ABSTRACT

From the second half of the 18th century onwards the new science of chemistry took root and applications were heralded in many medical-related fields, e.g. cures for diseases such as TB, the prevention of epidemics like cholera, the application of anaesthetics and the detection of poisons in forensics. Two pioneering chemists who worked in the city were Thomas Beddoes, who founded the Pneumatic Institution in Hotwells in 1793, and William Herapath who was the first professor of chemistry and toxicology at the Bristol Medical School, located near the Infirmary, which opened in 1828. As well as their major contributions to medical-chemistry, both men played important roles in the political life of the city.

INTRODUCTION

The second half of the 18th century saw chemistry emerge as a fledgling science. Up till then there was little understanding of the true nature of matter. The
classical Greek idea that matter consisted of four basic elements (earth, fire, water and air) still held sway, as did the practice of alchemy: the search for the “elixir of life” and for the “philosophers’ stone” which would turn base metals into gold. Also, the “phlogiston” theory of fire was still to the forefront. This idea proposed that when any material, such as wood, burnt an integral component, phlogiston, was released.

The new thinking originated with the discovery that “air” was not a single substance, as previously supposed, but rather was made of a mixture of different substances. Leading the way were a group of British scientists, starting with Joseph Black in Glasgow, who isolated carbon dioxide from air in the early 1750s; one of his pupils, Daniel Rutherford, discovered nitrogen in 1772. The Yorkshireman, Joseph Priestley is generally credited with discovering oxygen in 1774. He went on to discover several other gases including carbon monoxide, sulphur dioxide, and nitrous and nitric oxides. Meanwhile Henry Cavendish, in London, had discovered hydrogen in 1766. Moreover, Antoine Lavoisier, in Paris in the late 1770s, showed that combustion involves the material concerned combining with oxygen, thus demolishing the phlogiston theory.

In the medical field, physicians and apothecaries, at that time, still prescribed for the most part long-established, natural drugs based largely on plant extracts. This article tells the story of two pioneering chemists in Bristol who
developed their research and medical practice around the new, emerging science of chemistry: Thomas Beddoes and William Herapath. Since Herapath was only twelve when Beddoes died, it is unlikely that the two actually conversed. Nevertheless, they had much in common, not least that, as well as being scientists, they were both political dissenters and activists.

THOMAS BEDDOES (1760 -1808)

Thomas Beddoes, the son of a wealthy tanner, was born in Shrifnal in Shropshire and was educated at Bridgnorth grammar school. In 1776 he went to Pembroke College,
Oxford to study medicine. He also developed strong interests in botany, geology and languages. During the vacations Beddoes attended meetings of the “Lunar Society”, which met in and around Birmingham. Here he would have met radical political and religious thinkers, such as Erasmus Darwin, Joseph Priestly, Josiah Wedgewood, James Watt & Matthew Boulton, William Reynolds, Richard Lovell Edgeworth and Joseph Wright.

After gaining his BA at Oxford in 1781, Beddoes moved to London to study anatomy with the famed teacher, Dr Sheldon. He moved back to Oxford in 1783 and took his MA degree. However, he decided to spend part of his time in Edinburgh in order to attend lectures in chemistry by Joseph Black (who by then had moved from Glasgow), since Beddoes, like Black, saw chemistry as the key to future developments in medicine. He gained his MD degree from Oxford in 1876. In the summer of 1787 he visited Antoine Lavoisier in Paris. Afterwards Beddoes took up an appointment as a reader in chemistry back at Oxford. However, he was never really happy in this post. The facilities for his research were poor (a make-do lab in the bottom of the Ashmolean Museum) and the authorities (and increasingly his students also) took a dim view of his radical religious and political views – in particular his support for the revolution in France. Beddoes resigned his post in 1792.
Beddoes decided to move to Bristol, where his political and religious views would be more sympathetically received. He was particularly concerned with the plight of the poor, since tuberculosis and other contagious diseases were endemic in the new industrialised towns. Beddoes was keen to apply the new gases to try to treat such diseases. In Hotwells the medical “spa” was long-established. So, in the spring of 1793, Beddoes opened a clinic (the “Pneumatic Institution”) at 11, Hope Square, Hotwells. Two of the patients who underwent the new gas treatment were Tom Wedgewood and Gregory Watt, the sons of two of his old Lunar Society friends: Josiah Wedgewood and James Watt. James Watt supplied Beddoes with some specially designed equipment for making and delivering the various gases.

Beddoes set up home in Clifton, at 3 Rodney Place. In 1794, he married the third daughter of Richard Lovell Edgeworth (a friend from Lunar Society days), Anna, who was thirteen years his junior. They had four children; their elder son, Thomas Lovell Beddoes (1803-1849) became one of the well-known, early 19th century romantic poets, although he moved to Germany in 1825. It was through Anna’s elder sister, Maria, herself an author, that Beddoes became friends with three young poets then residing in Bristol: Robert Lovell, Robert Southey and Samuel Taylor Coleridge. Beddoes and Coleridge campaigned together in Bristol against slavery, in support (initially, at least) of the
French Revolution and, in particular, against the so-called “gagging bills” which Prime Minister Pitt had introduced to suppress dissident political views.

