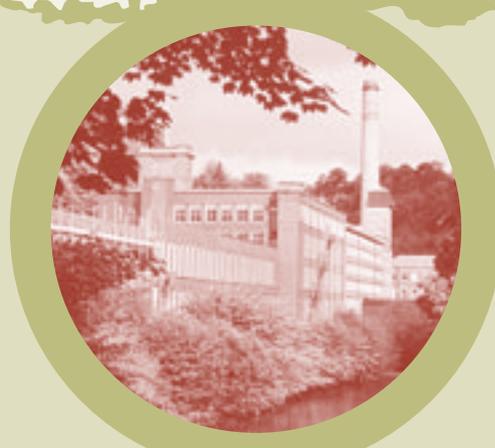




 **DERWENT VALLEY MILLS**
World Heritage Site

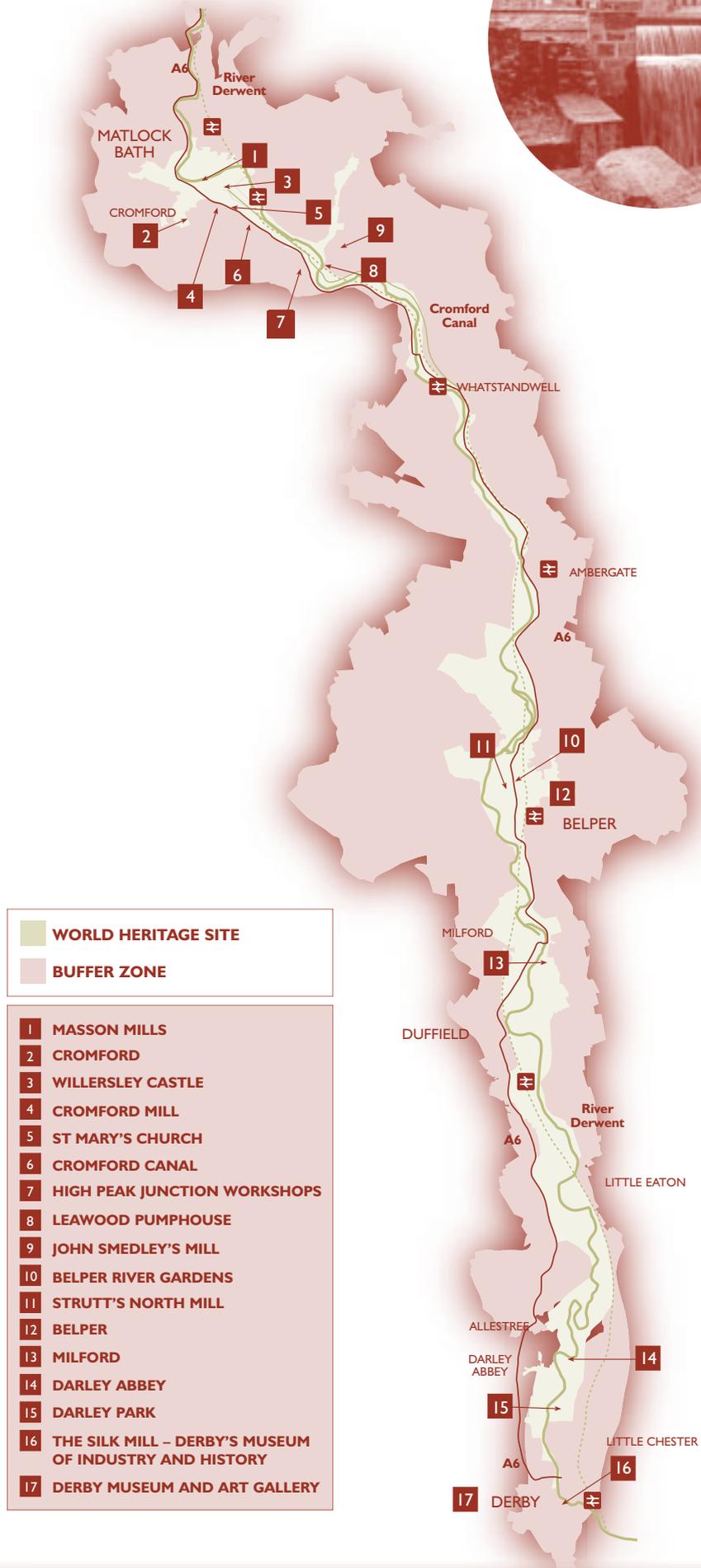


DERWENT VALLEY MILLS
WORLD HERITAGE SITE

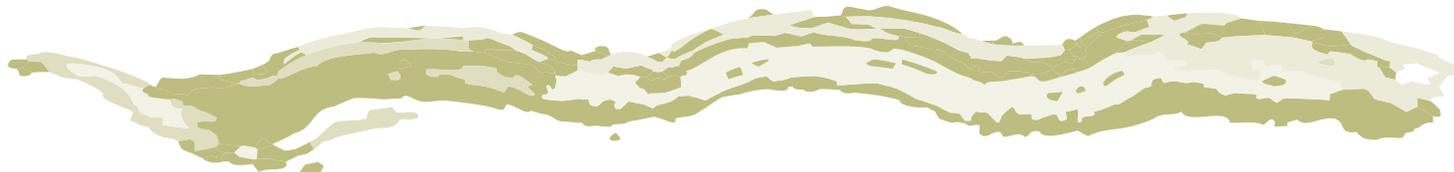
TEACHER'S PACK

Compiled by
JANE FEATHERSTONE

INTRODUCTION



What was the impact of the factory system and the building of the cotton mills in the Derwent Valley in Derbyshire?



ABOUT THE UNIT

In this unit children find out about the factory system and how this new system of producing goods began in the Derwent Valley in Derbyshire. They will find out about the famous people, the entrepreneurs, who developed the factory system including Richard Arkwright and Jedediah Strutt. They will find out how the factory system changed the working lives of men, women and children. They will find out about the impact that the building of the cotton mills and the industrial settlements had on the valley. They will also be introduced to the idea of World Heritage and why the Derwent Valley Mills has been made a World Heritage Site.

WHERE THE UNIT FITS IN

This unit will give children a good understanding of how the factory system came into being. This will provide them prior knowledge in preparation for the two units of work: Unit 11 What was it like for children living in Victorian Britain? and Unit 12 How did life change in our locality in Victorian Britain? Or it could be used alongside either of these units.

| PRIOR LEARNING | VOCABULARY | RESOURCES |
|--|--|--|
| <p>It is helpful if the children have:</p> <ul style="list-style-type: none"> answered questions about people/events in the past using pictures and written sources used portraits as a source of information on famous people living in the past read/listened to biographies or stories about people living in the past studied aspects of the way of life of people from the past | <p>In this unit, children will have opportunities to use:</p> <ul style="list-style-type: none"> words associated with the factory system, eg water power, weir, leat, transmission of power, mill, machinery, factory system words associated with the textile industry: cotton, silk, thread, loom, spindle, spinning machines, hosiery, cloth words associated with trade and industry: banker, finance, lease, market | <ul style="list-style-type: none"> a class timeline portraits of Richard Arkwright, Jedediah Strutt, and other industrialists of the period historical maps of the various settlements in the Derwent Valley drawings and watercolours of landscapes in the valley diagrams of machinery and factory buildings extracts from diaries, newspapers and magazines from the period |

EXPECTATIONS At the end of this unit

| | |
|---|---|
| Most children will: | Demonstrate factual knowledge and understanding of aspects of the beginnings of the factory system; use knowledge and understanding to identify changes within and across the period; select and combine information from more than one source of information to find out about aspects of the development of the factory system; describe important features of the factory system; describe some of the famous people of the early Industrial Revolution. |
| Some children will not have made so much progress and will: | Demonstrate factual knowledge and understanding of some aspects of the factory system |
| Some children will have progressed further and will: | Make links between the changes and the causes of the changes and describe these links in some detail; use sources critically within the enquiry to reach and support their ideas about the impact of the factory system on the working lives of men, women and children or the changes in the Derwent Valley. |

KEY STAGE TWO YEARS 5/6

| LEARNING OBJECTIVES | POSSIBLE TEACHING ACTIVITIES Linked to key questions |
|--|--|
| <p>CHILDREN SHOULD LEARN</p> <ul style="list-style-type: none"> To find out about John Lombe and the Derby Silk Mill through using copies of old maps, paintings and drawings About the beginnings of the factory system About the textile industry | <p>1. What is the factory system? (See page 8)</p> <p>Talk about John Lombe and the Derby Silk Mill</p> <p><i>Fieldwork Opportunity</i> Arrange a visit to the Derby Silk Mill. Look for traces of the first silk mill. Use old maps, copies of paintings and etchings and old photographs of the Derby Silk Mill that show the river and the weirs.</p> <p>Tell the story of silk in China and how silk thread came to be made in Derbyshire</p> <p>Talk about water power and the transmission of power using cogs, gears and shafts. Build models using construction kits</p> |
| <ul style="list-style-type: none"> To find out about the textile industry in the past To identify the main features of the factory system About the manufacturing of textiles through practical activities including carding, spinning, weaving and knitting and through visits to mill sites | <p>2. How did the factory system begin? Why did it all start in the textile industry?</p> <p>Talk about the early textile industry and how cloth was made in people's homes using machines that could be worked by hand. Talk about the inventions that led to the start of the factory system.</p> <p><i>Fieldwork opportunity.</i> Visit the Mills at Belper and Matlock Bath to take part in workshops to card, spin and weave cotton and to see textile machinery in action.</p> |
| <ul style="list-style-type: none"> To use pictures to help them ask and answer questions about Richard Arkwright To infer information from a portrait To identify how he became famous To infer information from a written or visual account of a person's life | <p>3. Who was Richard Arkwright?</p> <p>Show the children a picture of Richard Arkwright. Discuss what they think they can tell from the picture, eg status, lifestyle, job, when he was alive.</p> <p><i>Fieldwork opportunity.</i> Visit Derby Museum and Art Gallery</p> <p>Talk about Richard Arkwright about his early life and his search for a solution to the mass production of cotton thread.</p> <p>Talk about Richard Arkwright's water frame and the use of water to power the new machines.</p> <p>Talk about the mill Richard Arkwright built at Cromford to house the new machines.</p> <p>Talk about how he made lots of money making cotton thread. Show a picture of Willersley Castle, the house Richard Arkwright was building for himself, to demonstrate how rich he had become.</p> |
| <ul style="list-style-type: none"> About the possible reasons that led Richard Arkwright to build his first cotton mill in Cromford To use drawings and paintings to find out what the mill looked like To use written material to find out about the people who worked in the mill To use maps, diagrams and photographs to find out about the past To consider how attitudes to children and childhood were different in the past | <p>4. Where did Richard Arkwright build his first water powered mill and why did he choose this place? (See page 36)</p> <p>Carry out a role play exercise in which Richard Arkwright and Jedediah Strutt discuss the site at Cromford and decide whether or not it might be a suitable place to build a cotton mill.</p> <p>Use paintings to find out what the cotton mills at Cromford looked like. Use the tithe map of 1842 and an ordnance survey map of 1894 to find out about Cromford Village.</p> <p>Carry out an 'Into the Dragons Den' exercise where Richard Arkwright convinces Jedediah Strutt to back his business idea</p> |

| LEARNING OUTCOMES | POINTS TO NOTE |
|--|---|
| <ul style="list-style-type: none"> • Can place the start of the factory system on a class time line • Can say what is meant by the term 'factory system' • Can talk about the production of silk thread | <p>There are paintings of the Derby Silk Mill in the Derby City Museum and Art Gallery showing what it looked like in the past. Lombe began building the Silk Mill in 1721. It brought to England technology developed in Italy which enabled silk to be thrown on machines worked by water power. Lombe's mill contained many elements of the modern factory. The machinery was driven from a common power source and housed in a large multi-storeyed building. A large labour force was employed – by 1730, 300 people. The factory system is a system of working and the organisation of the labour force around the rigid demands of a common power source. Links with technology – use of construction kits</p> |
| <ul style="list-style-type: none"> • Can describe how textiles are made by weaving and knitting • Can talk about some of the inventions that led to the factory system | <p>This activity would be enhanced by having some simple hand operated textile making equipment in school, such as carders, drop spindles, fleece, and weaving frames.</p> <p>The children could also visit Strutt's North Mill Belper, to take part in workshops to card, spin and weave cotton. North Mill also has a display of early textile machines. The children could visit Masson Mills in Matlock Bath to see cotton machinery in action.</p> <p>It may be possible that a member of the school community spins and weaves and could come into school to work with the children or demonstrate the process.</p> |
| <ul style="list-style-type: none"> • Identify at least one reason why Richard Arkwright is famous • Show understanding of how he changed the working lives of men, women and children in the past | <p>There is a portrait of Richard Arkwright in the Derby City Museum and Art Gallery by Joseph Wright of Derby. Picture postcards of this painting are available at the shop. This activity would be enhanced by a visit to Derby City Museum and Art Gallery</p> |
| <ul style="list-style-type: none"> • Can give a number of possible reasons as to why Richard Arkwright chose Cromford to build his first cotton mill • Can say what the cotton mills looked like • Can talk about the people who worked in the mill and where they lived and what it was like to work in the mills • Can talk about how attitudes to children were different in the past | <p>A visit to Strutt's North Mill in Belper to see a copy of Richard Arkwright's spinning frame would enhance this section as would a field trip to Cromford Mill and Cromford village.</p> |

