KS2

Plant hunters: The Chatsworth Pinetum

A pinetum is a collection of coniferous trees from different parts of the world. The Chatsworth Pinetum was created between 1830 and 1831 by the 6th Duke and Joseph Paxton.

During the early to mid-19th century there was a growing interest in scientific horticulture and the Duke sponsored many of the increasing number of scientific plant-hunting expeditions.

The Chatsworth Pinetum was one of the first in England and was a symbol of the Duke's wealth and status. It was Paxton's first major project at Chatsworth.

Conifer trees have seeds that develop in cones. Many conifer trees are evergreen and have long, thin, needle-like leaves. They tend to grow quickly, and their wood is valuable for softwood timber and paper making.

Learning outcomes

Children will understand:

- what a conifer is
- why the pinetum was planted
- where the trees came from
- that there were plant hunters in Victorian times

Before the visit

- Use the Pinetum presentation to introduce children to conifers and the idea of plant hunting.
- Discuss with children how the plant hunters would have travelled during the 19th century and what dangers they might have faced.
- Think about the rights and wrongs of collecting plants from other countries.
- Use the list of conifers in slide 3 to plot the locations of the Chatsworth conifers on a world map to illustrate the global extent of plant hunting. Which tree travelled the furthest?
- Younger children could explore stories set in forests such as The Gruffalo, Tidy and The Boy Who Grew A Forest

During the visit

- Take a close look at the trees. Can children spot the typical features of a conifer?
- Use the visit to the Pinetum as a period of reflection and lie back and study the tree canopy, taking time to listen and watch.
- Get children to capture words (on paper or on audio) that come into their heads, which describe their feelings for the trees around them.
- Sit or stand in a circle and retell Sapling Song with each child telling a fragment of the tale.

After the visit

Use the experience of visiting the Pinetum for creative and reflective work by:

- recreating the adventures of a Victorian plant hunter
- producing a piece of writing about a favourite tree or why trees are important
- using the word PINETUM or one of the tree names as the inspiration for an acrostic poem

KS2

DEVONSHIRE EDUCATIONAL TRUST

Trapping the tropics: Joseph Paxton's Great Conservatory and other Glasshouses

Joseph Paxton designed and built a number of innovative glasshouses at Chatsworth. During the 19th century it became fashionable to collect and cultivate exotic tropical plants. These plants require hot, humid conditions and so glasshouses were essential.

The 6th Duke was no exception to this collecting passion and Paxton's glasshouses were built to house his extensive collection of tropical plants.

Bananas were one of the tropical plants that made Joseph Paxton famous. Banana plants were a novelty among British gardeners and plant enthusiasts in the 1830s and gardeners had not been able to get these tropical plants to flower and produce fruit in England. There was intense rivalry between the 6th Duke and his friend the Earl of Shrewsbury to be the first person to be able to produce bananas in England. Paxton managed it first, on behalf of the Duke. He put the plant, which had cost the princely sum of £10, in a pit filled with 'plenty of water, rich loam soil and well-rotted dung'. He named the plant *Musa cavendishii* after the 6th Duke, William Spencer Cavendish. Today Cavendish bananas are the most internationally traded and consumed bananas in the world.

Paxton's innovative glasshouse designs ensured as much light and heat were captured as possible. He built the Great Conservatory at Chatsworth which at the time was the largest glasshouse in the world. It was nicknamed The Great Stove because of the subterranean coal-fired boilers that kept it hot in winter. During WWI there was no coal to heat the Great Conservatory and many of the gardeners left to fight in the War. The plants died and the conservatory fell into disrepair. It was eventually demolished in 1920.

Learning outcomes

Children will understand:

- why glasshouses were built
- how glasshouses function
- how glasshouses were built
- that Joseph Paxton was an innovative Victorian glasshouse designer
- that Chatsworth was famous for its glasshouses

Before the visit

- Use the Glasshouse presentation to introduce children to the concept of glasshouses, their function, popularity during Victorian times and Joseph Paxton's innovative designs.