For several years Beddoes had been trying to raise money to establish a bigger and better institution in Bristol, where he could further his research as well as treat patients. Eventually sufficient money was raised to open the new “Pneumatic Institution” at 6-7 Dowry Square in July 1799. At the suggestion of one of his former tutees at Oxford (and subsequent lifelong friend), Davies Giddy, then MP for Bodmin, Beddoes appointed a 19-year-old, precocious young man from Penzance, Humphry Davy, as the first superintendent of the new Institution. At Beddoes’ suggestion, Davy started working on the gas nitrous oxide to see if it had any medical uses. Davy found it acted as a stimulant and mood enhancer, with strong psychedelic and hallucinogenic effects. Although Davy and Beddoes recognised it numbed pain they never sort to actually use it as an anaesthetic (that was to come later with Herapath). Instead it soon became used more as a “recreational” drug, which Davy shared with his new friends in Bristol; it was subsequently to become known as “laughing gas”.

By now the efficacy of Beddoes treatments was beginning to be questioned. Moreover, he had upset the local population somewhat. Firstly, he had set up a byre in Dowry Square to house cows, whose breath
(rich in carbon dioxide) he thought might be used to treat tuberculosis patients. Secondly, there was the episode of the “plague of frogs”, when a consignment of these creatures he had ordered for some experiments escaped during unloading in the City docks.

In 1800, a new chemical passion caught Davy’s imagination in Dowry Square: the use of Voltaic cells to produce gases by the process we now call electrolysis, in particular oxygen and hydrogen from water. However, in 1801 Davy was “poached” by the recently established Royal Institution in London.

Thereafter Beddoes himself became increasingly more interested in promoting preventative medicine and health awareness amongst the poor in Bristol. He renamed his Dowry Square institute “the Bristol Medical Institution” and he opened a second practice in the midst of the city docks, on Broad Quay. He was very keen to see surgeons, apothecaries and physicians better trained. To this end, in 1797 he and two surgeons from the Bristol Infirmary (Francis Bowles & Richard Smith) started a course of popular lectures on anatomy, initially at the Red Lodge (on Park Row) and then at premises at 10, College Green. Bowles died of TB in 1800 and Beddoes’ workload at the Medical Institution was increasing and so the course was abandoned.

The Bristol Medical Institution closed in 1807, after Beddoes himself became ill. He died on Dec 24 1808, aged 48. The autopsy showed that he had a collapsed
left lung. He is buried in the Strangers Burial Ground off Lower Clifton Hill, where the plaque shown below may be found.

WILLIAM HERAPATH (1796-1868)

William Herapath was born Bristol in 1796 and was brought up for most of his childhood in the “Packhorse” public house in Lawrence Hill, which his father, originally from North Devon, ran, together
with the associated brewery. When his father died in 1816 William inherited this thriving business, but he did not want to follow his father’s profession. He was more interested in chemistry and began to develop an analytical chemistry practice working with local industries in and around Bristol. His first published paper in 1823 was concerned with the analysis of cadmium in zinc dust, work carried out in association with a local zinc smelting company.

Herapath married Sophia Bird in 1819 and they set up home initially at 56, Old Market Street and then at 2 Old Park, near St Michael’s Hill. Like Beddoes, he was passionately interested in local and national politics. He was elected Vice President of the Bristol Political Union. He was very concerned about problems of public hygiene and campaigned strongly for public baths and washhouses. He also spoke out against the Bristol Corporation whom he thought were ineffective and corrupt.

When, in 1831, the House of Lords rejected the first reform bill, protests were held around the country. In Bristol these culminated in the infamous “Bristol Riots” which took place over the last weekend in October 1831. The mob attacked (and in many cases set fire to) various buildings in Bristol. Despite his antipathy towards the Corporation, Herapath, agreed to act as a “special constable” (along with Isambard Kingdom Brunel) at this time. He tried in vain to prevent the crowd from
breaking down the gates of the new Bristol Gaol on Cumberland Road. The reform bill was finally passed in 1832 and Herapath served as a Liberal member on the newly reformed Bristol Corporation from 1835 to 1863. He also became a senior magistrate in Bristol.

All this political activity did not affect Herapath’s medical and scientific work. In 1833 he was appointed as a lecturer (and subsequently professor) in chemistry and toxicology at the newly founded Bristol Medical School (located behind Park Row). He was a founding member of the Chemical Society (forerunner of the Royal Society of Chemistry) in London in 1841. He corresponded with many famous scientists, including Michael Faraday in London who requested a sample of cadmium from him.

Although anaesthetics had been used previously in London, in January 1847 Herapath was the first person in Bristol to administer a gas (ether) as a general anaesthetic during an operation; he assisted the surgeon during a leg amputation on a young man at the Bristol General Hospital. Herapath was very familiar with the work of Beddoes and Davy, and, a few days after this operation, he used nitrous oxide as a general anesthetic during a tooth extraction, again for the first time in Bristol.

