

## **Researcher: Kathryn Jones - Sublime Structures - Joseph Paxton - Jan 2018**

Sublime Structures: Joseph Paxton; architect, gardener, Member of Parliament, and cultivator of the Cavendish banana.

Portrait of Joseph Paxton circa 1850:

<https://www.architecture.com/image-library/ribapix/image-information/poster/sir-joseph-paxton/posterid/RIBA82337.html>

### **Early life & career:**

Sir Joseph Paxton M.P. (1803-1865), was born in the Bedfordshire village of Milton Bryan, the seventh son of a farming family.

Paxton's first job, aged 15, was as a gardening boy at Battlesden Park, a large manor house and country estate a mile away from home. By 1823, after several moves, he was experienced enough to gain employment at the Royal Horticultural Society's Chiswick Gardens. Nowadays, Chiswick is part of greater London, but in the early 19th century, it was still a rural fishing village on the Thames, yet to be swallowed up by the Victorian house-building boom.

### **Chatsworth:**

Whilst walking in the gardens at adjacent Chiswick House, Paxton fell into conversation with its owner, the Duke of Devonshire, who was so impressed with the young gardener's skill and enthusiasm, that he offered Paxton the position of Head Gardener at Chatsworth House, his family's country estate in Derbyshire.

On his first day at his new job, Joseph Paxton, having arrived by coach at 4.30 a.m. and scaled the kitchen garden wall, had explored the gardens, set his new employees to work, had breakfast with the Chatsworth housekeeper, *and* met his future wife, the housekeeper's niece... all before 9am.

### **Publishing Career:**

In 1831, Paxton published a monthly magazine called The Horticultural Register, followed by the Magazine of Botany in 1834, the Pocket Botanical Dictionary in 1850, and the Calendar of Gardening Operations. He also co-founded, in 1841, the horticultural periodical The Gardeners' Chronicle, and later became its editor.

### **The Cavendish Banana:**

William Cavendish, 6th Duke of Devonshire, received a shipment of bananas from Mauritius in 1834 and instructed his head gardener, Joseph Paxton, to cultivate them so they could be

grown in Chatsworth's greenhouses. Paxton named them *Musa cavendishii*, after the Duke. The Chatsworth bananas were shipped to various places in the Pacific in the 1850s. Mass commercial production began in 1903, but did not really take off until the dominant variety, Gros Michel, was mostly destroyed by disease in the 1950s. Almost every banana eaten in the Western world since then has been a direct descendant of a plant grown at Chatsworth.

While at Chatsworth, Paxton created lakes, arboreta, and greenhouses, and created gardens for other estates on contract. He also built the Emperor fountain, which at 280 feet, was twice the height of Nelson's Column, and the largest fountain in Europe.

Photo of the Emperor fountain (1844) at Chatsworth:

<https://www.architecture.com/image-library/ribapix/image-information/poster/chatsworth-house-d-erbyshire-the-south-front-dominated-by-the-emperor-fountain-in-the-canal-pond/posterid/RIBA25759.html>

Paxton's greenhouses at Chatsworth:

**1836-40: the Great Conservatory**, a wood and glass greenhouse, measuring 277 feet in length, 123 feet wide, and 67 feet high.

Many of Paxton's designs and inventions for the Great Conservatory were revolutionary: his use of prefabricated cast iron sections; a new guttering system; a new 4 foot length of sheet glass; the invention of a special pre-fabricating machine that could produce 500 timber sash window bars per day; and the first flat-roof use of the "ridge and furrow" glazing system invented by John Claudius Loudon (1783-1843). It set the glass at right angles to both the morning and evening sun, maximising the heat and light that reached the plants.

It was the largest glass building in the world, until overtaken by Paxton's Crystal Palace in 1851. It was nicknamed "The Great Stove" for the enormous amount of heating it required. Eight underground boilers fed a seven-mile maze of hot water pipes. In winter, it took 300 tons of coal to heat the boilers. The cost was immense.

(<https://www.chatsworth.org/garden/history-of-the-garden/6th-duke-paxton/great-conservatory/>)

Because of a shortage of coal due to the First World War - and also as so many of the estate's gardeners had gone off to fight - the Great Conservatory fell into disuse, and then disrepair. It was eventually demolished in 1920. Only the low foundation walls remain today. These are listed by English Heritage and now contain a huge maze, built in the 1960s.

Victorian illustration of the Great Conservatory at Chatsworth, copyright The Garden Museum:

<http://www.telegraph.co.uk/gardening/tools-and-accessories/glasshouses-a-history-in-pictures/glass-house/>

Photo of the Great Conservatory circa 1879, copyright Francis Frith Collection:

[https://www.francisfrith.com/chatsworth-house/chatsworth-house-palm-house-c1876\\_8849](https://www.francisfrith.com/chatsworth-house/chatsworth-house-palm-house-c1876_8849)

**1838-48: the Conservative Wall** (now known as The Case). This was a long greenhouse constructed along the length of an existing brick wall and on a difficult slope. It was built to protect fruit trees and other shrubs from the winter cold, and was heated using an ingenious system of hot water pipes. It is the only one of Paxton's great glasshouses that is still in use at Chatsworth today.