KEY STAGE TWO YEARS 5/6

| LEARNING OBJECTIVES | POSSIBLE TEACHING ACTIVITIES Linked to key questions |
|--|--|
| <ul style="list-style-type: none"> Use maps to find out where other mills were built along the valley and how the Derwent Valley was limited to the hosiery centres and to the east coast ports | <p>5. Why were lots more cotton mills built along the Derwent Valley in Derbyshire? (See page 58)</p> <p>Give the children the copy of the map of the Derwent Valley. Ask them to see what links the towns of Milford, Darley Abbey and Belper. They should see that the River Derwent flows along the valley and this is what provided power for all the cotton mills.</p> <p>Tell the children about the hosiery or stocking industry in the past and how it was a very important industry in the Midlands. Show the children maps so that they can work out the transport links between Derby, Nottingham and Leicester and the east coast ports.</p> <p>Tell the children about the other business men who built cotton mills along the valley.</p> |
| <ul style="list-style-type: none"> How to use buildings and sites to find out what it was like to live in an industrial settlement at the beginning of the Industrial Revolution About what it was like to work in one of the early cotton mills | <p>6. What was it like to live and work in a mill village or town? (See page 62)</p> <p>Provide some information on the numbers of working children, their hours of work, the types of jobs they did and their access to education. Discuss why children worked in the past.</p> <p>Arrange a visit to one of the cotton mills along the valley, eg Cromford Mill, Masson Mill or North Mill.</p> <p>Explain the characteristic features of a cotton mill</p> <p>Provide information about the industrial settlements that people like Richard Arkwright, Jedediah Strutt and the Evans family provided for their workers.</p> <p>Arrange a visit to one of the industrial settlements, eg Darley Abbey, Cromford or Belper</p> |
| <ul style="list-style-type: none"> About the impact the changes in working patterns had on the lives of people living in the Derwent Valley How to use paintings to think about the impact mill buildings had on the landscape | <p>7. What impact did the building of factories have on the Derwent Valley? (See page 64)</p> <p>Discuss with the children what they have learnt about the Derwent Valley in the past. Focus on the main changes that occurred in that locality over the period and the causes and effects of these changes.</p> <p>Identify categories, eg population growth, change in occupations and sources of employment, change in types of buildings, developments in welfare and education, developments in transport infrastructure.</p> <p>Ask the children to choose one of the categories and use a range of sources to find out about and summarise the changes that took place.</p> |
| <ul style="list-style-type: none"> About the importance of the Derwent Valley, the mills and the industrial settlements in interpreting the past lives of men, women and children About the role of conservation, restoration and regeneration | <p>8. Why has the Derwent Valley been made a World Heritage site? (See page 72)</p> <p>Discuss the idea of Heritage with the children. Show them pictures of World Heritage Sites from around the world. Ask them to find out why these places are special. Ask the children to find ten different World Heritage Sites in the UK using the free map provided by UNESCO. Find out if anyone has visited a World Heritage Site in the UK. Tell them that we have a World Heritage Site in Derbyshire. That it is called the Derwent Valley Mills World Heritage Site. Ask the children what they have learnt about the silk and cotton mills along the Derwent Valley that makes them special.</p> |

| LEARNING OUTCOMES | POINTS TO NOTE |
|--|--|
| <ul style="list-style-type: none"> • Can say why more cotton mills were built along the Derwent Valley • Can talk about some of the other business men who built cotton mills • Can draw conclusions from using maps about the location of the cotton mills | <p>A visit to some of the other towns, such as Milford, Belper or Darley Abbey would enhance this work.</p> <p>Links with the geography curriculum</p> |
| <ul style="list-style-type: none"> • Know about the industrial settlement they have studied • Record in words and drawings information about a building in the industrial settlement studied • Identify the features of a cotton mill | <p>This activity would be enhanced by a fieldwork visit to Darley Abbey, Belper, Milford or Cromford. To find out how to visit these places see the Derwent Valley Mills World Heritage Education pack available in print or on line. For details visit www.derwentvalleymills.org Observe houses and homes in the industrial settlement and draw examples of different types of building solution.</p> <p>See also The Teachers Pack produced for KS2 Y3&4 children 'What was it like to live in Belper in the Past?' by the Derwent Valley Mills Partnership.</p> |
| <ul style="list-style-type: none"> • Know about the cotton mills and speculate about the effect they had on the landscape and the lives of men, women and children who lived and worked there • Suggest ways in which the Derwent Valley changed in the late 1700s and early 1800s | <p>Use paintings of Richard Arkwright's Mills by day and night by Joseph Wright of Derby and others and paintings and drawings of the valley from the period. Some of these paintings can be seen in Derby Museum and Art Gallery and in publications available from the Museum shop</p> <p>Use maps to show the valley before and after the developments took place. Consider also the impact of building and use of the Cromford Canal, the new turnpike road and the railway along the valley.</p> <p>It is possible to travel along the valley by train stopping at many of the mill sites along the way.</p> <p>It is possible to walk along the canal towpath from Cromford to Ambergate to visit many of the sites along the way.</p> |
| <ul style="list-style-type: none"> • Can give a number of reasons why the Derwent Valley Mills has been made a World Heritage Site | <p>UNESCO produce many resources for teachers wishing to teach about World Heritage including a teaching pack called World Heritage in Young Hands. Contact the Young People's World Heritage Education Project www.unesco.org/education/asp</p> <p>This includes 26 A4 photographs of World Heritage Sites, a map of the World showing all the listed sites to date, including Derwent Valley Mills, stickers and information sheets. Price £36 including postage.</p> |

KEY QUESTION ONE

What is the factory system?



Introduction to the unit of work – giving the children an overview of the unit.

Say to the children that we are going to do a unit of work for the next six weeks or so about the Factory System and how it affected the lives of men, women and children living in the past. Tell them that the big question we are going to find out the answer to is – What was the impact of the Factory System and the building of the cotton mills on the working lives of men, women and children living in the Derwent Valley in Derbyshire a long time ago?

Write this question on a large sheet of paper and pin it up on a display board so that everyone knows what their work is going to be about for the next six weeks or so.

Say that we are going to find out about the place where the Factory System began, the Derwent Valley in Derbyshire. Tell them that we are going to learn about the business man who started the factory system and who built factories or mills in the Derwent Valley. That he was called Richard Arkwright. That we are going to learn about the other business men who helped him to develop his ideas and who also built mills in Derwent Valley. Say that the factory system was developed for the textile industry so we are going to find out about textiles made from silk and from cotton. That we are going to find out what it was like to live and work in the valley in the past. Say that we are also going to find out why the Derwent Valley is now famous as the place where the Factory System began and that it has been made a World Heritage Site.

Tell the children that the work will be organised around trying to answer some key questions. Say that we can do this by doing some work in class and by going out on fieldwork visits to the Derwent Valley. Tell them that the key questions we are going to work with are:

- What is the Factory System?
- How did the Factory System begin?
- Why did it all start in the textile industry?
- Who was Richard Arkwright?
- Where did Richard Arkwright build his first water powered cotton mill and why did he choose this place?
- Why were more cotton mills built along the Derwent Valley?
- What was it like to live and work in a mill village or town?
- What impact did the building of mills or factories have on the Derwent Valley?
- Why has the Derwent Valley been made a World Heritage Site?

Write them on the white board or on a very large sheet of paper. Keep the questions up on the wall and show children as the unit of work progresses where they are up to in working through the questions.

Say that to begin with we need to find out what is meant by the term 'Factory System'

Brainstorm with the children what they understand about the word 'factory', for example, ask the children, 'If you looked up the word factory in the dictionary, what do you think it would say?' The children will probably say that a factory is a large building where lots of people work on lots of machines.

Say that the factory system is the name people give to this way of working. Say that the factory system was first used in England in 1721. It was used by a man called John Lombe. He and his brother Thomas built Britain's first factory in Derby in the county of Derbyshire. It opened in 1721. His mill was built for machines that could make silk thread. The machines were made to work using the flow of water in the river. The flowing water turned a water wheel that was attached to the outside of the building.

* Have a small picture of the Derby Silk Mill to place on the classroom timeline. Use an atlas of the United Kingdom and ask the children to find Derby and to identify which river flows through Derby.

KEY QUESTION ONE

Finding out about silk

Ask the children if they know what silk is. Say that we are going to spend some time carrying out research so that we all understand what silk is and what it was used for.

* Have some pictures of silk worms to show the children. Have some of the information books about silk worms for the children to use. Have a piece of silk cloth for the children to handle. Have some copies of paintings of rich women from the 1700s wearing silk dresses. Spend some time carrying out research into the silk worm and silk.

Teacher's Background notes to be used to help the children understand the processes involved in making silk thread.

Silk is secreted by the silk worm. It is the material used to form the cocoon in which the silk worm changes into a silk moth. The silk is retrieved from the cocoons by boiling the cocoons. This loosens the natural gum or sericin, and allows the continuous lengths of silk filaments to be unravelled. This process, known as reeling, produces skeins of raw silk. It is in this condition that the raw silk arrives in Britain. In the silk mill the raw silk first needs 'winding'. During this process the silk is wound from the skeins on to bobbins. At the same time any knots or irregularities in thickness are removed. It is possible for the silk to be used in this state but usually it is given a degree of twist by a process known as 'throwing'. Thrown silk yarns can themselves be twisted together in varying multiples depending on the required result, a process known as 'doubling'. In this way different qualities and strengths of silk thread can be produced, for example organise, which is a strong and even thread used for the weft in the weaving process. Confusingly, the term throwing can be used to mean not only the specific process of twisting the silk thread but also the whole process from winding to doubling.

What is the Factory System?

Purpose

- to learn about John and Thomas Lombe and the Derby Silk Mill
- to understand what is meant by the term 'factory system'
- to understand how the factory system came into being
- to learn about the processes involved in making silk thread
- to learn that silk thread is made into a material called silk.

Resources

- a picture of Derby Silk Mill to put on the class timeline
- a set of pictures of Derby Silk Mill for each group
- pictures of ladies and gentlemen from the period wearing silk dresses
- a set of the diagram of the Derby Silk Mill
- a set of the section through the Derby Silk Mill
- a series of pictures showing the development of the silk worm.

Children's Information books on the topic of silk and silk worms

- *Mega bites – Bugs – a close up view of the insect world* by Chris Maynard. Dorling Kindersley ISBN 0-7513-3081-7
- Backpack Books, *1001 Facts about Insects* by Laurence Mound and Steve Brooks. Dorling Kindersley ISBN 0-7513-44206
- Knowledge Masters – *Mini-beasts*, Zigzag Books Interactive Multimedia. ISBN 1-903954-51-7
- Usbourne Discovery internet – linked BUGS with pictures showing the process of producing silk thread/cloth. ISBN 0-7460-4694-4
- Checkers Superbugs and minibeasts. *Facts at your Fingers* written by Kathryn Senior. Macdonald Young Books ISBN 0-7500-2726-6

Fieldwork

These activities would be enhanced by a fieldwork visit to the Silk Mill – Derby's Museum of Industry and History. Silk Mill Lane, off Full Street Derby DE1 3AF Telephone: 01332 255308

Website: www.derby.gov.uk/museums

Introduction

Tell the children that this first factory, the Silk Mill in Derby, had all the features that make a factory as we know it:

- all the machinery in the silk mill was driven by one power source, a water wheel
- all the machines were in one large building which had five floors or storeys
- a large number of people worked in the factory, by 1730 for example, 300 people are said to have worked there.

So, hypothetical question,

What did this first factory look like?

Well, we have some copies of paintings of the Derby Silk Mill and something called an etching of the Silk Mill. We also have some diagrams that show us the inside of the building. Say that each group is going to have copies of these pictures to work with.

Give each group a copy of the Activity One – Sheet A: Lombe's Silk Mill at Derby and then Activity One – Sheet B and Sheet D

Use these sheets with the children to help them understand what the mill looked like.

Notes on Sheet B

The millwheel was turned by water from the mill race – this was because the rate of flow could be controlled by means of the weir and sluice gates so that the wheel was not overwhelmed by the river in flood.

KEY QUESTION ONE

Introduction to Activity Sheet C

So, how did one water wheel make all the machines in the mill work?

We have found out what the Derby Silk Mill looked like and where the water wheel that provided power to the mill was put.

Now we need to find how this one water wheel worked all the machines inside the mill. So look at the diagram that shows how the Derby Silk Mill or Italian Works may have been.

Can you find the water wheel? Can you see the paddles that stick out all around the wheel? The water pushes against these paddles and forces the wheel to turn. Can you see the horizontal wheel shaft? It goes through the middle of the wheel, through the wall and into the mill. Can you find the drive wheel on the end of the wheel shaft? The drive wheel is turned by the water wheel. Can you find the upright shaft? It also has a drive wheel at the bottom and on each floor. The horizontal turning motion of the wheel shaft is converted into a vertical turning motion by means of cogs. The upright drive shaft goes all the way up to the top of the mill. On each floor there is another drive wheel. The drive was taken by a horizontal shaft running along the length of each floor. From this shaft more horizontal shafts would have been attached to the top of the upright shafts of the throwing machines. By this method each throwing machine was turned. Power was also taken to the top three floors so that each of the winding machines could be turned. This is called the transmission system. So looking again at the diagram you can see that the turning power of one water wheel could be used to work all the machines in the mill at the same time. Thomas Lombe had also worked out a clutch mechanism (think of the job of the clutch in a car which takes the engine out of gear), so that the whole mill could be shut down or so that any one of the machines could be stopped.

Tell the children that Lombe's Mill had twelve circular throwing machines arranged in pairs along the length of the mill. Can you see this on the plan? These throwing machines were as high as two floors of the mill. The machines went up through large circular holes in the second floor. The top three floors were for the winding machines.

Design Technology

- To construct a model to show how to convert the horizontal turning of a shaft, by the use of cogs, to a vertical or upright turning motion.

Use a construction kit such as Georello Gears available from NES Arnold, such as the 3D gears Bumper Pack which costs £28.50 and contains 350 pieces, enough for several children to build 3D structures using colour coded meshing gears.

Where did John and Thomas Lombe get their ideas from? Why did they want to build a silk mill anyway?

Purpose

- To learn about the history of silk production
- To find out why John Lombe went to Italy
- To learn about the silk industry in the 1700s
- To find out why Thomas Lombe decided to build a silk mill in Derby.

The History of Silk

Tell the children the story of how in the 1700s rich ladies and gentlemen wore clothes made of silk. Remind the children that they now know all about silk and how it comes from the silk worm and how it is made into a thread that can be woven to make material. Show the children copies of paintings of people wearing silk clothes from the period.

Links to the Art curriculum. The children could study and copy one of the paintings. Children could explore how painters managed to represent textiles, metal, pottery, glass, skin or fur in paint. They could have a go at trying to do this for themselves.

Tell them that silk was made in China and that for hundreds of years no-one in Europe knew how to make it, they didn't even know it came from a silk worm. Pliny who was a historian in ancient Roman times wrote in his Natural History book in 70AD that silk was obtained by removing the down from the leaves with the help of water. For more than two thousand years the Chinese kept the secret of making silk to themselves. It was the most closely guarded secret in history.

Tell the children the story of the Legend of Lady His-Ling-Shih

The story, according to Confucius tells that one day, the Lady His-Ling-Shih, the 14 year old bride of the Emperor Huang Ti, the so called 'Yellow Emperor' who ruled China in about 3000BC, was sitting under a mulberry tree, drinking a cup of tea when a silk cocoon from the branches above fell into the cup. She noticed that the delicate fibres started to unravel in the hot liquid and so was the first person to 'reel' or unravel a silk cocoon and use the filament to create a yarn for weaving. She is also supposed to have begun to rear silkworms to produce silk and to have invented the weaving loom.