During the visit

The Glasshouse

- Ask children if they can remember the process which makes a greenhouse work. Can they see another way of keeping the space hot?
- How can the greenhouse be cooled down? Look for a mechanism that allows the greenhouse to be vented when it becomes too hot.
- What building materials can children identify?

The Great Conservatory

- Use the ground plan of the Great Conservatory to map out the ground area of the Great Conservatory.
- Explore the tunnel and peer down the grating and encourage pupils to discuss with each other how they would feel to have worked beneath the ground.

After the visit

- Make your own mini greenhouse using either a recycled plastic bottle or plastic cups. Once planted up, place them in different locations where the intensity and amount of sunshine varies.
- Plot the growth of plants and record findings in graph format. You could try using different 'greenhouse' designs: a shallow tray covered with film; shallow tray with the film raised tent-like on sticks; tall plastic bottle; shorter plastic cups. Which is the most effective?

KS2

DEVONSHIRE EDUCATIONAL TRUST

Recreating the Alps: the Chatsworth Rock Garden

The Rock Garden was inspired by a visit to the Alps made by Paxton and the 6th Duke in 1838. Although it looks natural, it's a cleverly designed man-made landscape, ingeniously constructed to mimic Derbyshire rock formations.

Each formation is made of boulders carefully cemented together. The largest, which was named The Duke of Wellington, stands 13m (45ft) tall, complete with a waterfall. Other rock stacks are known as Queen Victoria and Prince Albert.

Paxton moved massive gritstone boulders from nearby Dobb Edge, using 'special apparatus' to move and winch the huge stones into place.

Learning outcomes

Children will understand:

- that the Rock Garden is not a natural feature
- why the Rock Garden was made
- how the Rock Garden was made
- how levers and pulleys can be used to shift loads

Before the visit

- Use the Rock Garden presentation to introduce children to how it was constructed. Look at the slides and discuss using pulleys and levers to move heavy objects.
- Experiment with using levers and pulleys. You may already have equipment in school to demonstrate this, otherwise there are examples online. The aim of the exercise is to show children how pulleys work and that heavy weights can easily be shifted using simple mechanical devices.

During the visit

- Explore the Rock Garden and identify the tallest rock formation: The Duke of Wellington.
- Using information gained prior to the visit discuss with children what would have been the best method of moving and raising the rocks to create the structures around them.
- Use the Rock Balancing activity in the garden to appreciate the difficulties of balancing rocks and to understand why Paxton chose to cement his formations in place.
- Take time to sketch one of the rock formations in preparation for the after-visit activity.

After the visit

- Children could role play the part of a head gardener and draw up a plan for a new rock formation.
- Their plan must include:
  1. A drawing of the rock formation.
  2. The name of the formation.
  3. Plans for installing it i.e. what machinery will be needed to lift the heaviest blocks into place.

KS2

A fountain fit for a Czar: Chatsworth's Emperor Fountain

The Emperor Fountain is the most impressive surviving feature of Joseph Paxton's work at Chatsworth. Visible for miles around, a single column of gravity-fed, white water shoots high above the lime trees beside the Canal Pond.

When the 6th Duke believed that Czar Nicholas of Russia was to visit Chatsworth he decided to build a fountain larger than the one in the Czar's hometown of Peterhof. Joseph Paxton embraced the challenge.
A new reservoir was built high on the moors above Chatsworth. A pipeline links the reservoir and the fountain, dropping 122m in height, creating pressure to force water high into the air. The reservoir is still there today, powering the fountain as it did when it was first created.

Sadly, the Czar never visited Chatsworth, but the fountain was named in his honour.

Today the fountain can reach a height of 60m (200ft). The highest the fountain ever reached was 90m (300ft).

Learning outcomes

Children will understand:

- why the fountain was built
- how the fountain works
- how pressure can be used to provide power
- that Joseph Paxton was an innovative engineer.

Before the visit

Use the Emperor Fountain presentation to introduce children to:

- the reason why the Emperor Fountain was built
- how it functions and the ingenious engineering solutions Joseph Paxton came up with to make the fountain work.

During the visit

- Ask children if they can remember how the fountain works.
- Where do they think the water comes from?
- Measure the height of the jet with a clinometer.