Two photos of the Conservative Wall at Chatsworth, designed by Paxton (1848):

<https://www.architecture.com/image-library/ribapix/image-information/poster/conservative-wall-chatsworth-house-derbyshire/posterid/RIBA77733.html>

<https://www.architecture.com/image-library/ribapix/image-information/poster/conservative-wall-chatsworth-house-derbyshire/posterid/RIBA77732.html>

In 1850, Paxton built a new glasshouse specifically for the Victoria Regia, a South American giant water-lily famous for the size and strength of its leaves. He tested their strength by floating his daughter Annie on a leaf.

Illustration of Paxton's daughter Annie upon the giant water-lily at Chatsworth, from Illustrated London News, 1849:

[https://commons.wikimedia.org/wiki/File:Victoria\\_Regia\\_LIN\\_1849-.jpg](https://commons.wikimedia.org/wiki/File:Victoria_Regia_LIN_1849-.jpg)

The design of the structure of the greenhouse was revolutionary; influenced by the shape of the water lily pad itself. Paxton realised that what gave the lily pad its strength was the radial structure, with supports radiating out from the centre. In the greenhouse, this was translated into "leaves" of glass, supported by thin iron cantilevers.

Illustration of the "Victoria Regia" glasshouse at Chatsworth (1850):

<https://www.architecture.com/image-library/ribapix/image-information/poster/victoria-regia-house-chatsworth-house-derbyshire/posterid/RIBA10169.html>

**The Crystal Palace:**

Three things happened within the space of 5 years that would change Paxton's fortunes once more. Firstly, in 1845, came the repeal of the glass tax, making the building of an even grander glasshouse possible.

Secondly, Paxton became an investor in the newly expanding railways, becoming Director of Midland Railway in 1848. The railways truly changed the face of Britain; whole towns and cities only exist because of the railways. The first suburbs were created, in cities that had only just become cities.

And then, in 1850, a Royal Commission chaired by Prince Albert launched a competition to find a design for the Great Exhibition, first ever World's Fair, and a celebration of Victorian industrial design and technology from across 32 nations of the Empire. The building was always intended to be temporary, and this caused problems from the start. Nearly 250 designs were submitted for the Great Exhibition, but the commission rejected them all and decided to go with a scheme of their own. This was large, heavy (building it would have required the use of 17 million bricks), required extensive foundations, and was effectively a permanent building. Joseph Paxton thought he could do better.

Paxton produced a sketch for his design, based on the Great Conservatory at Chatsworth, on blotting paper\* (\*V&A Museum no. E.941-1983), then developed this into a workable scheme in just two weeks, taking structural advice from engineer William Henry Barlow. Mindful of the committee's previous inability to make a decision, he took his design to the press; publishing it in the Illustrated London News to near-universal acclaim.

The genius of Paxton's design was in how much of the structure could be prefabricated. This made it cheap, speedy, and simple to erect. An enormous building - four times the size of St Peter's in Rome, 1851 feet in length, containing 24 miles of guttering, 4,500 tonnes of iron, and more than 293,000 panes of glass - was constructed in less than 6 months. This could only be achieved with such a high degree of prefabrication for the iron and glass parts, based on a twenty-four foot grid adopted throughout the building. It was a huge feat of engineering comparable with some of the great iron bridges of the era.

This was in large part due to the help of the contractors, who began producing materials for the scheme at their own expense, even before the formal contract was signed in October 1850. The ironwork contractors were Fox, Henderson & Co, and the plate glass was manufactured by Chance Bros. & Co.

Funded by public subscription, the Crystal Palace attracted more than six million visitors and raised a net profit of £186,437. The money was used to purchase land adjoining Hyde Park and develop the Royal Albert Hall, Imperial College and the South Kensington museums.

Paxton was knighted for the design by Queen Victoria, and oversaw the moving in 1854 of the entire structure 10 miles south to Sydenham Hill, then still semi-rural. The coming of the Crystal Palace created a new suburb around it, and other suburbs sprung up along the railway route.

### **After the Crystal Palace:**

Paxton was commissioned to build a number of private stately homes in the 1850s, including a house for Queen Victoria's dentist in Wimbledon, and a chateau in France. He also worked on public parks in Liverpool, Glasgow, Halifax and Scarborough, and somehow found time to become the Member of Parliament for Coventry in 1854.

Paxton remained Head Gardener at Chatsworth until 1858, when the current Duke died, but never stopped working on his other projects. He died in 1865, at his home in Rockhills, Sydenham.

There is a blue plaque to Paxton at the top corner of Westwood Hill:

<http://www.blueplaqueplaces.co.uk/joseph-paxton-blue-plaque-in-london-12443>