Links to the Art curriculum. The children could look at Chinese paintings and then do a painting or drawing of Lady His-Ling-Shih sitting under a mulberry tree drinking tea in the style of a Chinese painting.

Say that however, archaeologists have discovered a small ivory cup with a silk worm design on it and spinning tools, silk thread and fabric fragments from sites along the lower Yangzi River in China from 6000-7000 years ago which suggest that sericulture is even older (Sericulture is the name given to the rearing of silk worms to produce silk).

So how did the secret of producing silk get to Europe?

The Chinese realised the value of this beautiful material they were producing and kept its secret safe from the rest of the world for more than 3000 years. With the mulberry silk moth native to China, the Chinese had a monopoly on the world's silk production. That meant that no other country could make it. Travellers were searched thoroughly at border crossings and anyone trying to smuggle eggs, cocoons or silkworms out of the country were killed.

The demand for this exotic material from the countries in Europe eventually created the trade route known as the 'Silk Road' taking silk to the west and bringing gold, silver and wool to the East. The children could look on an atlas for the Silk Road and name all the countries that it travels through. Or, you may be able to get a holiday brochure advertising holidays that travel along the silk road.

Then around 550AD two Nestorian monks appeared at the Court of the Byzantine Emperor Justinian I in Constantinople in the Middle East, with silkworm eggs hidden in their hollow bamboo staves. The Nestorian Church had sent missionaries to China and the church had established there and Nestorian Churches were built. (For an explanation of Nestorianism and the Byzantine Church see below). Under the supervision of the monks the eggs hatched into worms and the worms spun cocoons. This meant that Constantinople was now able to develop the silk business. The Byzantine church and state created imperial workshops, monopolising production and keeping the secret to themselves. This allowed a silk industry to develop in the Middle East. The Byzantine Silk industry produced ordinary grade silk. High quality silk textiles were still woven in China and were made especially for the Middle Eastern Market. These silks were traded with the west and continued to fetch high prices. Trade continued along the Silk Road. It was only in the 13th century – the time of the Second Crusades – that Italy began silk production when 2,000 skilled weavers from Constantinople came to work in Italy.

Glossary

Nestorianism

Nestorianism is the doctrine that Christ was two distinct persons, one divine and one human, implying a denial that the Virgin Mary was the mother of God. It is attributed to Nestorius and survives in the Iraqi Church. Nestorius died about 451AD. He was a Syrian churchman, patriarch of Constantinople (428-431) and deposed for heresy by the Council of Ephesus.

The Byzantine or Eastern Orthodox Church

The Byzantine or Eastern Orthodox Church is the collective body of those Eastern Churches that were separated from the Western Church in the 11th century. The Eastern Orthodox Church was divided into four principal sees of Constantinople, Antioch, Alexandria and Jerusalem, and of Russia, Romania and Serbia each of which had a bishop or patriarch at its head. The bishop or patriarch of Constantinople was the highest in dignity. And, therefore, the head of the Eastern Orthodox Church.

Constantinople

Constantinople was formerly Byzantium and is now Istanbul. Byzantium was an ancient Greek city on the Bosphorus, founded about 666BC. It was rebuilt by Constantine I in 330AD and called Constantinople. The Byzantine Empire was the continuation of the Roman Empire in the East after the deposition of the last Emperor of Rome 476AD and which finally was extinguished with the fall of Constantinople in 1458.

How did silk thread come to be made in Derbyshire?

The story of how the large scale manufacturing of high quality silk thread arrived in Derbyshire in the 1700s is the story of the driving enthusiasm and inventive genius of a few key individuals.

Silk making in the late 1600s in England had grown during a period when fashion demanded luxury silk items, a demand that was met in part by the Huguenot refugees from France who settled in England, many of whom were skilled silk weavers. Silk in England was woven from thread which had been imported from Italy. Italy had a monopoly on the making of silk thread.

By the 1700s, in an area of north west Italy called Piedmont, people held the technological lead in throwing of silk thread. How had this come about? Silk weaving is known to have been carried out in Sicily in the 10th century and in Lucca by the 12th. In the 13th century Venice began to produce silk cloth in quantity, and by the 14th century the Italian peninsula dominated the world market in silk fabrics. In the 15th century Genoa and Florence came to prominence as silk producing states alongside Milan where, by 1474 the industry employed 15,000 people. The Italians imported large quantities of raw silk from China but the size and importance of the industry to Italy meant that the Italians learnt how to grow silk in their own country. The raw silk they produced was of a very high quality. The Italians dominated the world market in strong silk thread because they could grow high quality raw silk and also because they had the technology to throw the silk into strong thread. This was a secret that they guarded closely.

Tell the children that John Lombe from Derbyshire, stole the design of the throwing and winding machines from Italy. In 1716 John Lombe went on a journey to Italy and risked his life in pirating or stealing the design for the Italian silk throwing and winding machines. He returned to England, probably in 1717, with a number of Italian workmen and the details of the design of the Piedmontese throwing machine, the most advanced of the circular throwing machines of the time. Say that, although some historians have doubted that the story of Lombe's espionage is true, research in Italy has found evidence of Lombe's journey. Evidence has also been found that a reward was offered for his capture.

KEY QUESTION ONE

So, what was special about these machines?

Let's find out. We are very fortunate that some very old drawings of silk throwing machines have survived. Let's look at them. The earliest known illustration of the hand-powered machine, drawn in 1487, shows it to have been about 2.5 metres high and 2 metres in diameter. It turned three spindles per bay or section and probably held 32 spindles all together. It was constructed of wood with some metal and glass parts. It was circular in plan and designed as two timber framed cylinders, one inside the other. The outer cylinder stayed still while the inner turned inside it around a timber upright shaft. The inner cylinder had batons sticking out to connect with the bobbins. This action pulled the silk thread from one bobbin and wound it onto another set of bobbins. As the silk was drawn from the bobbin it passed through a loop in a wire flyer which rotated around the bobbin. The action of the flyer on the silk thread put a twist into it which made it stronger. This is what made it so good.

Notes to the children's resource sheets

The drawing of 1586 shows a machine that was hand-powered. The attendant is shown turning the inner wheel from the inside by walking around with it. The illustration of a powered machine shows that the conversion to a powered machine was made possible by attaching a shaft from the power source to the upright shaft of the inner cylinder of the throwing machine.

In Bologna, a town in Italy, the Italians had developed a system of putting the winding machine on the floor above the throwing machinery and connecting it to the same water power system as John and Thomas Lombe were to do in their factory in Derby.

The story of John Lombe and the Silk Mill

The Lombe family had a long history of being involved in the textile industry. By the 15th century the family lived at Melton Hall in Norfolk and had made their money exporting wool. They were also in the business of weaving worsted and silk from about the time of Elizabeth I. John Lombe was the son of his father's second marriage and so it was his elder half-brother, Thomas who inherited the business when their father died at the end of the 17th century. John was apprenticed at an early age and by the time he was ten he could handle the machines well, showing a natural aptitude which was to stand him in good stead later on. In his teens he made many suggestions for improving spinning machines and his main interest became centred upon the spinning of silk thread from raw imported silk.

At the age of twenty in 1704, in order to further these aims, John Lombe joined a retired Derby solicitor, Thomas Cotchett, who had built a silk mill on a marshy islet in the Derwent at Derby. The mill was engineered by George Sorocold, an important Derby man of the time. Thomas Cotchett had installed Dutch machinery for spinning silk but it was unsatisfactory, and he was still unable to produce silk of even texture and quality.

As we have seen, there are four main processes in the spinning of silk: the continuous filament was first wound onto bobbins; the strands were then cleaned by being passed through a small aperture to remove roughness and imperfections. The filaments were then 'thrown' or twisted together to form a single thread and 'doubled', where several threads were twisted together to make a strong thread of uniform gauge. It was this final process which neither Cotchett nor Lombe could perfect, despite building numerous experimental machines. As a consequence, British (and presumably Dutch) silk was of inferior quality – only the Italians produced perfect silk thread. In 1714 John Lombe decided to make a visit to the North Italian Kingdom of Sardinia.

Accordingly, with the moral and financial backing of his brother Thomas he studied Italian and perfected his knowledge of mechanical drawing and mathematics. He sailed for Italy and visited silk mills there as a tourist but he wasn't able to see how the machines worked. Perhaps with the help of a bribe, he managed to get a job in a mill as a machine minder or fillatooe-boy. He probably somehow managed to stay on after work and copied and sketched each of the three machines in the spinning process. As luck would have it, only when Lombe had just completed his task was his deception found out. The penalty for stealing these ideas was to be hung by one foot from the gibbet until dead. Lombe had been sensible enough to put each completed drawing in a bale of raw silk which was shipped to England through Thomas Lombe's agents in Livorno, Messers. Glover and Unwin. The secret contents of each bale were retrieved on off-loading in London. John just managed to escape because an English ship was on the point of departure for London and he was taken aboard. He arrived back in England three weeks later, although not without some measure of danger, as the ship had been chased by a Sardinian man-of-war shortly after departure, apparently dispatched by the angry Piedmontese on their discovery of his escape.

Three years afterwards John and Thomas Lombe were able to put the new machines into production for the first time. Prototype machines were made and in 1718 Thomas Lombe got a patent for their design. They began to build new mill to the south of Cotchett's earlier mill in Derby in 1721. George Sorocold was the engineer.

The silk mill was a success although Thomas Lombe tried to play down how much money he was making from the business so that other people did not try to steal his ideas.

Link to next Key Question

Tell the children that in the next section of work they are going to find out more about textiles and how they are made and how inventions to build better machines for spinning thread led to the beginning of the factory system.

ACTIVITY SHEET A

Lombe's Silk Mill at Derby



An engraving by J. Nixon of Lombe's Silk Mill at Derby in the 1800s.
(By permission of Derby Museums and Art Gallery).

This is an engraving, or drawing, that shows what Lombe's Silk Mill looked like from the banks of the River Derwent. You are looking at the east side of the building.

How many floors or storeys did the mill have?

How many windows are there on each floor?

It was a huge building.

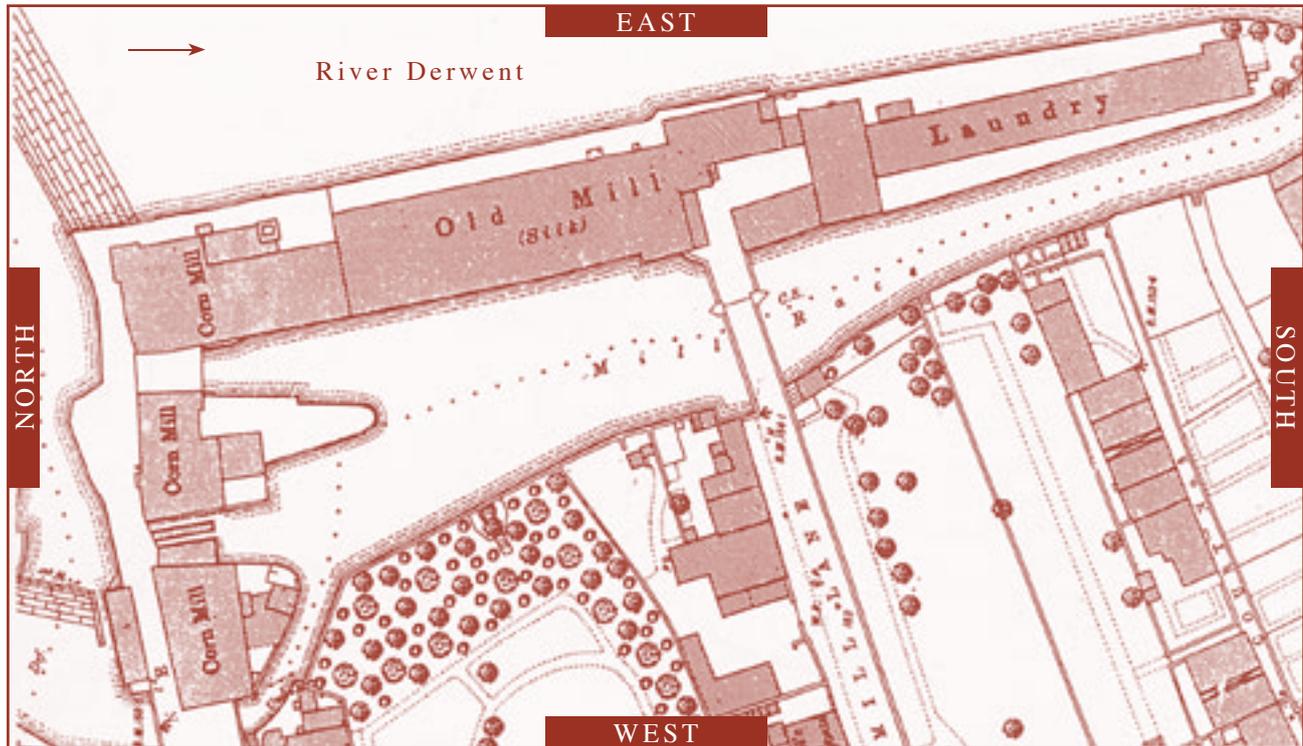
Look at the arches built underneath the building. **How many were there?**
Why do you think the building was built on these arches?

If you visit the Silk Mill today you can still see these arches alongside the river.
Make a list of all the other features you can see in the drawing.

| | |
|-------|-------|
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ACTIVITY SHEET B

Lombe's Silk Mill at Derby



Look at the plan, drawn in 1883, that shows the layout of the site.

You are going to work out if the water wheel was turned by water from the river or from the Mill Race.

- Colour the river in blue.
- Colour the mill race in blue.

In which direction is the river flowing? From North to South, from East to West, from South to North or from West to East? Use the compass rose to help you work it out.

- Colour in the Old Mill (Silk) in red.

On which side of the mill was the water wheel, the North, the South, the East or the West?

Look at the drawing of the Silk Mill (Sheet C) that shows the water wheel to help you work it out.

On which side of the mill was the River Derwent. North, South, East or West?

Use the compass rose to help you work it out.

On which side was the mill race, North, South, East or West?

