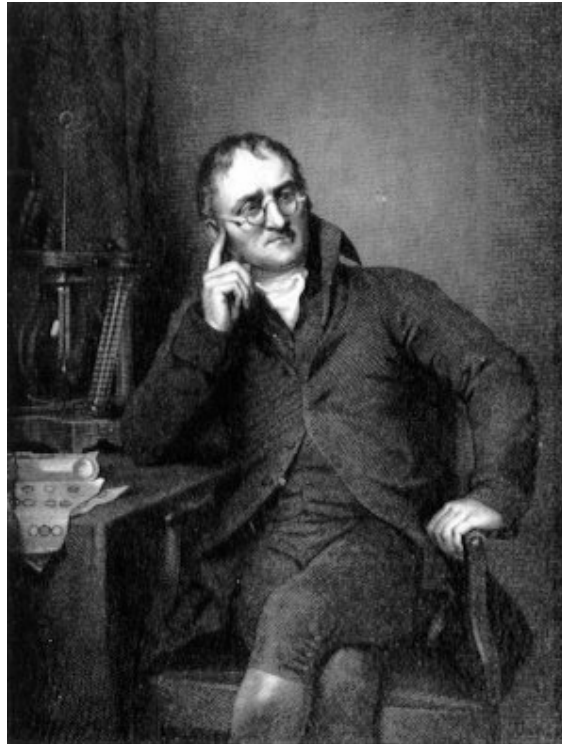


John Dalton's Manchester

A short walk around the city centre



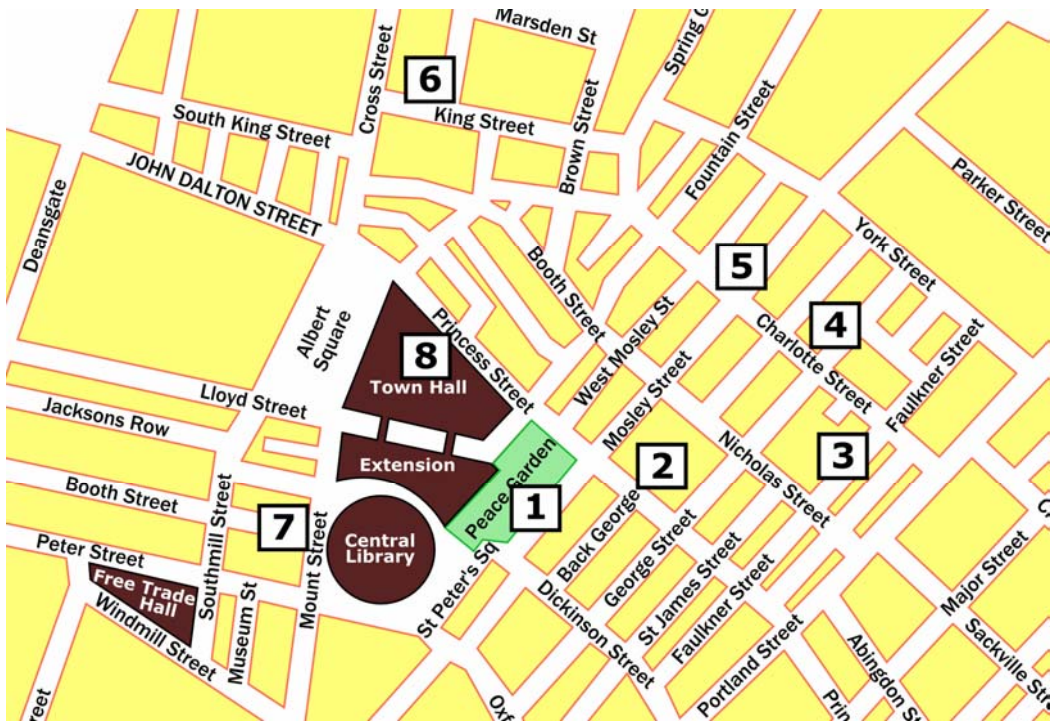
CHSTM

Centre for the History of Science,
Technology and Medicine

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Introduction

John Dalton was born in 1766 in the village of Eaglesfield, Cumbria. His family belonged to the Society of Friends, otherwise known as the Quakers, a religious movement which did not accept the teachings of the established Church of England. This background shaped the opportunities open to the young Dalton. Religious Dissenters such as Quakers were excluded from many of the traditional routes for social and professional success, including the two universities in England. But they had begun to build educational systems of their own, which could often be more useful to a young man without a professional background.

