supporting it, although not without reservations. ‘When I was near taking my leave, he urged me as far as civility wd. permit to assist him in his great chemical work...offering me any articles I might choose.’ Beddoes was not prepared to write an equal share of four or five volumes. ‘Besides he was the most able & conspicuous defender of the old system: to me the truth seemed to be on the opposite side.’ Beddoes had for once made a wise decision. The second part of Keir’s Dictionary was never published, and the work failed. But when it came to politics, Beddoes allowed that ‘Keir...is a very accurate & impartial observer, unless you shd. suppose his station at the revolution dinner might bias his judgment. For a reformer he is very temperate—one of your half-way politicians.’

However, although Keir had given up medicine for the army and then manufacturing, and although he remained a phlogistonist, he and William Reynolds jointly seem to have made the most important single financial contribution to Beddoes’s career, and thus to the programme of research and practice in pneumatic medicine on which Beddoes embarked immediately on his resignation from Oxford in 1793; this predated the death of Watt’s daughter Jessy in 1794, the collaboration between Watt and Beddoes in pneumatic medicine from 1794, and the design and manufacture by James Watt of pneumatic medical apparatus in the following year (Beddoes sketched a design for the gasometer). Beddoes bound himself to Keir and Reynolds for the enormous sum of £10 000. The bond was dated 27 August 1793 and was subsequently revised on 16 April 1794. It stated that if Beddoes, his future father-in-law, Edgeworth, and Anna Maria, his bride-to-be, observed the terms of a separate tripartite indenture, then the bond would be forgiven; and if not, not. The tripartite indenture, like the bond, is in the Chancery rolls in the National Archives at Kew. The three parties listed are: first Beddoes, second Richard Lovell Edgeworth and Anna Maria Edgeworth, and third James Keir and William Reynolds. The terms relate to Anna’s marriage portion, the disposition of land and money if Beddoes predeceased Anna, and the inheritance and provisions to be made to Anna and to any issue of their marriage. The indenture bears five seals, one for Beddoes, another for Richard Lovell Edgeworth, a third for Anna Maria Edgeworth, and two others intended for Keir and Reynolds. Thus, by the time that Beddoes started the public
campaign to raise funds for a Pneumatic Institution, he had already signed a bond for a sum more than ten times greater than the total announced as having been raised in that campaign. The published list of subscribers gives us a first approximation to a map of the distribution of support for the Institution. The list is interesting not only for what it includes but also for what it omits; and the most glaring omission is the bond to Keir and Reynolds. The members of the Lunar Society and their immediate family were prominent: Matthew Boulton and his son Matthew Robert; Erasmus Darwin and his son Robert; Richard Lovell Edgeworth and his son Lovell; James Keir (without reference to the bond); Mr and Mrs James Watt, and James Jr; William Withering; and no less than seven Wedgwoods, from the recently deceased Josiah to his son Tom. The Scots, and Edinburgh in particular, were well represented on the list: Professor Joseph Black, Professor Andrew Duncan and Professor Alexander Monro were there, along with surgeons, apothecaries and physicians; and the Royal Medical Society of Edinburgh, which made one of three donations acknowledged from institutions, the other two being book clubs. Richard Kirwan, a former defendant of phlogiston, was on the list; so, improbably, given Beddoes’s known political sympathies, was D[avid?] Dundas, Serjeant-Surgeon to the King.

In 1794 Beddoes wrote to Tom Wedgwood, observing that he particularly agreed with him about the importance ‘of not deterring others by too large a subscription. The Duchess of Devonshire & I believe the Duke will pursue the same idea.’ A few days later, Beddoes informed Tom that the Duchess had written that she would follow Tom’s example ‘in subscribing a sum immediately, & a sum annually for 3 years, suppose—.’ Beddoes put down Tom and his father for ten guineas immediately, and for five guineas annually: ‘But this needs not make any difference into your real subscription….’ Somewhat later, Beddoes told Tom:

I sometime since received… a letter written by your father’s direction, stating the subscriptions of your family & mentioning a scruple on the part of the banker to [enter?] two sets of sums—one for advertisement—the other not to be publicly mentioned. My opinion is that the ostensible subscription is liberal & sufficient. If but a small part of the public subscribes but moderate sums, which I hope will be the case, your generosity may well be transferred to some other object.

The public subscription, which Beddoes announced in 1795, was for a total of between £800 and £900. This was not sufficient, and over the next decade the Wedgwoods contributed substantially more than Beddoes announced. In 1801, Tom contributed a further £150, and then in 1802 he made two contributions of £400 and £100, respectively for the Pneumatic Institution and the Medical Institution. James Watt was also a continuing contributor, of ideas and apparatus as well as money. But what seems to have been by far the largest contribution to Beddoes’s career and projects was never publicly announced.

CONCLUSION

Patronage from Keir, Reynolds, Wedgwood, Watt and others had allowed Beddoes to establish a medical practice and a medico-chemical research institution. There, Beddoes and his associates investigated highly innovative, reasonable, but generally fruitless therapies.