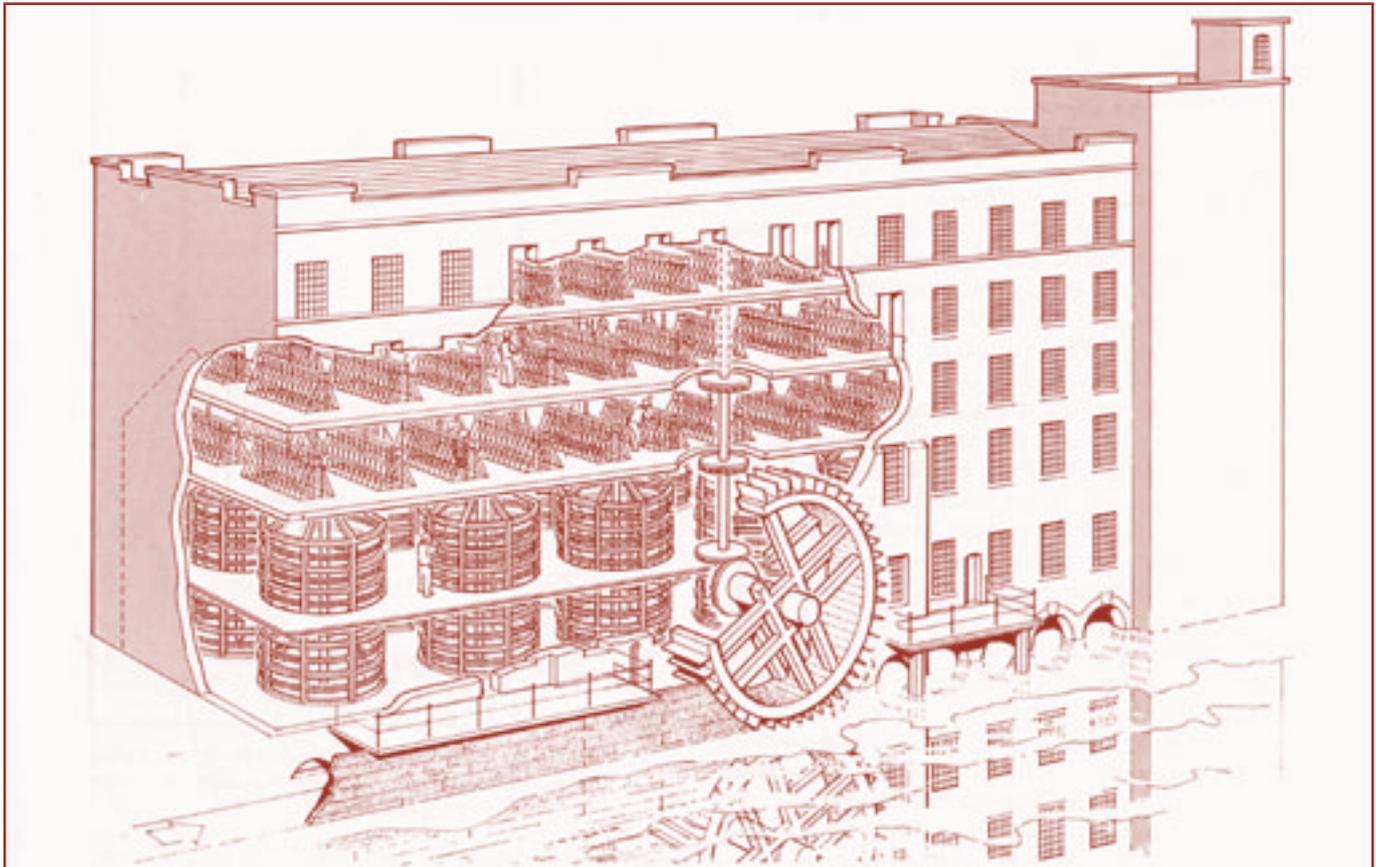
Use the compass rose to help you work it out.

The water wheel was turned by water from, (a) the mill race, or (b) the river?

Can you think of any reason why this was so?

ACTIVITY SHEET C

Lombe's Silk Mill at Derby

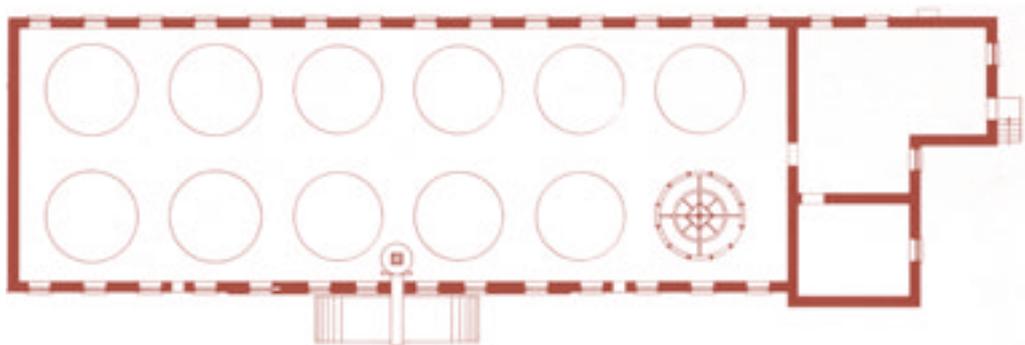


This is a drawing of the Silk Mill looking across the Mill Race. It shows the mill wheel on the west side of the building.

Look for the paddles round the edge of the water wheel. The flowing water from the Mill Race pushes the paddles round and makes the wheel turn.

Look at the shaft that goes through the middle of the wheel. It has a circle on the end that is inside the mill with cogs all around it.

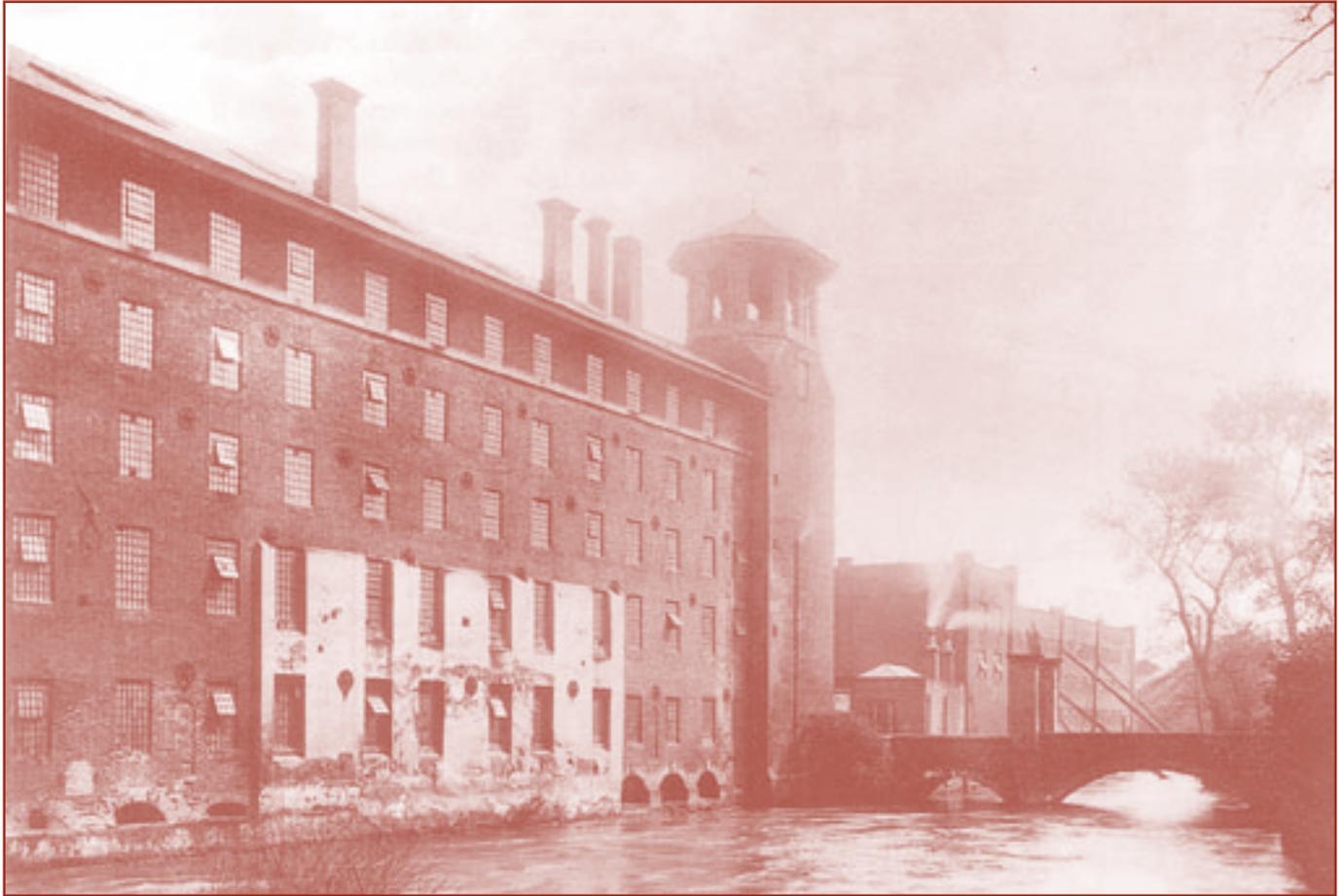
Look for the upright shaft that goes through all five storeys of the mill. On each floor, the upright shaft has another circle with cogs all around the edge. This is how the turning power of the water wheel is transmitted all through the building.



- Use the construction kit called Georello Gears to build a model to show how a horizontal turning motion can be changed to a vertical turning motion.
- Draw a diagram to show what you did

ACTIVITY SHEET D

Lombe's Silk Mill at Derby



This photograph, taken between 1865 and 1875, is of the west side of the Silk Mill. It shows where the water wheel was placed (the part of the wall that is painted white).

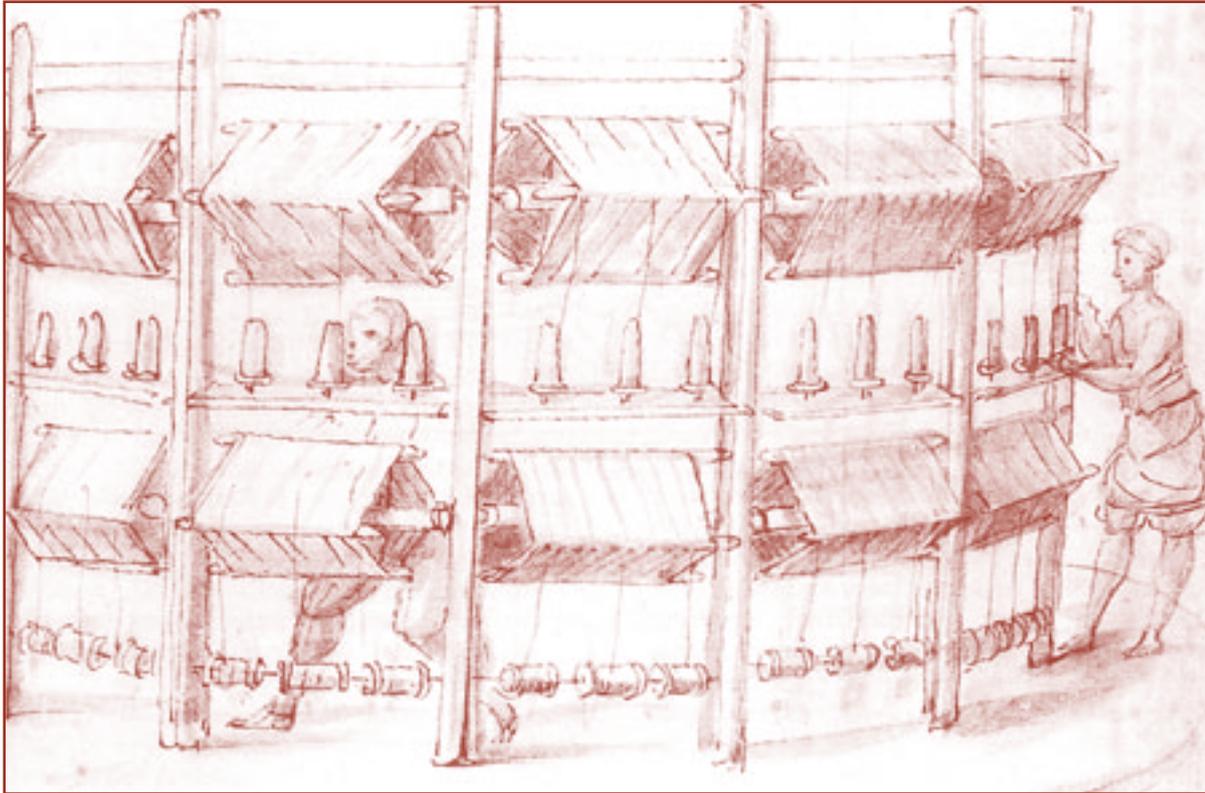
The Silk Mill was built on an island in the middle of the River Derwent.

Find the bridge that crossed over the mill race on the plan (Sheet B) and in the photograph above.

Where were the mill gates?

What was the name of the road leading to the mill?

Drawings of an Italian circular hand-powered throwing machine from 1586



The earliest known drawing of an Italian powered silk throwing machine from 1500. It is not known if it was horse or water powered.



KEY QUESTION TWO

How did the factory system begin? Why did it all start in the textile industry?



Purpose

- To learn about the domestic textile industry in the past
- To learn about the changes that took place in the domestic textile machines such as looms and spinning wheels
- To learn about the manufacture of yarn or thread using water powered machines in cotton mills
- To find out that this led to the introduction of the Factory System.

Resources that will be needed for this section

- Pictures of sheep
- Samples of fleece
- Pictures of cotton
- Different coloured paper strips for paper weaving and sheets of black paper which has had a number of parallel cuts made in it to make a weaving frame
- Several pairs of carders for brushing the fleece of cotton wool
- Drop spindles
- Knitting needles and wool
- Cotton reel knitting kits for French Knitting.

Resources included in this section

- Picture of a pair of hands carding
- Picture of a pair of hands drop spinning
- Picture of a woman using a spinning wheel and a diagram to show how this works
- Picture of John Kay's Flying Shuttle
- Picture of Richard Arkwright's spinning frame
- Picture of Samuel Crompton's Mule.

Opportunity for Fieldwork and Site Visits

Please note several of the mill sites can offer workshops for school groups where the children handle fleece and raw cotton and have a go at carding, spinning to make yarn or thread and knitting and weaving to make textiles. At Masson Mills in Cromford, children can see spinning and weaving machines in action. Spinning and knitting machines can also be seen at Strutt's North Mill in Belper. There is a copy of one of Richard Arkwright's spinning frames at Strutt's North Mill Belper.