After the visit

Make your own pressure fountain to demonstrate how pressure (in this case air rather than water) can power a fountain. See the Classroom Activity Sheet.

Joseph & Sarah Paxton

Joseph Paxton was head gardener at Chatsworth between 1826 and 1858. He started work when he was only 23 and he inspired the 6th Duke to take a keen interest in the gardens at Chatsworth. He went on to design innovative glasshouses such as the Great Conservatory, an immense Rock Garden and what was the highest gravity-fed fountain in the world, all of which made Chatsworth's garden famous. He is probably best known for designing the Crystal Palace for the Great Exhibition of 1851.

On his first day at Chatsworth he met Sarah Bown, the housekeeper's niece, and they fell in love. They were married in 1827. Sarah proved to be a very capable project manager, running her husband's gardening and architectural projects whenever he was absent from Chatsworth.

Joseph Paxton was described by Charles Dickens as 'the busiest man in England'. His life was a rags to riches story. From humble beginnings as the ninth child of a Bedfordshire farm labourer, Paxton rose through hard work and talent to become a great Victorian, a knighted MP who left a fortune. When he died, The Times newspaper called him the 'greatest gardener of his time, the founder of a new style of architecture and a man of genius'.

Joseph Paxton was a man of vision. He managed his staff well and he worked with talented and skilled people to deliver his innovative ideas and vision. He worked on engineering projects with Isambard Kingdom Brunel and George Stephenson, and was friends with Charles Dickens. He met Queen Victoria through the 6th Duke and accompanied her to several events including horticultural shows. Queen Victoria wrote about Paxton in her diary. He also knew and worked with Prince Albert on several projects in London.

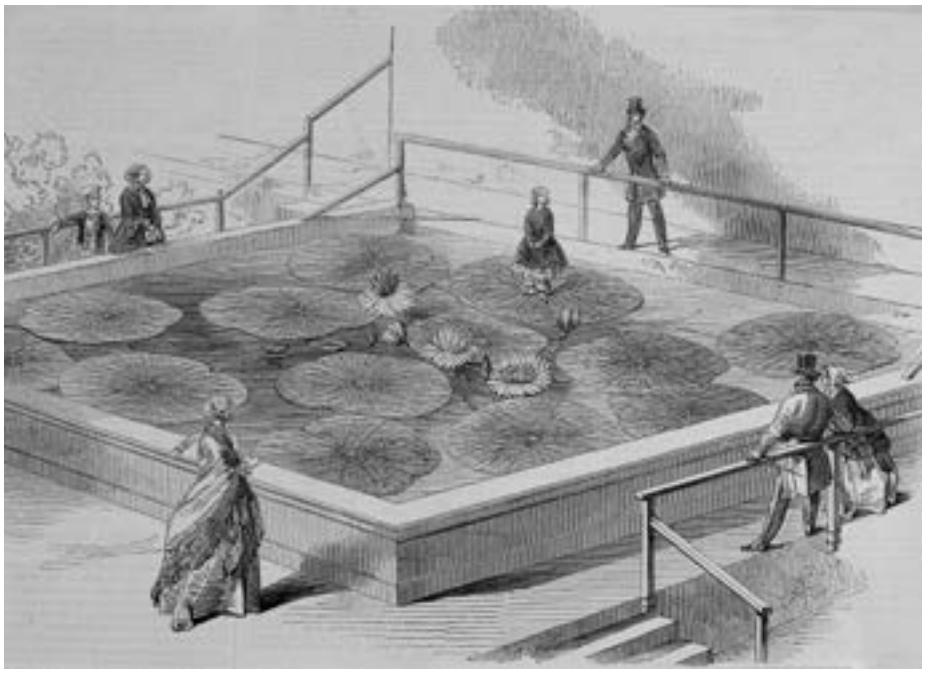
As well as working at Chatsworth, Paxton designed other gardens for the aristocracy. He developed garden features for Heligan in Cornwall, and designed public parks at Scarborough and Birkenhead. He published gardening magazines and newspapers. Joseph Paxton was also involved with the railways and was a director of the Midland Railway.

