

## Science Places John Dalton walk - script

### 1. Central Library

Welcome to this tour of the scientific history of Manchester. I should explain that I am John Dalton, the man they credited with the atomic theory in chemistry. I lived in Manchester from 1793 to my death in 1844, but, by little miracle of science, I'm also able to tell you what happened afterwards.

### 2. War memorial, formerly Peace Garden

Up on the corner, by Princess Street, there once stood a college called the Manchester Academy, and it was the Manchester Academy that first brought me to this city as a young teacher in 1793.

Now, when you think of where young men went to be educated in those times, you might think of the universities at Oxford and Cambridge, which were already centuries old. But those places were Church of England, closed to the followers of the Nonconformist religions, including Quakers such as myself. So Nonconformists had to develop their own institutions: there was a famous Dissenting Academy in Warrington, where Joseph Priestley taught in the 1760s, around the time I was born. You may know about Priestley's work on electricity and discovery of new gases; he was a bit too radical for my liking, in his religion and in his politics, but I believe he did some good work in reforming the teaching there. He brought in a new emphasis on natural philosophy — more or less what you'd call physics — and natural history. This was at a time when the old universities were very set in their ways.

Well, that Academy in Warrington closed in 1786, but the new Manchester Academy took its place. I came here, as I say, in 1793, and I taught chemistry and natural philosophy and especially mathematics. I'd learned about these things where I grew up, in the south of the Lake District, where there was a fine tradition of teaching among Quakers: believe it or not, I'd been school-teaching in one form or another from the age of about twelve. Manchester was a still small town then, but it was beginning to industrialise. When I arrived the first big factory was going up in Ancoats; the political situation, meanwhile, was becoming tense because of the French Revolution.

The Academy was quite an impressive public building, established by some of the richest Nonconformists in Manchester society. It was meant for young men who were training to be Dissenting ministers, especially in the Unitarian churches, though many of the sons of Unitarian manufacturers went there as well. But in 1804, it was decided that Manchester was a bit rough for the sons of gentlemen, and the college moved to York. It moved to various places afterwards, though it always kept the Manchester name, and it even came back to Manchester for a spell in the 1840s; but eventually it settled in Oxford, of all places, where it's now Harris Manchester College.

Anyway, when the Academy moved to York, I decided to stay here. I'd already done a fair amount of teaching, and I reckoned I could make a living — and I did. Not a great living, but then I was a man of simple tastes.

Behind the Academy was another college, created in 1824. But this one wasn't for the elite of Manchester: it was the Mechanics' Institution, built for working men. Of course the people who set it up were mostly well to do, including one or two up-and-coming engineers. But the Institution was supposed to take workers from the cotton industry and engineering industry and give them a basic education in sciences. I used to teach there myself sometimes.

Of course, as you might guess, many of the people who took advantage of these colleges were not so much workers in industry — they were young shopkeepers and clerks, improving their language skills and their mathematics. How'be, the Institution developed, and later it was reorganised as the Technical School, which became UMIST, which in your day became a part of the University of Manchester.

### **3. Corner of Princess Street and Mosley Street ( Manchester Art Gallery)**

Now, you see here Manchester Art Gallery: I remember when that was built in the 1820s. Before that, there was a big house on the site, and that house was home to my friend William Henry. William's father Thomas was one of the most successful apothecaries in Manchester, with a considerable business in magnesia, and he was one of the people who'd brought me to the Academy. Now, William Henry went into the family business, which gave him some useful skills, and he gave me a great deal of assistance in my chemical work. Some would say he was a better chemist than I was, and to be honest, I wouldn't disagree.

What William Henry and I shared, in particular, was an interest in gases and liquids. I'd heard how Joseph Priestley and the other new chemists described the air as a mixture of various different gases, and growing up in the Lake District where, as you know, there is an awful lot of weather, I'd got to thinking about clouds and water vapour, and I found myself wondering why the gases didn't separate out into different layers. Now William Henry had another reason to be interested in these things: alongside the magnesia business, he made soda-water. You may have heard of Henry's Law, which he discovered, which says that at a given temperature, the amount of a gas which you can dissolve in a liquid goes in proportion to the pressure of the gas. Well this was a pretty handy principle for somebody making money out of soda-water. William Henry and I used to discuss these matters, and I think that this, as much as anything else, was the basis of my atomic theory — but more of that later.