Contact

Strutt's North Mill Belper
Bridgefoot
Belper
Derbyshire
DE56 1YD
Telephone: 01773 880747
Website: www.belpernorthmill.org.uk

Masson Mills
Derby Road
Matlock Bath
Derbyshire
DE4 3PY
Telephone: 01629 581001
Website: www.massonmills.co.uk

Materials and equipment

NES Arnold (Telephone 0845 120 4525) and Hope Education (Telephone 08451 20 2055) have a good range of tools and materials to use for making textiles, including carders, fleece, and card and wooden weaving frames.

Cotton from

Curriculum links – Art and Design

Refer back to Unit 1B Investigating Materials where children learn about the skills involved in weaving and add to this the skills involved in creating knitted fabrics.

KEY QUESTION TWO

How did people make cloth or material in the past?

Tell the children that in the past people made material or cloth in their own homes, using the wool from sheep with the help of simple tools. Show the children pictures of sheep. Show the children samples of fleece and let them handle it. Tell the children that farmers take the wool from the sheep by shearing them (cutting away the fleece) in the early summer. Tell the children that one of the ways of making cloth from the fibres of wool in the fleece is by weaving. You could show examples of cloth that is woven and see if the children can work out how the yarns are used. Another way of making cloth is by knitting. You could show examples of cloth that has been knitted and see if the children can work out how the yarn is used. You could test both materials to see which is stretchy, which can be pulled this way and that to work out the properties of each way of making material.

Demonstrate weaving with paper strips.

Say that the children are going to have a go at weaving with paper to see if they can work out how to do it. Explain how to weave the coloured strips of paper through the cuts in the black paper weaving frame by going under then over. Explain how the next strip of paper needs to go over and under in the opposite way to the first strip and so on.

Demonstrate knitting with yarn and knitting needles.

Knitting is a way of making a material by interlocking loops of yarn, using a pair of knitting needles or a knitting machine. There are two basic stitches used in knitting, the plain-knitting stitch which is the simpler stitch with the wool passed round the front of the needle and the purl-knitting stitch a reverse plain stitch. The rib pattern is produced by knitting a repeat pattern of plain and purl stitches. The children could be given the chance to have a go at knitting.

Getting the fleece or cotton ready so that it can be used for making the thread or yarn that can be used for knitting or weaving.

Tell the children that the fleece or cotton wool needs to be prepared so that it can be used to make cloth. It needs to be turned into thread or yarn that can be woven or knitted. The first stage is carding. The fleece or cotton wool has to be combed to get all the fibres lying straight, a bit like you have to brush your hair in the morning to get the tangles out. To do this you will use two paddles or brushes called carders. Demonstrate using the carders, lay one on your lap with the bristles pointing upwards and the handle pointing towards your left side. Pull a small amount of fleece or cotton wool over the hooks of the carder on your knee. Hold the carder on your knee with your left hand. Then hold the other carder with your right hand and use this to pull the fibres through the carder on your knee. The brushes are working against each other. Do this several times until the fibres are all lying straight. When the fibres are all straight and now on the right hand carder, lay the carder on your knee instead of the left hand carder, and pick up the ends hanging over the edge rolling them up into a sausage shape. This is called a rolag. The rolag will be used to supply the spinner with fibres in the spinning stage which comes next.

Spinning the fibres to make thread.

The fibres are now ready for the next process which is called spinning. Demonstrate spinning with a drop spindle. Say that people have been using drop spindles for thousands of years to make thread. In drop spinning, the spinner, uses the supply of fibres, the rolag, and draws out the fibres and twists them into a long continuous thread. In the beginning this twist was made by rolling the fibres between the fingers and the thread of finger-spun yarn was wound on to a stick to store it. From this stick the primitive spindle evolved. It was made up of a slightly tapered stick with a weight known as a whorl towards one end. The whorl acted as a fly wheel.

Sometime between 500BC and 750AD the spindle was mechanised into the spinning wheel. The spindle was now mounted horizontally between two supports, the whorl functioning as a pulley with the spindle being turned by a belt from the whorl to the drive wheel. The wheel was turned by hand. The spinner attaches the roving or rolag to the spindle and draws it out with her left hand, at the same time adding a slight twist for strength by turning the driving wheel with her right hand. When the thread has been fully drawn, the required twist is added by turning the driving wheel more rapidly. Spinning can take place only when the thread is held at an angle which allows it to slip off the spindle tip. After twist has been added, the spinner moves her left hand to a position at right angles to the spindle, which is then revolved for the winding up of the thread onto the bobbin. It is a very skilled job.

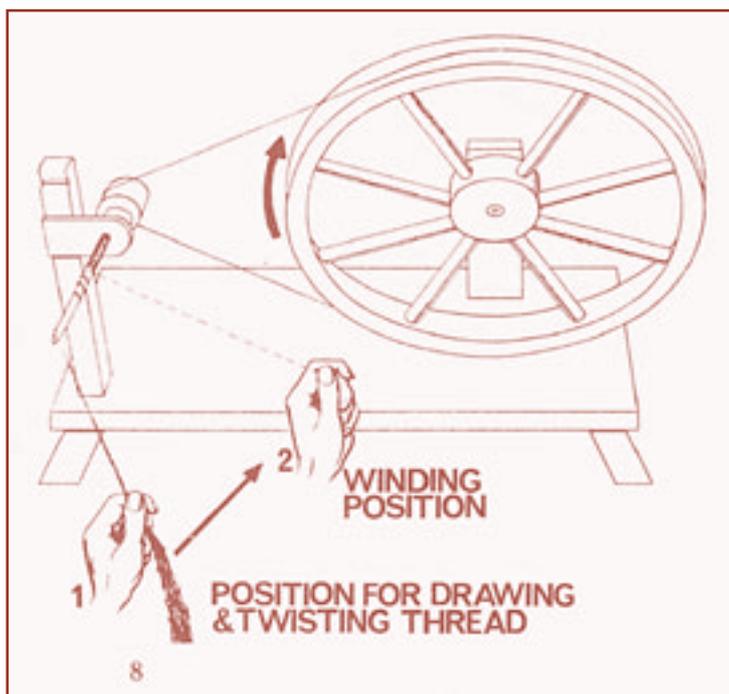
If you have some drop spindles the children could have a go at spinning. They will find that it is a hard skill to learn. If you have access to a spinning wheel or know someone who can demonstrate how to use a spinning wheel you can show how spinning was made easier by the invention of the spinning wheel. The children may be allowed to try their hand at spinning using a spinning wheel.

A Jersey spinning wheel



Spinning wheels like this were used for five hundred years until the machines of mass-production were invented in the 18th century. The way the Jersey Wheel worked was by spinning from the spindle tip. This method was used by James Hargreaves in his Jenny and Samuel Crompton in his Mule. In the foreground are iron-toothed hand carders for untangling the raw cotton and drawing the fibres into parallel strands.

Spinning on the Jersey Wheel – a diagram to show how it works



KEY QUESTION TWO

Weaving using a simple loom.

Tell the children that people have been weaving threads or yarn to make cloth for thousands of years. You may have pictures of Romans, Ancient Greeks or Egyptians weaving. Pictures can be found on Greek and Egyptian pots, or Egyptian and Roman wall paintings. You may have some pictures of weaving and spinning in resource packs you have in class for the topics of the Egyptians or the Ancient Greeks. You may have pictures of people from developing countries using weaving looms. If you have any packs used for teaching about a country in the developing world, it might have pictures of people weaving or spinning included.

Tell them the earliest looms were very simple. A number of strong threads would have been tied to a strong wooden pole and the ends perhaps tied around the waist of the weaver. A long length of thread would then be tied to a short wooden rod rather like a needle. This would then be used to weave the thread under and over and under and over, just as you did with the paper weaving. Eventually the weaving would be long enough to be used to make clothes. You could have a go at making a simple weaving frame with the children using wooden sticks or frames.

Weaving using a more mechanised loom.

Tell the children that people gradually improved the design of the loom until they had made a very complicated machine. You could show the children pictures of a loom. Say that the loom would have been used by people in their own homes and all the family would have helped make the cloth. The children could do the carding, the women the spinning and the men the weaving. The family could then either use the material themselves or sell it to earn money to buy things they couldn't make themselves. This was called a cottage industry.

John Kay's Flying Shuttle – 1733.

Tell the children that a man called John Kay wanted to improve the weaving loom and make it easier to use. He invented the 'flying shuttle'. The shuttle had been used to carry the thread from one side of the loom to the other. The shuttle had a spindle inside it around which the thread was wound. In the old machines the shuttle was thrown from one side to the other using both hands. John Kay invented a way of using hammers on each side of the loom to send the shuttle backwards and forwards using just one hand. This meant the other hand could be used to operate the batten which pushed the threads together after each throw. John Kay's invention meant that the weaver could make twice as much cloth in the same time. John Kay's loom could still be used in people's homes.

The demand for yarn – keeping the weaver in work.

John Kay's invention meant that the weaver could produce twice as much cloth, and with only hand spinning wheels in use to make the thread, this meant that six to eight spinners were needed to make enough yarn to keep the loom working. This meant that the weaver often ran out of yarn and so was out of work. There was, therefore, a big incentive for someone to come up with an idea for a machine that could make more yarn, perhaps by spinning several lengths of thread at the same time.

How three important inventions to improve the spinning of thread led to the start of the factory system.

Tell the children that three important inventions solved the problem of the shortage of thread. These inventions led to the start of the factory system.

1. 1764 James Hargreaves' Spinning Jenny
2. 1769 Richard Arkwright's Water Frame
3. 1779 Samuel Crompton's Mule.

If possible have pictures of each of these inventions mounted on card to put on the class timeline. Or write the date and the name on a piece of card and use these to put on the timeline.

1) 1764 James Hargreaves' Spinning Jenny.

James Hargreaves invented a way of using the traditional spinning wheel, the driving wheel, on its side. The first wheel could be made to turn eight spindles. This meant that one person could spin eight threads at the same time. These machines could still be used in people's own home. James Hargreaves' Spinning Jenny of 1764 used the same method of spinning as the Jersey Wheel.

Later improved versions had as many as 120 spindles. At one point, James Hargreaves had the spinner using both hands and a foot, an operation that needed a lot of agility. The girl in the photograph has stretched the threads with the draw bar and is about to turn the wheel to drive the spindles. After putting the twist into the yarn, she uses her foot to control the faller wire, which guides the threads as they are wound evenly on the bobbins.

(The machine in the picture was built at Helmshore in 1963 using James Hargreave's patent specification of 1770 and his drawings).

2) 1769 Richard Arkwright's Water Frame.

Richard Arkwright invented a machine that could spin cotton thread. Richard Arkwright's machine was a big improvement on the Jenny. Using the Jenny the spinner had to do three different operations to spin the thread and twist and wind it. Richard Arkwright's machine had a continuous action of spinning, twisting and winding. This made it suitable for a powered operation. Also it was a much easier machine to use and could be operated by unskilled women and children. The key to his machine was the three pairs of rollers. The rollers drew the fibres, as each pair moved faster than the preceding one, with twist added by bobbins and flyers. The front pair of rollers was weighted by lead weights hooked over the top roller. This prevented the twist running back up the roving and forcing the rollers apart.

As has been said, this machine was suitable for powered operation. When Richard Arkwright first tried to put his machine into operation he used horse power. This was in a converted building in Nottingham. This first experiment wasn't very successful. Richard Arkwright went into partnership with a wealthy silk mill owner, Jedediah Strutt who lived in Derby. Jedediah Strutt's Silk Mills were powered by water power using a water

KEY QUESTION TWO

wheel. Richard Arkwright and Jedediah Strutt decided to build a purpose-built mill for the cotton spinning frames that would be operated by water power using a water wheel. Richard Arkwright built his first successful water powered cotton mill in Cromford, Derbyshire.

3) 1779 Samuel Crompton's Mule.

The mule was a combination of the Jenny and the Water Frame and overcame some of the problems of these earlier machines by producing very fine and strong thread. The machine had 48 rotating spindles mounted on a moveable carriage. The carriage moved on rails away from the rollers, thinning the drawn out slivers of cotton (rovings) and then moved back to the original position with the spindles rotating to wind up the thread.

Later developments in the 1800s made the machine automatic, with as many as 2,500 spindles.

The drawing in the children's resource sheet shows an early mule factory. These machines needed manual power as well as that transmitted from the overhead shafting. The shaft was attached to the water wheel by means of gears and pulleys and upright shafts. Until mules were made self-acting, the spinner moved the carriage by turning a driving wheel. Mule spinners employed their own assistants. The picture shows a piecer twisting together broken threads and a child picking up waste from underneath the frame.

The start of the Factory System.

Of these three inventions, that of Richard Arkwright, was the most important and the one that led to the start of the Factory System. His cotton mill at Cromford provided the blueprint for factory production.

This was because his machines were not used in people's homes but had a special building built for them, the mill or factory. The power of the water wheel could work a large number of machines in one huge building. Vast amounts of cotton thread could be produced very cheaply. This had a big impact on people's working lives. People, women and children, went out to work in the cotton mill rather than working at home. And, because the machines were tireless and could work day and night, women and children worked day and night as well. And because the machines could spin and twist and wind, all the women and children had to do was to keep the machines supplied with cotton and make sure threads were re-tied if they broke and remove the full bobbins and replace them with empty ones. They became machine minders rather than skilled workers.

The cotton mill gave employment to hundreds of people in Cromford. Richard Arkwright had to attract families to move into Cromford to provide this workforce. To house the workforce Richard Arkwright built houses in Cromford and so created the first industrial community. This was a pattern which was copied and developed in the other Derwent Valley settlements where other industrialists, such as Jedediah Strutt, built cotton mills such as in Belper, Milford and Darley Abbey.

Arkwright's system was copied widely in many parts of Britain and soon after, in other countries of the World.

Tell the children that in the next section they are going to learn more about Richard Arkwright and how he came to invent the water-powered spinning frame and the factory system.

John Kay's Flying Shuttle



A hand-loom weaver. This old man is using a fly shuttle, the simple but revolutionary device invented by John Kay in 1733. By jerking the picking stick with his right hand, the weaver propels the shuttle across the loom by means of sliding hammers known as pickers. Before Kay's invention, the weaver had to use both hands to throw the shuttle backwards and forwards. Afterwards, his left hand was free to operate the baton, which is pulled forward after each throw to press the weft threads together. The photograph is of 'Owd Eccles', the last known hand-loom weaver in Darwen.