Dalton's father was a smallholding farmer and weaver, and Dalton himself worked on the land as a child. His family was not wealthy, but membership in the close-knit local Quaker community introduced the young Dalton to Elihu Robinson, a well-read local landowner. Robinson noticed the boy's keen appetite for study, and soon brought him to share his own particular interest in the meteorology of the Lake District. Dalton took up teaching very early: aged only twelve, he was already running a village school for younger boys in a barn in Eaglesfield.

At fifteen, he moved to Kendal to teach at another school with his brother. Here he met another well-connected Quaker, the blind scholar John Gough, who encouraged his meteorological studies and taught him some higher mathematics. It was Gough who persuaded Dalton to start a daily weather record, which he was to keep up for the rest of his life.

By 1787, Dalton was advertising as a tutor in specialist branches of natural knowledge including astronomy and mechanics. Yet he struggled to find a paying audience for his teaching, and sometimes had to go back to farm labouring to make ends meet. He wondered about breaking into an established profession such as law or medicine, but his social status was a problem. Other opportunities, however, were beginning to open up for Dissenters interested in new knowledge of the natural world.

1. Site of the Manchester Academy and Mechanics' Institution

The Unitarians were another Dissenting group, who, like the Quakers, were excluded from the opportunities of the established church. A large Unitarian community, led by wealthy manufacturers and professional men, had developed in Manchester, and in the 1780s a group of Unitarians led by Thomas Percival, a medic, had set up the Manchester Academy. It was intended mainly for young men who were training to be Dissenting ministers, though the sons of Unitarian manufacturers also studied there.

Sometimes also known as the New College, this institution was a successor to the Warrington Academy, where the famous chemist and electrical researcher Joseph Priestley had worked in the 1760s. At a time when the established universities of Oxford and Cambridge favoured very traditional teaching, Priestley had emphasised new ideas in natural philosophy (the study of underlying causes in nature, corresponding roughly to the modern physical sciences).

News of John Dalton's skills had reached Manchester by way of John Gough and others in Kendal. In 1793, he accepted a job at the Manchester Academy. As a lifelong Lakelander, he was surprised to find the town to be made almost entirely of brick. Manchester was still small, but was industrialising rapidly: the first large mill buildings, in Ancoats, went up around the time of Dalton's arrival.

The Academy stood on what is now the east corner of the Peace Garden, near Princess Street. This site was then on the very edge of Manchester: Oxford Street ran southeast across open fields. The building was impressive, serving as a reminder of the Dissenters' local power. Here, Dalton taught natural philosophy, chemistry and mathematics, met others with similar interests, and began to put down roots.

In 1803 the Academy moved to York, following the appointment of a new head. (It made several further moves, finally settling in Oxford, where it eventually became Harris Manchester College). Dalton, however, decided to stay in Manchester. He was, by this time, an experienced teacher with a growing reputation, and the city offered various opportunities for paid work.

One of the institutions at which Dalton taught in later life also stood here. In 1824, the Mechanics' Institution was set up near what is now the north corner of the Peace Garden by Cooper Street. As the name suggests, the Mechanics' Institute was set up to educate working men, mostly from the cotton and engineering industries, and give them a basic education in the sciences. It was founded by local industrialists and scientific men including Dalton, who was

its Vice-President in 1840. In practice, the tuition fees proved an obstacle to its stated mission: most of the pupils came instead from the trades and lower middle classes, young shopkeepers and clerks.

The Institution was successful, however, and grew in scale: after Dalton's time, it became the Technical School, and later the University of Manchester Institute of Science and Technology (UMIST) on a new site further east. In 2004, UMIST became part of the merged University of Manchester, which records the original Mechanics' Institution foundation date of 1824 in its logo.

2. Site of William Henry's house/Royal Manchester Institution

In Dalton's time, this area contained a mixture of shops and houses, including the homes of some of Manchester's well-to-do manufacturers. Where the front part of the Art Gallery now stands was once a large house belonging to Dalton's friend and collaborator, William Henry. William's father, Thomas Henry, was one of the most successful apothecaries (trading chemists) in Manchester, and a leading producer of the mineral salt, magnesia. He was also a Dissenter, a friend of Thomas Percival, and one of the group who had brought John Dalton to Manchester. William Henry went into the family business, and carried the skills he learned as a manufacturing chemist into his research work. Sometimes he helped Dalton with his experiments. While Dalton eventually became world-famous for his theories, his practical abilities were apparently not as strong.