Watt was impatient at Beddoes’s politics but valued his medical expertise, even while disagreeing with him about chemical theory; he contributed manufacturing skill in
designing the breathing apparatus, collaborated with Beddoes in medico-chemical research, and contributed moderate sums towards the Pneumatic Institution. Keir and Beddoes were in broad agreement about politics, and it looks very much as though political agreement was the catalyst for Keir’s support of Beddoes’s career. Patronage was the key. ‘A cynic has defined the acronym MASER as: Means for Acquiring Sums for Experimental Research’. Beddoes was a master in using the MASER.

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NOTES

5 Jennifer Tann’s entry for James Watt in the Oxford dictionary of national biography (Oxford University Press, 2004–05) gives a good brief account, together with a bibliography of the older studies and of modern more specialized ones.
21 Jean-Henri Hassenfratz (1755–1827), chemist and inspector of mines, who worked in Lavoisier’s laboratory. The Académie des sciences was abolished along with other elite institutions during the Terror.
22 Emmanuel-Joseph Sieyès (1748–1836), Roman Catholic abbé and major theorist of the French Revolution; author of the pamphlet _Qu’est-ce que le tiers état?_ (1789).
23 Burke, _op. cit._ (note 20), p. 67.
24 Burke, _op. cit._ (note 19), p. 86.
26 Joseph Priestley, _Discourses on various subjects, including several on particular occasions_ (printed for the author, by Pearson and Rollason, Birmingham; and sold by J. Johnson, London, 1787).
27 Joseph Priestley, _Letters to the Rev. Edward Burn, of St. Mary’s chapel, Birmingham, in answer to his, on the infallibility of the apostolic testimony, concerning the person of Christ_ (printed by J. Thompson, Birmingham; and sold by J. Johnson, London, 1790), pp. ix–x.
28 Edmund Burke, _Letter to a Member of the National Assembly, 3rd edn_ (1791), p. 29.
30 Burke, _op. cit._ (note 19), p. 338.
33 Joseph Priestley, _Letters to the Right Honourable Edmund Burke, occasioned by his Reflections on the Revolution in France_ (printed by Thomas Pearson, Birmingham; and sold by J. Johnson, 1791).
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Jay, op. cit. (note 13), begins with a vivid picture of the riots and their immediate aftermath.

Thomas Beddoes, Reasons, For believing the friends of liberty in France not to be the authors or abettors of the crimes committed in that country (1793); Where Would be the Harm of a speedy Peace? (printed and sold by N. Biggs, Bristol, 1795); A Word in Defence of the Bill of Rights, against Gagging Bills (printed and sold by N. Biggs, Bristol, 1795); Essay on the Public Merits of Mr. Pitt (printed for J. Johnson, London, 1796); Alternatives compared: or, what shall the rich do to be safe? (printed for J. Debrett, London, 1797). Beddoes’s political writings were reviewed favourably and quoted extensively in Samuel Taylor Coleridge’s short-lived journal, The Watchman; see The collected works of Samuel Taylor Coleridge, vol. 2 (The Watchman) (ed. Lewis Patton) (Routledge & Kegan Paul, London; Princeton University Press, 1970).

Lazzaro Spallanzani, Dissertations Relative to the Natural History of Animals and Vegetables (tr. Thomas Beddoes) (2 volumes) (J. Murray, London, 1784); Torben Bergman, A Dissertation on Elective Attractions (tr. Thomas Beddoes) (John Murray, London; Charles Elliot, Edinburgh, 1785). Beddoes also annotated translations made by others of works by Scheele and Bergman.

Beddoes to Davies Giddy, 19 November 1792, Cornwall Record Office (henceforth CRO), MS DG 41/38.

Beddoes, Reasons, For believing the friends of liberty in France not to be the authors or abettors of the crimes committed in that country (2 pages) (1793), copy with letter from Beddoes to Giddy 9 October 1793, CRO MS DG 41/25.

Watt’s letters to Beddoes in the James Watt Papers (henceforth JWP) in Birmingham City Archives (henceforth BCA) begin in 1794, but Watt’s correspondence with Erasmus Darwin shows that he was aware of Beddoes’s work as a chemist and physician from 1793 at the latest.


Watt to James Black, 17 July 1793, BCA JWP 4/12/29.

Although I think it likely that Watt had read Burke, I did not find Burke’s political writings in Sotheby’s sale catalogue of Watt’s library; but with the furore of the Birmingham ‘King and Country’ riots echoing long after the flames had died down, and with the prominent use of chemical metaphors attacking Priestley in political cartoons, such chemical metaphors were near to hand.


Lind to Watt, 20 February 1795, BCA JWP 4/65, MS 3219/4/27.

Larry Stewart, ‘His Majesty’s subjects: from laboratory to human experiments in pneumatic chemistry’, Notes Rec. R. Soc. 63 (2009). (This issue.)