1764 James Hargreaves' Spinning Jenny



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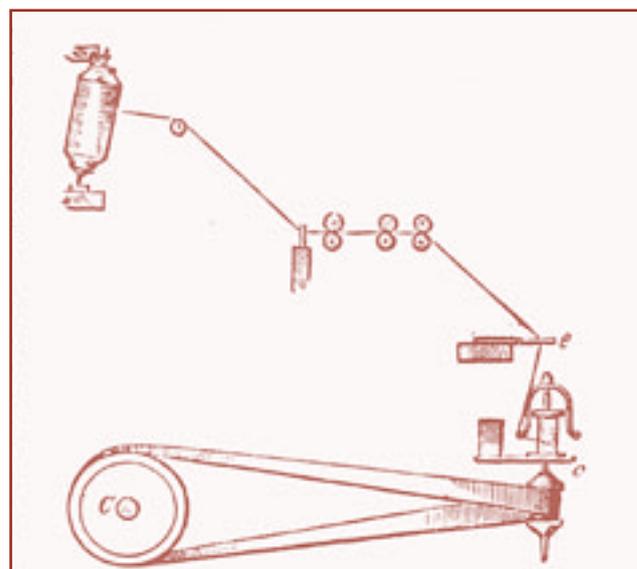
James Hargreave's Spinning Jenny of 1764 used the same method as the jersey wheel. Later improved versions had as many as 120 spindles. At one point, James Hargreaves had the spinner using both hands and a foot, an operation that needed a lot of agility. The girl in the photograph has stretched the threads with the draw bar and is about to turn the wheel to drive the spindles. After putting the twist into the yarn, she uses her foot to control the faller wire, which guides the threads as they are wound evenly on the bobbins.

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1769 Richard Arkwright's Water Frame

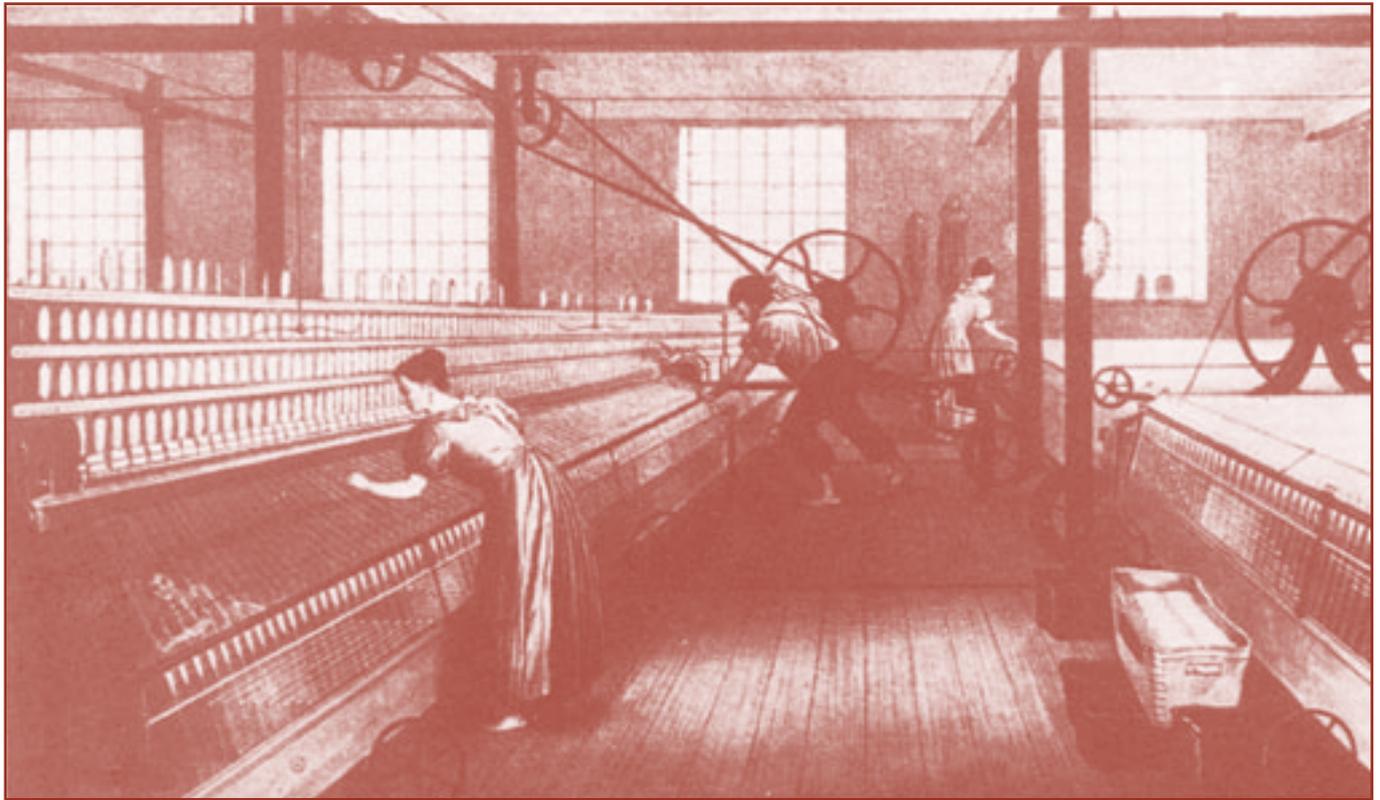


Richard Arkwright invented a machine that could spin cotton thread. His machine used three pairs of rollers. But, unlike the Jenny, this machine could not be worked by hand because its parts were too heavy. Instead the rollers were turned using the power from a water wheel. This meant that the machines could not be used in people's homes. Richard Arkwright had to build a factory or mill for his machines and these had to be built near to a source of flowing water. Richard Arkwright built his first successful water powered cotton mill in Cromford. Richard Arkwright's machine was a big improvement on the Jenny. Using the Jenny the spinner had to do three different operations to spin the thread and wind and twist it. Richard Arkwright's machine had a continuous action of spinning, winding and twisting. This made it suitable for a powered operation. Also it was a much simpler machine and could be operated by children.



The diagram shows the thread being drawn out by the three pairs of rollers before being twisted by the rotating arm of the flyer.

1779 Samuel Crompton's Mule



The mule was a combination of the Jenny and the Water Frame and overcame some of the problems of these earlier machines by producing very fine and strong thread. The machine had 48 rotating spindles mounted on a moveable carriage. The carriage moved on rails away from the rollers, thinning the drawn out slivers of cotton (rovings) and then moved back to the original position with the spindles rotating to wind up the thread.

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KEY QUESTION THREE

Who was Richard Arkwright?



Purpose

- To find out about some of the people who began the Industrial Revolution
- To infer information from a portrait
- To identify how Richard Arkwright became famous
- To infer information from a written or visual account of a person's life.

Resources included in this section

- A copy of the portrait of Sir Richard Arkwright painted by Joseph Wright of Derby.

Resources that could be provided to illustrate this section

- Copies of paintings by various English artists showing men and women wearing wigs.

Using Portraits

Introduction

Tell the children that we are going to find out more about Richard Arkwright, a very famous person. Tell them that we are going to use a piece of evidence from the time to help us find out about Richard Arkwright. Tell them that we are going to use copies of a portrait that was painted of him when he was 56 years old. Give each group of children a copy of the portrait of Sir Richard Arkwright painted by Joseph Wright of Derby. Tell them that:

- Sir Richard Arkwright was a famous man
- He was an inventor and a business man
- That he invented a machine that could spin strong cotton thread
- That he used water-power to work these machines
- That he built factories or cotton mills in which to put these machines. That he was the first business man to build water-powered cotton mills
- That his first successful water-powered cotton mill was built in Cromford in Derbyshire.

Tell the children that Richard Arkwright began life as a poor man from a poor family, but through hard work, the ability to enthuse others with his ideas and his inventive business mind became rich and famous.

Tell the children that when Richard Arkwright was alive photography had not been invented. Richard Arkwright was born in 1732 and he died in 1792. Tell them that, when people wanted a picture of themselves, they could ask a painter to paint a picture of them. Say that it was expensive to have your portrait painted by a famous artist. When Richard Arkwright was 54, in 1786, he was given a knighthood. That meant he became Sir Richard Arkwright. He began to build himself a mansion in Cromford, called Willersley Castle in 1786. From 1788 Sir Richard Arkwright also had a town house in London, 8 Adam Street. This tells us he was a rich man. He also had his portrait painted by Joseph Wright of Derby, himself a famous portrait artist. Say to the children, let us look at the portrait closely to see if we can find out something about what sort of man Richard Arkwright was. Remind the children that when a person decided to have their portrait painted they could choose what clothes to wear, what pose to take, what things they wanted to have in the picture with them. They did this because they wanted to say something about themselves. So, for example, if you are a keen football player you might want your portrait or photograph taken to show you in your football kit, standing in front of the goal with a ball under your foot. Or if you liked ballet dancing you might like to show yourself wearing your dance dress and ballet shoes.

Using the portrait to discover something about Richard Arkwright

Clothes

Ask the children to describe Richard Arkwright's clothes. What is he wearing on his legs? What is he wearing on his feet? What colour is his jacket? Is it long or short? What materials do you think it is made from? Are his clothes made of silk? Is he wearing lots of frills and ruffles? What are the buttons like? What is his waistcoat like? Is he wearing rings or jewellery? What is he wearing around his neck? What do you think his clothes tell us about him? Does he look like a famous, rich and important man in expensive clothes? Or, does he look like a more ordinary man? Why do you think Richard Arkwright wanted to show himself like this?

Face and Head

Ask the children to look at his head. Ask them if they know what he is wearing on his head. Explain about

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wigs and why people wore them in the past. Ask the children to look at his face. Ask the children to think about his expression. Does he look kind and friendly or bad tempered and fierce? Does he look happy, contented, pleased with himself or disappointed and sad? Is he looking at us or away from us? What sort of person do you think Richard Arkwright was? What do you think he would be like?

Pose and position of body

Ask the children to look at Richard Arkwright's pose. Is he standing or sitting? Where are his hands? Does he look comfortable? Is he holding anything in his hands? Is he well built or thin? What do you think his pose tells us about Richard Arkwright?

Background

Ask the children to look at what else there is in the picture. What furniture is there in the picture? Describe the furniture. Does it look grand and expensive or rather plain? Is there anything in the picture to give us a hint that Richard Arkwright might actually be rich? Is there anything on the table? Describe what this object looks like? What might this object signify? Think about what made him famous and rich.

Introduction

Tell the children the story of Richard Arkwright's life. Tell the children that Richard Arkwright was born in Preston, Lancashire. He was the youngest son of Thomas Arkwright and his wife. Thomas and his wife had thirteen children. Thomas Arkwright was a tailor. A tailor was a person who made men's clothes. Richard Arkwright's parents were poor and could not afford to send him to school. They arranged for his cousin Ellen to teach him to read and write. When he was old enough his parents apprenticed him to a barber. A barber was a person who cut men's hair and shaved their faces and was a bit like a doctor. Richard Arkwright, for example, was apparently good at bleeding people and pulling teeth out! An apprentice is a young person who goes to work for someone and learns to do the job as they go along. A person is apprenticed for a number of years, usually five, until they are qualified and can set up on their own.

Richard Arkwright moved to Bolton because he got a job with a man who made wigs. Wigs used to be in fashion for rich men and women in the 1700s. Have pictures to show some rich people wearing wigs. However, he was an ambitious young man and had a strong desire to run his own business. In 1762 Richard Arkwright was running his own barber's shop as well as a public house and had started his own wig making business. He travelled all over England to buy women's hair which could be made into wigs. It was while he was travelling around the country that he heard about the attempts being made to design new machines for the textile industry, especially a machine that could spin lots of threads at one time. He must have thought that there was money to be made by the person who could invent such a new machine.

In about 1764 or 1765 Richard Arkwright met John Kay (not the man who made the flying shuttle) a clockmaker from Warrington. John Kay had been busy for some time working with Thomas Highs (or High) of Leigh trying to produce a new spinning-machine but without success. Richard Arkwright was inspired by the idea of designing a new type of spinning machine and he spent the next three years working on an idea until he succeeded. Richard Arkwright's machine involved three sets of paired rollers correctly-spaced and weighted which turned at different speeds. While these rollers produced yarn of the correct thickness, a set of spindles twisted the fibres firmly together. The machine was able to produce a thread that was far stronger than that made by the Spinning-Jenny produced by James Hargreaves. Ask the children if they remember the machine that was sitting on the table in Richard Arkwright's portrait.

In 1768 Richard Arkwright went into partnership with John Smalley of Preston and David Thornley of Liverpool to put Arkwright's spinning frame to work. Their first business was in Nottingham – a centre of the East Midlands hosiery or stocking industry, where they rented a building in which to put the spinning frame to work. They used horse-power to make the machines work. However they didn't have enough money to get the business off the ground.

So, in 1769 Arkwright went to Ichabod Wright, a banker from Nottingham, to ask for a loan to expand his business. Instead, Ichabod Wright introduced Richard Arkwright to Samuel Need, a hosier (stocking manufacturer) who also lived in Nottingham. Samuel Need was impressed with Arkwright's Spinning Frame and decided to introduce him to Jedediah Strutt, another wealthy hosier who lived in Derby. Samuel Need and Jedediah Strutt agreed to form a partnership with Richard Arkwright.

The partnership took out a lease on a site in Cromford where they planned to build a building to take several of the new machines. This new business eventually proved to be so successful that Richard Arkwright became a very rich man. He built another mill on the Cromford site and at Matlock Bath, Masson Mill and others in Derbyshire, Staffordshire, Lancashire and Scotland which were managed by his family or by managers who had learned their trade at Cromford. As well as mills Richard Arkwright built most of the village of Cromford.

Richard Arkwright was successful because he developed the Factory System. A system which had the machines and the workforce making a finished product that used a common source of motive power, all in one building built for the purpose. Many people went on to copy his ideas in Britain, including Jedediah Strutt who built mills in Belper and Milford, and in the rest of the world.

As he grew older he was able to enjoy his wealth. In 1786 he was given a knighthood and became Sir Richard Arkwright. He began to build a mansion, a very large house, in Cromford, called Willersley Castle. He bought himself a town house in London, 8 Adam Street. He had his portrait painted by Joseph Wright of Derby, as we have seen, and a famous American artist called Mather Brown.

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However people said that although Richard Arkwright bought himself a town house, had a mansion built for him in the country and had his portrait painted by a famous artist, he kept working rather than living the life of a country gentleman. It is said that “when considerably more than 50 years of age – feeling that the defects of his education placed him under great difficulty and inconvenience in conducting his correspondence, and in the general management of his business – he encroached upon his sleep, in order to gain an hour each day to learn English grammar and another hour to improve his writing and orthography”.