In particular, Dalton and Henry shared an interest in the chemistry of gases and liquids. Alongside magnesia, Henry's family firm also made soda-water. His investigations of the manufacturing process led him to what is still called Henry's Law: at a given temperature, he discovered, the volume of a gas which will dissolve in a liquid goes in proportion to the pressure of the gas above that liquid. Dalton's discussions with Henry as to what might cause these effects were probably important in the later development of his atomic theory.

In the mid-1820s, after William Henry had moved away and the house had been pulled down, the site was used for the building which still stands here. Initially named the Royal Manchester Institution, it was built mainly as an art gallery, which it remains today. In its early years, however, the Institution also had a large lecture theatre and meeting rooms. Here, the specialist scientific groups which developed in the 1820s and 30s used to meet, with Dalton and his friends often in attendance.

3. Faulkner Street

Between two Chinese restaurants on the side of Faulkner Street facing the car park, a small black-and-white plaque commemorates Dalton's atomic theory. This theory, the prime source of Dalton's fame, was first announced in 1803 while Dalton was in lodgings here.

These streets, which became Manchester's Chinatown after the Second World War, were newly laid out when Dalton arrived. During his half-century in Manchester, Dalton lived at three properties on Faulkner Street. In his early days, he lodged for a time at number 35; then, from 1800 to 1804, at number 18. He then moved the short distance to Booth Street, where he lodged with a friend, the Reverend William Johns, but returned in 1836 when he bought 27 Faulkner Street. This last was opposite Chain Street. Faulkner Street then had properties on both sides, and Dalton's home stood near what is now the north end of the car park.

After leaving the Manchester Academy, Dalton supported himself by a mixture of public lecturing and tutoring to private pupils. It is significant that in later life, when he had become an international public figure and comfortably well-off, he remained as a householder among the streets where he had lodged in his sometimes difficult early days. Dalton's regular workplaces and social haunts were clustered within a handful of nearby streets, and the area suited his 'plain' Quaker identity better than the more ostentatious suburbs. Dalton lived in Manchester for practically his whole life from 1793, though he would return to the Lakes in the summer. On Thursday afternoons, he would take a trip to the Dog and Partridge Inn on Chester Road, Old Trafford, where he enjoyed a game of bowls.

Dalton's atomic theory was inspired partly by the work of Joseph Priestley and others on new ways of understanding the air: not as a single gas, but a mixture of 'airs' with different properties. If these substances were different, wondered Dalton, why didn't they separate out into different layers? Dalton's ponderings connected with his interest in meteorology. Moving between the rainy Lake District and rainy Manchester naturally led him to focus on the nature of water vapour and clouds: water, it seemed, could sometimes disperse itself in the much lighter air. Similarly, gases could dissolve in liquids, as in William Henry's soda water: the heavier the gas, Dalton discovered, the more of it tended to dissolve.

Dalton's background in teaching, often to young pupils, meant that he was used to breaking down complex ideas into simple components. All matter, he decided, was made up of atoms — tiny, unbreakable particles, far too small to be seen. If the atoms were of different sizes, the small atoms could mingle among the big ones to form a mixture such as the air.

Atomic theories were not new. They had existed since ancient times, and the name *atom* comes from the Greek *átomos*, meaning 'uncuttable' or 'indivisible'. But Dalton combined the concept with new descriptions of the different forms of matter, or 'elements', and with the results of weight measurements in chemical reactions, which were becoming more and more precise in the nineteenth century. Chemists had found that a given weight of hydrogen, for instance, would combine with a particular weight of oxygen to make water, but not with more or less.

Dalton proposed that all the atoms of each element weighed the same; that the particular weight could be different for different elements; and that atoms of different elements combined with each other in simple fixed proportions — two to one, for instance — to make larger 'atoms' (what we would call molecules). This was a major change in thinking, and helped to explain a lot of experimental results.

Though Manchester was not an ideal base from which to promote a new grand theory, Dalton quickly won some powerful supporters. Probably the most important was Thomas Thomson, an Edinburgh chemical researcher. Thomson, like Dalton, supported himself by private teaching, and William Henry had been one of his pupils. Thomson was also the author of the *System of Chemistry*, the first systematic chemistry textbook in English, which was highly influential. He first met Dalton in 1804 and was impressed enough to promote his theory in later editions of the *System*. Some chemists, notably Humphry Davy, doubted the atomic approach at first, but Dalton's theory gained increasing experimental support and was eventually accepted. This secured Dalton's status as a man of science internationally.