In the mid 1820s, when William Henry's house had been knocked down, they put up the building you see now, and at first it was called the Royal Manchester Institution. Now this was, just as it is now, a big art gallery: what the founders were about was showing that Manchester was a place of culture, not just business. But it wasn't just for the arts: there was a big lecture theatre — it's gone now — and meeting rooms, and the societies which developed in the 1820s and the 1830s often held their meetings there. That was true of the Medical Society, which had a big collection of books, and also the Statistical Society, who investigated the conditions of the poorer districts around the cholera epidemic of 1831.

Look over to the opposite side of Princess Street, and you'll see a plaque to Frederick Crace-Calvert. He was another man who put his chemical knowledge to use in manufacturing, but he came slightly later, arriving in Manchester in 1846. He taught at the Royal Manchester Institution as well as a nearby medical school, and you'll see the medical connection when I tell you that one of his particular chemical interests was carbolic acid, or phenol as it's now known, which is an antiseptic. It became famous for its use in antiseptic surgery, with Joseph Lister from the 1860s; and Crace-Calvert sold carbolic tooth cleaner! He was often consulted about sanitation and disinfection — not only for public health, but for cotton, which of course can suffer from mildew when it gets damp. And he also knew a lot about dyestuffs — another area where a chemically-minded man could make himself useful to the textile trade.

### **4. George Street (Guardian Exchange)**

Now I want to show you a strange thing, from about 110 years after I died. And here I think a Quaker like me may feel somewhat troubled. There's a telephone exchange here, from around 1954, but it was built deep underground in a bunker so that communications could carry on if the city was hit by an atomic bomb. The main tunnel is under Back George Street, 34 metres underground by your Continental measure: what you're looking at is a surface access point, and the tower there provided ventilation. They called this the Guardian Exchange.

If there had been a 'nuclear emergency', people might have had to stay down there for several weeks, so there were supplies of food, electrical generators and a well on the site. The main entrance would have been sealed off by a 35-tonne concrete slab, but with two kilometres of deep tunnel running out to escape points in Salford and in Ardwick — that would have been out in the

countryside when I was around.

It's funny to think what talking about atoms led to — and to continued to lead to. These deep bunkers became obsolete almost immediately, because hydrogen bombs came along that could penetrate even deeper. But Guardian was kept in use as a civil telephone exchange, and the main tunnel's still used now for secure cabling.

### **5. Faulkner Street ( China Town car park), atomic theory bicentenary plaque**

Now, look carefully between the Chinese restaurants on the side of the street facing the car park, and you'll see a small black-and-white plaque. This is the street I was living on in 1803 when I first announced my atomic theory. As I said earlier, it was partly a matter of thinking about how different kinds of gases could exist in the atmosphere, how they could enter into solutions, and why it was that different chemical elements appeared to combine in particular ways.

I suppose one thing that led me to this theory was that I did a lot of teaching, and it was part of my task to make things simple. So, I began by imagining that these gases, and the other elements, were made up of tiny particles which couldn't be divided or broken up any further, and that they combined with other elements in simple fixed proportions — two to one, for instance — to make larger molecules. Now, 'indivisible' in the classical Greek language is *átomos*, and there had been 'atomic theories' about indivisible particles in ancient times. My theory, though, had a nineteenth-century aim: to explain the outcomes of exact measurement. If all the atoms of each element weighed the same, but each element had its own particular weight, I found I could explain the results of a lot of chemical combinations.

Well, it turned out to be quite an important idea, and it amused me, after I was dead, to see how people celebrated the atomic theory as they developed chemistry in Manchester. Of course, in the early twentieth century, with young Rutherford at the University, things took another turn, when for the first time it appeared that atoms were being split — so they weren't indivisible at all... I like to think it was me who introduced atoms into the history of Manchester.

Now, you may know that Piccadilly Gardens, just up the road from here, was the site of the Manchester Infirmary, later the Manchester Royal Infirmary, which was set up in 1755. Before it moved to Oxford Road in the 1900s, this was the centre for clinical teaching in Manchester, and in my time there also a succession of private medical schools, where students learnt the anatomy, the physiology and some chemistry before they went on to do their clinical training at the hospital. I used to teach chemistry to them — not that many of them cared much for it. They were a rough lot and most of 'em just wanted to get qualified.