A man called Josiah Wedgwood, who was a famous pottery manufacturer said this about Richard Arkwright: “I have visited Mr Arkwright several times and find him much more conversible than I expected, and he invites me to come and see him as often as I can, though he tells me he at present shuns all company as much as possible because it robs him of his time and breaks in upon his plans – and besides he says he is no company for them, for whilst they are talking to him upon one subject he is thinking upon another, and does not know what they say to him”.

Sir Richard was reported by the Gentleman’s Magazine as having “died immensely rich, and as having left manufactories, the income of which is greater than that of most German principalities... his real and personal property is estimated at little short of half a million”.

In an obituary in the Derby Mercury Erasmus Darwin said this about Richard Arkwright’s system of spinning: “by giving perpetual employment to many thousand families has increased the population, and been productive of greater commercial advantages to this country, and contributed more to the general benefit of mankind, in so short a period of time, than any other single effort of human ingenuity”.

National curriculum links to English – Ask the children to work with these pieces of historical writing during their literacy work. These pieces of writing are examples from the National Literacy Strategy for Y6 of Non-fiction (i) autobiography and biography, diaries, journals, letters, anecdotes, records of observations, etc. which recount experiences and events; (ii) journalistic writing; (iii) non-chronological reports. The children could be asked to work on their own or in pairs to put these reports into their own words or into modern language.

Links to the next section

Tell the children that in the next section they are going to find out more about why Richard Arkwright decided to build his first water-powered cotton mill in Cromford in Derbyshire.

Portrait of Richard Arkwright by Joseph Wright of Derby 1789-90

ACTIVITY SHEET A



Sir Richard Arkwright – a portrait

**Read this piece of historical writing.
It tells us something about Richard Arkwright’s character.
Try to put the piece written inside the quotation marks into modern English
or in your own words.**

However people said that although Richard Arkwright was now a rich man and had bought himself a town house, had a mansion built for himself in the country and had his portrait painted by a famous artist, he kept working rather than live the life of a country gentleman. It is said that even “when considerably more than 50 years of age – feeling that the defects of his education placed him under great difficulty and inconvenience in conducting his correspondence, and in the general management of his business – he encroached upon his sleep, in order to gain an hour each day to learn English grammar and another hour to improve his writing and orthography”.

What do you think this says about Richard Arkwright’s personality?

ACTIVITY SHEET B

A portrait of Richard Arkwright

Read this piece of historical writing.

It tells us something about Richard Arkwright's character.

Try to put the piece written inside the quotation marks into modern English or in your own words.

A man called Josiah Wedgwood, who was a famous pottery manufacturer, said this about Richard Arkwright: "I have visited Mr Arkwright several times and find him much more conversible than I expected, and he invites me to come and see him as often as I can, though he tells me he at present shuns all company as much as possible because it robs him of his time and breaks in upon his plans – and besides he says he is no company for them, for whilst they are talking to him upon one subject he is thinking upon another, and does not know what they say to him".

What do you think this says about his personality?

ACTIVITY SHEET C



A portrait of Richard Arkwright

**Read this piece of historical writing.
It tells us something about Richard Arkwright's character.
Try to put the piece written inside the quotation marks into modern English
or in your own words.**

In an obituary in the Derby Mercury Erasmus Darwin said this about Richard Arkwright's system of spinning: "by giving perpetual employment to many thousand families, has increased the population, and been productive of greater commercial advantages to this country, and contributed more to the general benefit of mankind, in so short a period of time, than any other single effort of human ingenuity".

What do you think this says about his personality?

KEY QUESTION FOUR

Where did Richard Arkwright build his first water powered cotton mill and why did he choose this place?



Purpose

- To find out where Richard Arkwright built his first water powered cotton mill
- To find out about the possible reasons he might have had for choosing this site
- To find out what the mill building was like
- To find out who worked in the mill
- To find out where Richard Arkwright lived
- To find out where the people who worked in the cotton mill lived.

Resources that are included in the pack

- Maps of Cromford – including the Tithe map of 1842 and the Ordnance Survey Maps 1890s
- Arkwright's Cotton Mills by Night, by Joseph Wright of Derby
- Arkwright's Cotton Mills by Day, by Joseph Wright of Derby
- The Upper Mill from a watercolour by William Day 1789
- Lower Mill from a watercolour by Zachariah Boreman 1787
- Sketch plans of the layout of the site and its development at Cromford
- Letter of 1780
- Certain advertisements – Derby Mercury from 1771 and 1781
- Map showing the route of the road from Derby through Cromford to Matlock
- Drawing of the Turnpike road through Scarthin Nick, Cromford, from a 19th century drawing by T. Allom. Drawn from the south
- Drawing of the road made to the north of Scarthin Rock. Artist unknown.

Resources that might be added

- Copies of painting from the period showing men wearing silk stockings or hose
- Wool and knitting needles, bobbins and pins for French knitting
- A piece of knitted fabric
- The children's story book 'Scavenger Boy' by Teresa Tomlinson ISBN 0-7445-5997
- Details of houses for sale from an estate agent.

Fieldwork

- The activities in this section would benefit from a fieldwork visit to Cromford Village, Matlock Bath, Cromford and Masson Mills. Suggested fieldwork activities are included in this section

Where and why did Richard Arkwright build his first water powered cotton spinning mill?

Write this question on the whiteboard and tell the children that they are going to find out where Richard Arkwright built his first water powered cotton spinning mill, what the site was like, what the mill looked like and to have a go at working out what reason he chose this place to try out his ideas.

Tell the children that Richard Arkwright built his first water powered mill on a small site between Cromford Village and Cromford Bridge. Cromford is near Matlock, in Derbyshire.

Let us look at the site. Give the children the sketch map of the site and point out the features of the site. The site was long and narrow. There were rocky cliffs on the north side and on the south side of the site. There was a stream running through the site called the Bonsall Brook. A lead mine drainage channel, the Cromford Sough, drained into the brook upstream. Bonsall Brook was and is a tributary of the River Derwent. Bonsall Brook joined the River Derwent at Cromford Meadows which is nearby. There was a road running alongside the site which came from Birmingham, went through Derby in the south, then through Cromford, then Matlock and went via Chesterfield to Sheffield in the north. The road crossed the River Derwent at Cromford Bridge. There was a water powered corn mill on the site already.

Tell the children that they are going to think about why Richard Arkwright might have thought this would be a good place to try out his cotton spinning machinery and his ideas for a water powered mill. Say that Richard Arkwright and his partner Jedediah Strutt must have been looking out for a suitable site where they could build a mill. Jedediah Strutt lived in Derby where he owned two water powered Silk Mills. One mill on the Markeaton Brook and one on Gaol Brook. Jedediah Strutt must have been experienced in the building of water powered mills and in finding sites on which to build them because he had built his own silk mills. He must have known the area well and

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had ideas about where a suitable site for the new cotton mill could be found. Perhaps he saw an advertisement in the local paper offering a site to rent or lease and discussed it with Richard Arkwright before they decided.

Advertising land to rent.

Ask the children to make up an advertisement pointing out the good features of the site. Tell them to think about any 'House for Sale' advertisements they might have seen. Give them this list of good points that they could use in their advertisement. They could use the map in their advertisement.

Good Points about the site.

- On the road which links Birmingham with Derby, Chesterfield and Sheffield and goes through Cromford
- The stream called Bonsall Brook runs through the site
- The leadmine drain called the Cromford Sough runs into the stream giving a constant flow of water
- There is a water powered corn mill on the site already which uses the water from the Sough and the Brook
- There is a small village nearby where men work in the lead mines.

What would Richard Arkwright have been looking for?

Put this question on the whiteboard and tell the children that they are going to be thinking about what Richard Arkwright would have been looking for in a site on which to build his mill. Ask the children, in their groups, to come up with a 'Must Have List' for Richard Arkwright to build his mill, a bit like when a family are looking for a new home, for example; must have four bedrooms, two bathrooms, a kitchen, a garage, etc.

Put this list of 'Things to think about' on the white board to help the children to make their 'Must have List'. Or, give each group a card with one 'Things to think about' and the supplementary questions or snippets of information to talk about.

'Things to think about'

He would have been looking for:

- A supply of water to power the machinery BUT the water must be reliable, that is not too much or not too little. Why might the Brook be a better bet than the River Derwent, for example? What might happen to the big river after heavy rain?
- A supply of water from a source that doesn't freeze in winter. Why? What happens to the flow of water when a stream freezes over? Do you think the water coming from a lead mine deep underground would freeze?
- To have the 'right' to use the water because all the streams belong to someone. What tells you that the site might already have permission to use the water from the Brook to power a mill? What building is already on site?
- A road or transport route nearby so that raw materials and finished goods can be transported to market, that is the raw cotton and the finished

cotton thread. The road that went through Cromford continued northward to Matlock, Chesterfield and Sheffield. To the South the road went along the old packhouse route towards Wirksworth and then over Wirksworth Moor towards Milford and then Derby. Raw cotton and finished goods could be bought and sold in Derby and transport on to London.

- Women and children to work the machines. Richard Arkwright's machines were so easy to use that they could be worked by women and children who were much cheaper to employ. In the Cromford area there was lots of work for men in the lead mines. There was no work for women and children.

Notes about the transport routes in the East Midlands in 1770s.

It might be wondered where Richard Arkwright got his raw cotton from and how he got it to Cromford. No-one really knows for certain but it would seem likely that it came via Derby by means of packhorse.

Derbyshire, Nottinghamshire and Leicestershire were the main hosiery manufacturing counties in England. The hosiery industry was the main employer and economic driver for this area. Derby, Nottingham and Leicester were the three market towns of the area that made a triangle of textile centres for hosiery and knitwear in the East Midlands 1700s.

The transport routes in the region were able to take advantage of the rivers systems. The River Derwent joined the River Trent near Derby. Nottingham is situated on the River Trent. Leicester is on the River Soar, another tributary of the River Trent. The River Trent flowed out to the sea through the Humber Estuary. There was also an important port on the East Coast called Bawtry. Ships could therefore navigate the River Trent from the sea all the way to Derby. Cotton could be brought by boat to Derby and then by pack horse or cart from Derby to Cromford via the road over Wirksworth Moor.

The raw cotton would have come by ship from Egypt and the Levant, which was part of the Ottoman Empire at this time. Cotton from the West Indies didn't arrive in England until much later. The East Coast ports would have been used in those times. The West Coast ports were considered dangerous because of the stormy Atlantic Sea.

It would help the children to look at a map of the UK to work out where these places are.

It should be noted that the canal came later in 1793 and does not seem to have been used to transport cotton.

In 1771, the road from Derby that went through Cromford did not follow the route of the present A6. (The A6 was turnpiked in an Act of Parliament passed in 1817 and which was completed by 1820. It probably followed the route of a private road made by Richard

KEY QUESTION FOUR

Arkwright from 1771 onwards along the valley of the river Derwent southwards towards Belper). The road through Cromford came down Cromford Hill and then crossed the River Derwent by Cromford Bridge carrying on up the hill over Starkholmes and so into Matlock. At the top of Cromford Hill the road continued south over Wirksworth Moor, passed the Bear Inn, Sandy Ford and Belper Lane End and followed the Chevin to join the road at Milford as so into Duffield and Derby. It seems a strange route to us but in 1771 the Derwent Valley was subject to flooding. To help the children understand the route, a map and activity sheet is included in the pack if you wish to use it.

The other difficulty about the roads through Cromford when Richard Arkwright was building Cromford Mill that perhaps needs explaining is that there wasn't a road through Scarthin Nick, the limestone rocks as shown on the sketch map. The road from Matlock Bath went along the river bank and the along the north side of Scarthin Nick around the end of the rocks and crossed Bonsall Brook by the old bridge that is still in the middle of the mill yard (See the children's resource sheet). A branch of this road met the Cromford to Matlock road and crossed the river Derwent by Cromford Bridge. The sketch map should make this clear. The route of the A6 or the turnpike road built in 1820 cut through Scarthin Nick. There is a good illustration of the cut through Scarthin Nick (See children's resource sheet).

Role Play Exercise – discussion between Jedediah Strutt and Richard Arkwright about whether or not the site at Cromford might be suitable for the building of the cotton mill.

Ask the children to carry out a role play exercise to discuss the things Richard Arkwright was looking for and why this site at Cromford might have been just the right one. One group could play the part of Richard Arkwright. Richard Arkwright could tell Jedediah Strutt some of the things he is looking for in the site. One group could play the part of Jedediah Strutt. Jedediah Strutt could be telling Richard Arkwright that he had seen an advertisement for a site that might suit them. He could tell Richard Arkwright one of the 'Good Points' about the site. They could discuss what it was about the site that might make it ideal for them. They are trying to match the things Richard Arkwright is looking for with what the site has to offer.

To conclude

Whatever happened, in real life, Richard Arkwright and Jedediah Strutt and their partners took out a lease on the site at Cromford in 1771. This is what Richard Arkwright said about the site in an extract from the book 'The Arkwrights – Spinners of Fortune' by R.S.Fitton – 'Nine years later Arkwright was to tell John Lee, his counsel, why the site had been chosen. Cromford, he said, was "a place affording a remarkable fine Stream of Water, And [was situated] in a County very full of inhabitants vast numbers of whom & small

Children are constantly Employed in the Works". The lease makes interesting reading and the children could use this text as an example of Non-Fiction writing to read and understand examples of official language, for example legal documents (from the past). (See The National Literacy Strategy Year 6 Term 2 Non-Fiction Reading Comprehension 17).

Understanding the lease on the Cromford Site.

Give the children the extract from the book – 'the Arkwrights – Spinners of Fortune' and the lease Richard Arkwright took out on the piece of land in Cromford. Ask the children to extract the key points from the lease. What for example was Richard Arkwright going to be allowed to do with the site? Have a discussion with the children about legal language and its characteristic features. In this case a very long sentence with no punctuation and the use of capitals throughout. Why do the children think this is done? Do any of the children have a family member who is a solicitor or a member of the legal profession? If so would they be willing to come and talk to the children about legal language. Make sure that you give this person a copy of the lease before their visit so that they are in a position to talk about it. The children could ask the questions: Why are very long sentences used? Why is there no punctuation?

What was Richard Arkwright's first mill like?