John Ewart, The history of two cases of ulcerated cancer of the mamma; one of which has been cured, the other much relieved, by a new method of applying carbonic acid air; illustrated by a copper-plate; . . . By John Ewart, M.D. One of the physicians of the Bath City Infirmary and Dispensary (Bath and London, 1794). On p. 50, Ewart referred to Beddoes, and also to Watt, calling him ‘one of the most accurate experimentalists of the age’.

Thomas Beddoes and James Watt, Considerations on the medicinal use and production of factitious airs (printed for J. Johnson, London and Bristol; and Bulgin and Rosser, 1795).


Lind to Watt, 7 August 1796, BCA JWP W/9, MS 3219/4/29:46.

JWP W/9 contains several instances.

Beddoes to Watt, 26 December 1795, BCA MS 3219/4/28:23.

Thomas Beddoes, *Medical cases and speculations; including parts IV. and V. of Considerations on the medicinal powers, and the production of factitious airs* (Bulgin and Rosser, Bristol, 1796), p. vii. Beddoes was subsequently more constructively critical in *A Letter to the Right Honourable Sir Joseph Banks... on the causes and removal of the prevailing discontents, imperfections, and abuses in medicine* (Richard Phillips, London, 1808).

Watt to Black, 9 October 1796, BCA MS 3219/4/124:497.

Beddoes to Mr. Richard Beddoes, 1776, Bodleian Library MS Dep. C.135/2.

Beddoes to Mrs. Beddoes [his mother], 5 June 179[3], Bodley MS Dep. C.135/Iia.

Beddoes to Richard Beddoes, 24 July 1793, Bodley MS Dep, C 135.

Thomas Beddoes, *A letter to Erasmus Darwin, M.D. on a new method of treating pulmonary consumption, and some other diseases hitherto found incurable* (printed by Bulgin and Rosser Bristol; and sold by J. Murray... and J. Johnson..., 1793).


Bond for performance of Covenant. Dr Beddoes to Jas. Keir & Wm Reynolds Esqrs, National Archives MS C104/41.


James Keir to Josiah Wedgwood, 17 February 1791, KUA, Wedgwood papers 688.1.

Keir, *op. cit.* (note 65).


Burke, *op. cit.* (note 19).


Gregory Watt, *G. Watt 13 years old his book 1791*, 14–20 July 1791, entry 20 July, BCA MS 637/1. John Reynolds wrote (J. Reynolds to T. Beddoes via D. Giddy, CRO MS DG 41/30) after the riots, thanking Beddoes for his solicitude for his brother and family: ‘we were frightened not hurt... (...my brother had got arms and ammunition for 30 men in the house) which had inclined the Mob to be much more attentive to arguments of another kind than they otherwise would have been... [Quakers make] no direct prohibition of self defence in extreme cases.’


Beddoes, *op. cit.* (note 59).

Beddoes to Giddy, 3 April 1792, CRO MS DG 41/50.

See sketch by Beddoes in ‘Draft mercurial pneumatick apparatus 1795’, BCA JWP 4/65, MS 3219/4/27. The question of who actually built apparatus is a complex and fascinating one: see A. D. Morrison Low, *Making scientific instruments in the Industrial Revolution*...

79 There are several different ways of comparing the value of the pound sterling today with its value in earlier years, but no matter which way one makes the comparison, the value of the bond would, in today’s currency, be in the millions of pounds. See Robert Twigger, ‘Inflation: the value of the pound 1750–1998’, Economic Policy and Statistics Section, House of Commons Library, Research Paper 99/20, 23 February 1999.


82 Signatures accompany the first three seals; Keir and Reynolds did not sign the document. Unsurprisingly, Beddoes’s death was followed by a series of lawsuits in the Court of Chancery, involving Keir, Anna Beddoes, the Beddoes children, and Davies Giddy, who had advised Beddoes about investments and had often acted as his banker. The lawsuits went slowly forward for decades, and I have not found the end of them; they seem straight out of the Court of Chancery in Dickens’s Bleak House.

83 Thomas Beddoes and James Watt, Considerations on the medicinal use and production of factitious airs, part III (printed for J. Johnston, London, 1796), pp. 177–178, where Beddoes states that the amount raised was between £800 and £900.

84 Beddoes to Tom Wedgwood, 7 November 1794, Keele University Archives (henceforth KUA), Wedgwood papers W/M 35. Compare Beddoes to Josiah Wedgwood, 12 August 1795, KUA Wedgwood MSS W/M 35.

85 Beddoes to Tom Wedgwood, 16 November 1794, KUA, Wedgwood MSS W/M35.

86 Beddoes to Tom Wedgwood, n.d. [late 1795], KUA, Wedgwood MSS W/M35.

87 Beddoes and Watt, op. cit. (note 83), pp. 111–112.

88 KUA Wedgwood MSS 14 March 1801 95-17369; loc. cit., 20587-40 and 28509-40.