### **6. George Street (Lit and Phil site)**

Well, on the site where the building with the plaque now stands was the first permanent home of the Literary and Philosophical Society of Manchester. The 'Lit and Phil', as it was known, was one of the first in England. There were lots of them by the 1830s, and they were very important before universities got going as places for science.

The Manchester Lit and Phil began as a dining club, about 1781, at the home of a physician named Thomas Percival. Now you may not be surprised to learn that Dr Percival was a Unitarian, who'd studied at the Warrington Academy, and his friends included men like Thomas Henry, the wealthy apothecary. Within a few years the club was an established Society and rich enough to build its own premises here on George Street, which opened in 1799.

Of course, I'd joined the Lit and Phil not long after I arrived, and in 1800 they made me Secretary. As the plaque tells you, they had a chemical laboratory here, which they let me use. It was here that I first announced the atomic theory in 1803, and the following year I moved into lodgings just

across the road. In 1816 Thomas Henry, who'd been President, died, and everyone expected his son William to succeed him, but William felt the role should go to me. Well, I stayed President of the Lit and Phil for the rest of my life, and I like to think I gave it a public face. They used to joke, when I was older, that if nobody much had anything to say, Dr Dalton would go on about the weather; but I kept the Society going through some difficult times.

As the name should tell you, the Lit and Phil tried to promote all kinds of learning, but it's always been most interested in the sciences, and it's had several members who became known across the world: for instance, my old pupil James Joule, and the chemist Henry Roscoe — you'll be hearing more about those later on — and powerful Manchester engineers like Joseph Whitworth and William Fairbairn, and later on there was Ernest Rutherford. Now, the Lit and Phil stayed in this building until the Second World War when, unfortunately, it was bombed out, and it grieves me to say that the destruction included most of my personal papers, which had been stored on the site — leaving me, as far as your present-day historians are concerned, a bit of a man of mystery. If you're so inclined you can see what remains in the John Rylands Library on Deansgate: some of the papers are charred from the fire.

There's a second sad story here: after the War, they built a new home for the Lit and Phil on the same site. Unfortunately, by another little bit of the magic of science they built it with high-alumina cement. Well, this kind of building proved insecure, and this particular one had to be knocked down. Now by this time, the Society was no longer really a centre of science, more a general discussion group, and they decided to sell up and continue without a regular site. They are still going, but these days they hold their lectures at the University, or MMU, or at public rooms in town.

Anyway, the streets around here were very much my home ground, though once a week or so, I used to go out to Old Trafford, to a public house that had rather a good bowling green, and of course every summer I went back up to the Lakes. But for the most part I stayed close by the Lit and Phil: after I left the Academy, I lived mainly on the earnings from private classes and public lectures at various local institutions.

## **7. Corner of Mosley Street and Charlotte Street (Portico Library)**

When I came here in 1793 this was a residential area, but by about 1830 most of the houses were gone, and these streets were filled with businesses and public buildings. One of the most important, from 1806, was the Portico Library: as you can see from the various signboards, it's still here, although most of the building's become a public house, would you believe. Now this was a private library, and a very handy place for those of us who could afford its subscriptions — you'll see my name on the list of readers up on that blue plaque. I was the first honorary member, and they gave me the official duty of 'Clockman', making sure the Library clock kept time. Another reader was William Gaskell, a Unitarian minister at Cross Street Chapel in the 1830s. His wife wrote books, novels. You may have heard of some of them. Mary Barton, for example, created a bit of a stir because of some of her criticisms of the cotton industry; but by and large, William Gaskell and Elizabeth did a lot of good work.

## **8. Corner of King Street and Cheapside (old Town Hall)**

We're now moving towards Cross Street, the site of the Unitarian Chapel where so many of Manchester's scientific and medical Dissenters used to meet. On the large building which is now a bank, on the corner with Cheapside, there's a plaque telling you that here, when I first came to Manchester, was the house of Charles White. Dr White came of an important medical family; he was a surgeon and what was then known as a 'man-midwife'. He was another founder of the Lit and Phil, and was involved in setting up the Infirmary in the 1750s. Well, in the 1820s, some time after he died, this became the site of Manchester's new Town Hall, though the building's since been

pulled down. It was in that Town Hall that they laid me out after I was dead; and would you know, 40 000 people filed past my body.

Well it was a peculiar experience for a plain Quaker. I like to think that it indicated that people were taking note of Manchester, and that in Manchester, people were taking note of chemistry and natural philosophy. Also, that they knew what a simple plain man could do by continued 'application.'