Joseph Paxton's first day at Chatsworth demonstrates his character. He wrote this account which was published in the Duke's Handbook for Chatsworth in 1844:

The Great Conservatory

The Rock Garden

"I left London by the Comet Coach for Chesterfield, and arrived at Chatsworth at half past four o'clock in the morning of the ninth of May 1826. As no person was to be seen at that early hour, I got over the greenhouse gate by the old covered way, explored the pleasure grounds, and looked round the outside of the house. I then went down to the kitchen gardens, scaled the outside wall and saw the whole place, set the men to work there at six o'clock; then returned to Chatsworth and got Thomas Weldon to play me the water works, and afterwards went to breakfast with poor dear Mrs Gregory and her niece. The latter fell in love with me, and I with her, and thus completed my first morning's work at Chatsworth before nine o'clock".



Paxton's daughter standing on a Victoria water lily pad in the Great Conservatory

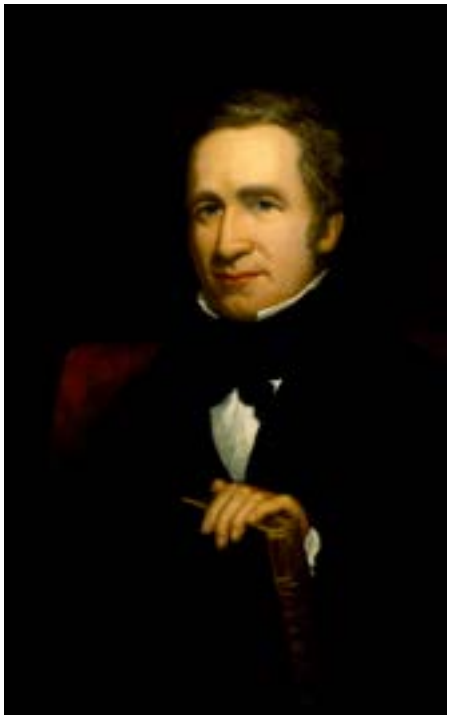
The only existing image of Sarah Paxton

Sarah Paxton is one of the unsung heroes of Chatsworth. She was highly intelligent, had excellent business skills and played an essential role in her husband's success. She was the niece of the housekeepers at Chatsworth and at nearby Hardwick Hall, so she was familiar with the domestic work involved at a large country house.

Sarah was greatly respected in the Chatsworth Estate community. Joseph was often away with the Duke, when she was left in charge of the Chatsworth projects. He wrote hundreds of letters to her, giving her instructions on managing the projects and the garden staff. She took on many of the responsibilities of Head Gardener and Land Agent, paying out pensions to widows and retired workers, visiting the sick and keeping an eye on the behaviour of the gardeners.

Sarah's role was crucial in enabling Joseph to achieve his innovations and become rich and famous. She was an outstanding project manager, coordinating major building and landscape schemes over long periods of time. She also brought up their children, almost single-handedly as Joseph was so often away.

The Crystal Palace, hailed as Paxton's greatest achievement



Joseph Paxton, 1844

Learning outcomes

Children will understand:

- who Joseph and Sarah Paxton were
- what Joseph Paxton achieved at Chatsworth
- why he was an important Victorian.

Before the visit

- Use the PowerPoint slides to introduce children to Joseph and Sarah Paxton.
- Discuss with children how unusual it would have been in the 19th century for a woman to have managed such important projects. Think about how the roles of women have changed since the 19th century and discuss examples of women in important roles in society today, such as prime ministers, architects, doctors and business leaders.
- Listen to the audio story of Paxton's first day at Chatsworth and discuss how much he achieved.

During the visit

- Use the visit to experience the Paxtons' legacy at Chatsworth such as the Glasshouses and Rock Garden (see other PDF presentations).
- In Paxton's glasshouse, discuss how extraordinary it must have been to see bananas and other tropical plants growing here. Banana plants are still grown here today.
- Stand in the Rock Garden and discuss how it enhances the design and atmosphere of Chatsworth's garden.

After the visit

- Use the audio story and the children's experiences from their visit to write a diary entry for Joseph Paxton's first day at Chatsworth.
- Write a letter from Sarah to Joseph describing how the work on the glasshouse or the Rock Garden is progressing.