Part of Herapath’s role within the Bristol Medical School
was as a chemical analyst. In this context he analysed the composition of the Hotwells spring water. He is, however, chiefly remembered for his work as a forensic chemical analyst. He was the first person to devise a definitive test for arsenic in a corpse. He gave evidence in many famous court cases involving poisoning. One of these was the trial at the Spring Assizes in Bristol in 1835 of Mary Ann Burdock, who was accused of murdering, by arsenic poisoning, Mrs Clara Ann Smith, a 60-year-old, relatively wealthy widow, who had been a lodger at the boarding house run by Mary Burdock in St Phillips. Mrs Smith’s death in October 1833 was certified as being from “natural courses”. However, when in due course a nephew returned from overseas questions were asked: where was his inheritance and why had Mary Burdock apparently become so much richer? The upshot was that the coroner ordered an exhumation and autopsy of the body. Although the body had been in the grave for more than one year, Herapath was able to detect sufficient arsenic in the stomach to suggest poisoning. Mary Burdock was arrested and on the evidence of Herapath and of a maid, who had observed Mary Burdock administer a “red powder” to Mrs Smith, a remaining sample of which Herapath also showed contained arsenic, Mary Burdoch was convicted and subsequently hanged outside the new Bristol Gaol on Cumberland Road. A crowd, estimated
to be 50,000 persons, gathered outside to witness the first public execution of a female at the gaol.

Herapath also appeared on occasions for the defence in murder trials. One such famous occasion was at the trial in 1855 at the Old Bailey in London of a doctor, William Palmer, in one of the most notorious cases of the 19th century. Palmer was arrested for the murder, allegedly by poisoning with strychnine, of his racing associate, John Cook. The police were also convinced he had murdered several other victims, including family members, for the life insurance money to feed his gambling habits on horses. In this case Herapath was up against some heavyweights. The lead barrister for the prosecution was the renowned and fearsome attorney general, Sir Alexander Cockburn, and the forensic witness called by the prosecution was Alfred Swain Taylor, Professor of Medical Jurisprudence at Guys Hospital, who has been called “The Father of Modern Toxicology”. Herapath could find no evidence of strychnine in the body of John Cook. Ironically, Taylor could find none either! But the highly respected, London-based toxicologist stated that he was “still convinced” that Cook had been poisoned! Palmer was found guilty on purely circumstantial evidence and the biased summing up by the judge, Lord Chief Justice Campbell, who had also prevented Herapath from demonstrating his chemical test to the court. In
1859, on the basis of this and other cases, Herapath wrote a letter to The Times stating: “I consider that professional witnesses, who give their opinions, where the life or freedom of a man is at stake, are as much on trial as the prisoner”.

A major outbreak of cholera occurred in Bristol 1832, and then again in 1849. Herapath held the conventional view that cholera emanated from the putrid “poison”, associated with decaying animal flesh, which is inhaled into the lungs. He even suggested a chemical cure: fumigation with a mixture of black manganese oxide and common table salt, onto which vitriol (sulphuric acid) was poured. However, the real heroes in the fight against cholera in Bristol were a group of other doctors in the City (including William Budd, a doctor at the Infirmary, but also a director of the Waterworks company), who came to realize that cholera was not carried in the air, but in contaminated drinking water.

Herapath served as President of the Bristol Philosophical and Literary Society, at that time located on Park St. in what is now the Freemasons Hall. He was very interested in public education. In 1836 he delivered a series of four lectures on various scientific topics at the Mechanics Institute located in Broadmead: air and fire; water; cooking and brewing; and laughing gas. He repeated the laughing gas lecture at the Bristol
Philosophical and Literary Society where hundreds were turned away! William Herapath retired from his post at the Medical School in 1867. He was a diabetic and died at home in February 1868 aged 71. His grave is in Arnos Vale Cemetery.

The Herapath family in Bristol established a minor scientific dynasty. William’s cousin John Herapath (born 1790 in Bristol, but he later moved to London) was an applied mathematician and theoretical physicist. William’s eldest son, William Bird Herapath FRS (born 1820), was both a surgeon and a scientist (he received his FRS for his discovery of the first light-polarising crystal, subsequently named “herapathite”). In addition, William’s youngest son, Thornton John Herapath (born 1830) carried out some significant research as a chemical analyst, but sadly died when he was only 28. John Herapath’s second son, Spencer (born 1821), became a civil engineer. The son, grandson and great-grandson of William Bird Herapath all became doctors in and around Bristol. So five, successive generations of the same family worked in the city as medical practitioners or scientists. A plaque to Herapath A plaque was erected in February 2017 by the Bristol Civic Society on the outside wall of the “Packhorse” pub in Lawrence Hill, where William Herapath lived prior to his marriage.
The only other commemoration to the Herapath family in Bristol is in nearby Barton Hill, where a road, “Herapath Street”, was named in their honour.
BIBLIOGRAPHY