## **9. Corner of Cross Street and Chapel Walks ( Cross Street Chapel)**

So, here is Cross Street Chapel, and you may well wonder about the history of this site, which now seems to be an office block. When I came here in 1793, as I've said, the Chapel was the centre of the Unitarian congregation: a lot of Manchester's rising men and their families attended there of a Sunday morning. Some of the most powerful were active in developing the Lit and Phil, which as you can see is mentioned on the plaque, and supported the Manchester Academy. Now, the original Chapel, like the Lit and Phil, was destroyed by bombing in the Second World War. And again, they rebuilt on the original site, and in this case they didn't use high-alumina cement. But, you know, these chapels don't get the congregations they used to, so they realised their assets by turning most of the site over to offices, and now they have one or two nice rooms on the ground floor and the first floor.

But if we're talking of churches, it was just over the road here, in the reading room of St Ann's Church, that James Prescott Joule first announced his principle of the mechanical equivalent of heat. Now this lecture, in 1847, came a couple of years after I departed this life, but I maybe had a hand in it, for when young Master Joule was aged about sixteen, he was sent to me with his brother as a private pupil in arithmetic and geometry. It pleases me that he continued his analytical work into later life. Not during the day, of course — Joule's father kept a brewery up on New Bailey Street, on the Salford side, and young James put in a full day's work at the brewhouse. But at evenings and weekends, he'd be busy with his investigations: he'd had a laboratory built at the family house, and he sometimes worked in the brewhouse cellar. People say that his brewer's sense of heat control was a great help to him there.

What got him going in the 1820s and 30s was the belief among many people that the newly discovered powers of electricity could lead to something like perpetual motion. Now Joule was a very careful young man: he did some precise measurements to find how much zinc was burned up in batteries to produce a given amount of work by an electric motor. It was that kind of balancing, the physical and economic considerations that lead him to the mechanical equivalent of heat, and with the help of his friend, William Thomson up in Glasgow, it led to the principle of the conservation of energy.

Now then, we're about to go up to the present Town Hall, and as a plain man I'd best not notice that, going off to the right hand side, they've named a street after me.

## **10. Inside Manchester Town Hall**

Well, here in the entranceway, past the main porch, you should have no trouble in making out that the left-hand statue is of me. I remember my embarrassment at having to sit there and be modelled by Francis Chantry, but I must admit he did a rather good job. And then across the aisle, there's my old pupil, James Prescott Joule. It's a remarkable thing, though I say it myself, that a Town Hall porch should contain statues of two scientists. Not, you should note, scientists who belonged to universities, or could do as they pleased, but men who made their own ways in life, me with my teaching and Joule working away in his time away from business.

Around the corner on the right is a hall of statues, including one of William Fairbairn the engineer. What people sometimes forget about Manchester, being at the centre of a big textile area, was that the textile mills didn't build themselves. Many a local fortune was made from engineering: making

iron beams for the mill buildings, or machinery to prepare the cotton and make the cloth. Fairbairn and his partner James Lillie were leading local millwrights in the 1820s, but after a crisis in 1832 the partnership broke up, and Fairbairn turned to his other main interest, which was shipbuilding. Also in this hall, you'll see a commemoration of the Nuclear Free Zone declaration, part of the same broad movement which created the Peace Garden: Manchester City Council was the first to declare itself 'nuclear-free', in 1980.

If you can get up to the Great Hall on the first floor, you'll see me again. There are twelve frescoes painted by Ford Madox Brown to show the history of Manchester, and on the near right as you come in I'm pictured collecting fire-gas from a marsh. Like most of these pictures, it's more legend than history! At the far end you'll also find a local astronomer, William Crabtree, one of a northern group who measured the transit of Venus in 1639 — he was a draper, or cloth-dealer, by trade, as you can see from the picture. And of course there are also the textile and canal scenes you would expect.

### **11. Mount Street (Friends' Meeting House)**

Well this Quaker Chapel was there in the early nineteenth century, and it's there I used to attend, because I was for the whole of my life attached to the Society of Friends, as we called it. Now, if you were to walk left around the Library, you'd be back where you started, and some of you may wish to end your journey here; or, if you'd like to walk with me a while further, I'll show you something of the University's origins and bring you finally to the Museum of Science and Industry. But if you are stopping at this point, I'll thank you for your company and I'll wish thee, Quaker-fashion, farewell.