4. Site of the Lit and Phil

A plaque here marks the site of the first permanent home of the Literary and Philosophical Society of Manchester, the mainstay of John Dalton's activities and reputation. The 'Lit and Phil', as it was known, was one of the first in England. Similar societies existed in most of the major cities and towns by 1830. Before the growth of professional research culture, and the expansion of the university system, they had a crucial role as sites for the development and discussion of scientific ideas.

The Manchester Lit and Phil began as a dining club, about 1781, at the home of the medic Thomas Percival. With support from influential medics, engineers and leading Manchester men of business such as the Henry family, the club soon became an established Society, and set up premises at 36 George Street in 1799.

John Dalton joined the Lit and Phil soon after his arrival in 1793. In 1794 he presented his first research paper, on the subject of colour vision. Dalton had worked out that his vision was different from other people's. Pink, to him, seemed nearer blue than red, and he might see a geranium as 'blue' in daylight and 'red' by candle-light. Dalton provided the first clear description of this condition, which he shared with his brother, and attempted to explain it in terms of structural differences in the eye. The condition, a form of red-green colour-blindness, was widely known until recently as 'Daltonism'.

Dalton became increasingly influential in the development of the Lit and Phil, and in 1800 was appointed Secretary. The building's facilities included a chemical laboratory, which Dalton (still living on his teaching income, with no private facilities of his own) was allowed to use regularly. It was at a Lit and Phil meeting in 1803 that Dalton first announced his atomic theory. The following year, he moved into 25 George Street, almost directly across the road, lodging with the Johns family and working mainly at the Lit and Phil: this arrangement persisted until 1830.

In 1816 Thomas Henry, then President of the Lit and Phil, died. William Henry, his son, was expected to succeed him, but felt that the role should go instead to his friend Dalton. Dalton accepted the presidency, which he retained for the rest of his life, his international reputation providing a public face for Manchester's growing scientific culture. Following Dalton's death, the prestige of the Lit and Phil was maintained by members such as James Joule, the chemist Henry Roscoe, the powerful Manchester engineers Joseph Whitworth and William Fairbairn, and, in the twentieth century, the atomic physicist Ernest Rutherford. Throughout its growth, the Lit and Phil continued to operate from its historic home on George Street.

In December 1940, at the height of the 'Christmas blitz' on Manchester, the building was totally destroyed by fire, and almost all of its contents lost. These included the vast majority of Dalton's known original manuscripts. Some of their content can be guessed at from surviving catalogue records, but reconstructing many details of Dalton's working life now presents a challenge for the most dedicated of historians. Yet the destruction was not total: a few manuscripts survived in a metal box in the Lit and Phil's basement, albeit with significant heat and water damage. These documents were treated and preserved, and are now maintained by the John Rylands University Library Manchester's Special Collections department at Deansgate, their charred edges a highly visible reminder of their history. Also lost to the fire was William Allen's well-known 1814 portrait of Dalton: most reproductions today are actually of a 1946 replica painted from surviving copies.

After the war, the Lit and Phil built new premises on the same site. The new building, unfortunately, suffered serious structural problems due to the use of

high-alumina cement, and was itself demolished. With the Lit and Phil functioning increasingly as a discussion group, the decision was taken to sell the site. Meetings of the Society continue at a variety of locations, which include Manchester's universities.

A short way north and east of here, on what is now the Piccadilly Plaza site, the Pine Street Medical School opened in the 1820s. This provided another source of teaching income for John Dalton. It was one of a series of private medical schools where students learnt anatomy, physiology and some chemistry before going on to clinical training, usually at the Manchester Infirmary. This had been set up as a cottage hospital in the 1750s, but had moved to a much larger site near here — a site which was cleared early in the twentieth century, and is now Piccadilly Gardens.

5. Portico Library

Over the years of Dalton's residence, the character of this area gradually shifted from being largely residential to incorporating more public buildings. One of these was the Portico Library, founded in 1806: one of many private subscription libraries developed in this period, and a valuable resource for researchers in a town without university facilities. Dalton became the Library's first honorary member: his official role was 'Clockman', making him theoretically responsible for ensuring that the Library clock told the correct time. Dalton visited regularly at lunchtime to read the day's newspapers.

The Portico Library is still based here, though much of the building is given over to a pub.

6. Site of Charles White's house/Old Town Hall

On the large building at the corner with Cheapside, now a bank, a plaque indicates the site of the house of Charles White, another founder of the Lit and Phil. A member of an established medical family; White was a surgeon and obstetric consultant (what was then known as a 'man-midwife'), and was involved in setting up the Infirmary in the 1750s. Both Thomas Percival and Thomas Henry lived nearby.

Later, in the 1820s, a new Town Hall for Manchester was built here. Following his death in 1844, Dalton's body was laid in state here: 40 000 people filed past the coffin to pay their respects. A funeral procession over a mile long then bore the coffin, with much pomp and ceremony, to Ardwick Cemetery.

Dalton's memorials were much-travelled in the twentieth century. Ardwick Cemetery was converted to parkland in the 1960s, and the red granite slab bearing Dalton's name was transferred to the rebuilt Lit and Phil building on

George Street, where it had pride of place in the entranceway. This stone was later transferred to the Friends' Meeting House on Mount Street, and then to the Museum of Science and Industry, where it's now on display in the Manchester Science Gallery. Dalton's memorial committee had also commissioned a second statue, a scaled-up copy of the Chantrey sculpture in bronze, which first stood in Piccadilly. In 1966 it was moved to stand outside the John Dalton College of Technology, at the corner of Oxford Road and Chester Street, which is now the John Dalton building of Manchester Metropolitan University. Alongside it is a second slab from the Ardwick memorial.

As you return to Albert Square, on your right, you will note the street named in honour of John Dalton.

7. Friends' Meeting House

Quakers have met and worshipped at a Meeting House on this site since the 1790s. Dalton, as a lifelong and passionate Quaker, attended here at a former building from his first arrival in Manchester. In the 1820s, he contributed to the fund to build the enlarged Meeting House we see today. Dalton did not, however, involve himself in the social work and philanthropic activities typical of successful Quakers. Indeed, he was silent on social and political questions generally. In person he was usually private and reserved, preferring to be known through his research and teaching.

8. Manchester Town Hall

The statue of John Dalton that stands in the entranceway to the Town Hall was modelled during Dalton's lifetime, having been commissioned by several of his admirers in the 1830s. Dalton personally sat for the sculptor, Sir Francis Chantrey. Honouring a living man in this way was a relatively unusual practice: Dalton was then the established figurehead of Manchester science, and probably the most internationally famous Mancunian living at that time.

The statue was originally set up in 1838, in the entranceway to the Royal Manchester Institution. Following the building of the new Town Hall, completed in 1877 as a replacement for the King Street site which was now too small, it was transferred here.

Dalton's reputation grew after his death in 1844: scientific and industrial expansion demanded stories of founding fathers, and, as a small town until recently, the town had little scientific heritage (though the Elizabethan mathematician John Dee, and the astronomers Jeremiah Horrox and William Crabtree, had Manchester associations). In the 1850s, a proposal emerged to set up a new statue of Dalton, among those of other worthies, on the

Infirmiry site at Piccadilly: what was eventually commissioned was a scaled-up replica of the Chantrey statue, cast in bronze. This statue survived in Piccadilly Gardens until the 1960s, when it was moved for an electricity substation. Like Dalton's gravestone, it was transferred to the John Dalton College building by Oxford Road, where it still stands.

Facing Dalton across the entranceway is his most famous pupil, James Prescott Joule, who gave his name to the unit of energy. Famous in the late nineteenth century for his principle of the mechanical equivalent of heat, Joule was the son of a prosperous brewer whose site lay up on New Bailey Street, on the Salford side of the river. As a young man, James Joule fitted in his investigations around a full day's work at the brewhouse, at evenings and weekends, in a laboratory built at the family house, and sometimes in the brewhouse cellar. Some historians suggest that his brewer's sense of heat control was a great help in developing his thermometric studies that led to the mechanical equivalent theory, which Joule first announced a short distance from here in the reading room of St Ann's Church.

Around the age of sixteen, Joule and his brother were sent for a course of private tuition with Dalton. It was not at all unusual for gentlemen's sons to be educated on this basis. Dalton and Joule were not research collaborators in later life, and Dalton's tuition probably covered standard topics which could have been covered equally well by less famous teachers: but it's interesting to speculate on how Dalton's systematic approach might have shaped the young Joule's mind. Other Dalton pupils who went on to become well known include the engineer, Eaton Hodgkinson, and the gas supply pioneer Samuel Clegg.

Dalton appears again upstairs in the Great Hall: he is the subject of one of the twelve frescoes painted by Ford Madox Brown between 1879 and 1893 to show the history of Manchester. Dalton is depicted collecting combustible 'fire-gas' from a marsh, with the aid of an assistant: like most pictures in the series, it offers a more legendary than factual view of events.

Walk text by James Sumner, 2009. Based on material from "Science Places: Manchester" by James Sumner and John Pickstone, at [www.scienceplaces.org.uk].

www.manchester.ac.uk/chstm