Put this question on the whiteboard and tell the children that they are now going to find out what Richard Arkwright's mill looked like. To do this they are going to use paintings of the mill that were painted at the time by Joseph Wright of Derby, old maps and plans that have been drawn by historians and archaeologists who have been working on the site in recent years. Tell the children that artists of the time must have been interested to paint these new buildings in the landscape and that we are lucky to have several of the mills at Cromford. Show the children a copy of a watercolour of the Upper Mill by William Day painted in 1789. This painting was made from a viewpoint along the 'turnpike road' that went through Cromford higher up the valley towards Wirksworth. The water colour shows how much of the mill would have been seen from higher up the valley before the building of the A6 road destroyed the natural slope of the valley from Cromford Market Place to the Mills. The limestone cliffs were broken through to make the A6 road and the rubble used as infill to make the valley floor level to carry the road in 1818 when the turnpike road to Belper was constructed.

Ask the children to look at the Tithe map drawn in 1842 (included in the pack) that shows Cromford village and the mills. Ask them to mark the spot where they think the artist must have been standing and put an arrow to show the direction he was looking in. (If your class is making a field trip to Cromford, you could take the children to this spot to compare the scene today. There are lots of clues to show how the land has been raised around the junction of the A6 the B5023).

KEY QUESTION FOUR

Describing the Cotton Mills.

Show the children the picture of the Lower Mill from a water colour by Zachariah Boreman, 1787.

Ask the children to describe the Upper Mill or the Lower Mill using the paintings as evidence. They should be able to say that the Upper Mill was five storeys or floors in height and that in 1789 (the time of the painting) there were 15 windows or bays on each floor. The Lower Mill was six storeys or floors in height and with another attic storey in the roof and with 16 bays or windows on each floor. But that although they were very tall they were also quite narrow or thin. They were huge buildings and dominated the landscape.

So where did Richard Arkwright get his idea about what a cotton mill should look like? Why were the mills so tall and narrow and with so many windows?

Put these rhetorical questions to the children. Ask the children if they remember learning about the Silk Mill in Derby and what the Silk Mill looked like. Archaeologists and historians think that John Lombe's Silk Mill in Derby had proved to be a good design for a mill building and one that could be adapted to the cotton industry. Jedediah Strutt (Richard Arkwright's partner) had two silk mills in Derby. It would seem likely that both men would have decided that the design of the Silk Mill building could work just as well for a cotton mill.

The good points about the design of the mill building were these:

- A lot of machines could be fitted in on each floor
- Each machine would be next to a window and could be lit by natural light
- Natural light was important because of the delicate manual tasks that were done to operate the machines
- The distance from source of power (the water wheel) to each machine was not too far. This was important because the further away a machine was from the power source the less power it got and wouldn't work as well.

The plan of the Derby Silk Mill shows this very well. (*Plan included in the Pack*)

However it should be remembered that the cotton spinning process was very different from the silk throwing process. Richard Arkwright's mills were narrower than the silk mill because of the different size of the machines and the space between the floors may have been different.

Show the children the plan of the Derby Silk Mill. It shows the floor plan of the building. It shows the plan of the machines in their places. The machines were the circular throwing machines (copies of drawings of these were seen in the section on John Lombe and the Derby Silk Mill). It shows how the windows let in lots of natural light. It shows how the water wheel was placed in the centre of one long wall so that the source of power was central to the machines and none of the machines were too far away from the source of power.

Use the Activity Sheet E the Plan of Derby Silk Mill.

How many people worked in the mill? Where did the people who worked in the cotton mill live?

Tell the children that they are going to find out a bit about the people who worked in the cotton mill. Tell the children that lots of people were needed to work in the mills. The machines that Richard Arkwright designed were so easy to operate that they could be worked by women and children. So lots of women and children were needed and this meant families. At first it is thought that Richard Arkwright could have given jobs to the wives and children of the lead miners who already lived in Cromford and round about. But as the Upper Mill got going and began to prove to be a success and he built the second Lower Mill in 1776, he needed lots more families to move into Cromford. To get families to move into Cromford, Richard Arkwright began to build houses but he also had to find employment for the men of the family who would not find work in the mill. The first houses he built in 1776 were in North Street. Ask the children to find North Street on the Tithe map of 1842, the earliest map we have. (There are no maps of Cromford from 1771, unfortunately). The houses in North Street show how Richard Arkwright found the answer to the problem. The top floors of the houses were built as workshops for weavers. He would offer employment to the wives and children in the mill and the men would weave his yarn into calico in the workshops in the houses. (If the children make a visit to Cromford they can walk along North Street and see the houses Richard Arkwright built).

The houses in North Street may have been home for two families. The design of the houses with the rooms on the ground floor and the first floor opening onto the separate staircase, meant that they could have been rather like a block of flats. People could go up to the workshops from the street without going into the domestic rooms.

Richard Arkwright continued to build houses in Cromford for about 20 years. In the 30 years from when Arkwright built the Upper Mill or first mill, to the date of the first census, the population of Cromford probably grew 10 times, although there is no information about the size of the population in 1771. Cromford had been a small declining lead mining community before Richard Arkwright began building his mills and the houses and other buildings in Cromford.

Population figures using Census data.

| | | |
|------|------------|-------------|
| 1801 | 208 houses | 1115 people |
| 1811 | 239 houses | 1259 people |

It should be remembered that the population figures for the early years of the census are not accurate since not everyone was willing to register their names in the beginning (a bit like today!).

KEY QUESTION FOUR

Fieldtrip Opportunity

The Tithe Map of 1842 of Cromford Town should show all these houses. *The Tithe map could be used on a fieldtrip to Cromford. The children could quite easily identify the houses that were there in Cromford in 1842 because the centre of Cromford remains unchanged from those times. They could have a copy of the Tithe map and an ordnance survey map of today. They could colour in the houses on the ordnance survey map that they have evidence were built before 1840. But do remember that 1840 is 60 years after Richard Arkwright built his first mill in Cromford.*

What evidence do we have that Richard Arkwright employed women and children in the cotton mill?

Tell the children that we have some evidence to show that Richard Arkwright employed women and children in his mills.

Show them the advertisement from the Derby Mercury published on the 10th December, 1771 about three months after Richard Arkwright took out the lease on the Cromford Site (Activity Sheet F). Ask the children to read through the advertisement and answer the questions.

The three different types of craftsmen Richard Arkwright was advertising for were, two Journeymen Clockmakers, a Smith and two Wood Turners. These terms will probably need explaining to the children. A Journeyman is a craftsman, or competent worker, that used to be hired on a daily wage. A Clockmaker makes clocks and so is used to making Tooth and Pinion, in other words, cogs and gears. Richard Arkwright's spinning frame used cogs and gears as did the water wheel and power transmission system so a Clockmaker would have been the ideal person to help him build the machinery he needed for his mill. He also wants a Smith, like a blacksmith, someone who can forge and hammer and shape metal objects, and Wood Turners who can turn wood on a lathe into cylindrical shapes to make spindles.

He needed all these craftsmen because he would have had to make all the spinning frames for Cromford Mill. He couldn't go out and buy them.

Show the children the picture of the spinning frame (Activity Sheet G). This one has a handle that means it can be worked by hand. It is to be found at Strutts North Mill Belper. In Cromford Mill all the spinning frames would have been attached by leather belts and pulleys to the drive shaft which was turned by one water wheel.

Ask the children to see if they can work out which part of the machine would have been made by each of the craftsmen.

Tell the children that women and children were employed in the mill. Their job was to look after the machines, making sure the thread was not broken and re-tying if it was, taking off bobbins that were full, putting on new bobbins, oiling the various moving parts, collecting the cotton fluff from the floor. You could read to the children the book called 'Scavenger Boy' by Teresa Tomlinson ISBN

0-7445-5997-9 which is actually set in Cromford. Or, Pauline Chandlers 'The Dark Thread' – Oxford University Press.

You should explain to the children that it would not have seemed unusual at that time for children to work. All children in a family would have been expected to work either at home, helping with the cleaning, mending, looking after younger children, or working on the farm feeding the animals, minding the flocks of sheep, and scaring away the birds from the corn fields. The difference that Richard Arkwright's factory system made to children's lives was that the work in the mill was paid for in cash, the work was regular if long hours, that they were working for the mill owner rather than a member of the family, they had to be at work for a certain time, were told when they could have breakfast and lunch and they had to work night shifts. See the pictures painted by Joseph Wright of Derby, Arkwright's Cotton Mills by night and by day.

The children may want to know what Boxwood was and why Richard Arkwright was advertising for it. Boxwood is the hard close-grained yellow wood of the box tree used to make tool handles and small turned or carved objects. It would have been wanted to make spindles and bobbins. *Masson Mill in Matlock Bath, near Cromford, has a huge collection of bobbins that the children can see and handle if you are making a field visit to the Cromford area.*

Was Richard Arkwright's cotton mill a success?

Tell the children that they are going to look at the evidence we have available to decide whether Richard Arkwright's cotton mill was a success.

It is hard to imagine the risk of this business venture. When Jedediah Strutt agreed to go into partnership with Richard Arkwright and to put his money into the project, he had no idea whether or not it would succeed. We can only imagine that Richard Arkwright must have been a very enthusiastic and charismatic character to have convinced Jedediah Strutt to put up the money for his idea. Of course, Jedediah Strutt was a very rich man who could, perhaps, afford to risk some of his money in this venture. However they both must have thought that the spinning frame had the potential to be 'a winner'.

All Jedediah Strutt's business experience was in textile manufacturing, the hosiery business or that of making silk stockings. He had his own silk mills in Derby and employed many framework knitters to make the stockings or hose in their own homes on the firm's own frames. He had himself, invented a machine, the Derby Rib Knitting Machine patented in 1759, so he would have known what it was like to come up with a good idea for a machine to improve the manufacture of textiles and to make money from putting it into production.

KEY QUESTION FOUR

The Derby Rib machine was a machine that could knit a rib pattern. This made the knitted material stretchy. Knitting is a way of making a material by interlocking loops of yarn, using a pair of knitting needles or a knitting machine. There are two basic stitches in knitting, the plain-knitting stitch which is the simpler stitch with the wool passed round the front of the needle and the purl-knitting stitch a reverse plain stitch. The rib pattern is produced by knitting a repeat pattern of plain and purl stitches. This was ideal for making stockings or hose. Stockings were worn by men in those times. Show the children the copies of the paintings of men and women at the time. They didn't want baggy stockings. The Derby Rib Machine meant that stockings stayed up. The rib pattern giving the material stretch. Let the children handle a piece of knitted material. See how it stretches then returns to its original shape when they let go. **Teach the children to knit in plain and purl stitch and then in rib. Or do French knitting with a bobbin.**

Links to the National Curriculum Art and Design programme of work and the QCA unit of work 5C Talking Textiles

Jedediah Strutt backed Richard Arkwright's business idea, rather like the entrepreneurs sometimes do in the television programme 'Into the Dragons Den' if they are convinced by the contestants ideas.

Into the Dragons Den!

Role Play Exercise – Presenting the business case for Cromford Mill.

So what were the good points about Richard Arkwright's business plan. The children could learn the following points and then perform a role play exercise to present their business plan to a panel of entrepreneurs.

The good points about the plan were along these lines:

- He had invented a machine that could do all the operations of spinning in one continuous motion
- The machine was very easy to use
- Women and children could operate the machines
- Women and children were cheaper to employ than men
- The machine made good quality cotton thread
- The machine could be worked by water power
- Water power was powerful enough that one water wheel could be made to work lots of the machines at once
- The machines could work all the time, day and night, because the water wheel didn't get tired and need a rest like people or horses would have done
- Lots of machines meant that lots of thread could be made
- Lots of money could be made.

No wonder it looked like a good idea.

However the downside was not knowing whether or not the system would actually work and the huge expense involved in setting it all up.

In the role play exercise the entrepreneurs need to be prepared to ask hard questions.

What about:

- The huge investment in having to build a purpose-built building for the machines. This was a new type of building to be designed especially for the water-powered machinery. An existing building wouldn't do.
- The difficulty of finding a suitable site with a source of flowing water and with rights to use the water for a water-powered mill.
- The huge investment in diverting streams and making culverts and channels to bring the flowing water to the water wheel
- The huge investment and time involved in making all the spinning frames
- The expense of building a water wheel and transmission system throughout the building
- The problem of finding a workforce to operate the machines
- All the money that could be lost.

Curriculum links – Enterprise Activities

First Steps.

Richard Arkwright's first steps in Cromford were slow and tentative. It is clear from a letter of March 1772, seven months after the lease at Cromford had been signed, that though he boasted to his partner Jedediah Strutt that he would be able to make three frames in a fortnight in reality not a single frame had been made. Nor had the building been completed: the sash windows were still to be fitted and he was waiting for latches and door fittings. He was also recruiting key staff and not finding it easy.

Apart from this glimpse of early difficulties, little is known of the first years of the new enterprise. But, it is known that the mill was operational by 1774.

The second patent – the Carding machine.

Much of his time in the early years in Cromford must have been taken up with experiments. One of the things he was working on was a machine to do the opening of the cotton bales and the cleaning of the raw cotton to get the bits out of it. He was also working on a machine to do the carding of the raw cotton, the process where all the fibres are laid parallel and the making of slivers and rovings, the loose, slightly twisted ropes of fibres which formed the raw material for the spinning frames. Until these operations could be mechanised to keep pace with the spinning, continuous production, the essence of the factory system, could not be achieved. He managed to make a machine that could card the cotton and turn it into rovings and the design for this was set out in the second patent which he got in 1775.

KEY QUESTION FOUR

The second mill.

The first mill must have proved to be a success, once it got going, because in 1776-77 Richard Arkwright built the second or Lower Mill. Richard Arkwright looked for money from someone other than Jedediah Strutt to build this mill. He went to Peter Nightingale who was a wealthy lead merchant and neighbouring land owner. His estate was in land around Lea, a nearby village. Richard Arkwright had managed to set up a deal whereby Peter Nightingale could buy the Cromford Estate for £20,000. This must have been a good deal because Peter Nightingale built Rock House on a site overlooking Cromford Mill for Richard Arkwright and in which he lived for the rest of his life. *The children could find Rock House on the Ordnance Survey Map of 1890 and seen in the background of the picture by William Day 1789 of the Upper Mill. Look for it high on the cliffs above the village.* (Activity Sheet C). Peter Nightingale also put up £2,000 to build the second or Lower Mill and £1,000 to build houses for the work people.

The houses that Peter Nightingale invested money in the partnership to build, were the ones in North Street. He put up another £750 to build the houses higher up Cromford Hill in 1778. There may have been more money given to build workshops at the mill site and in the village such as the Greyhound Inn or Black Dog as it was known then.

The building of the second mill at Cromford in 1776-77 was followed by the building of lots more mills elsewhere. In 1777 mills were built by Arkwright and his family at Birkacre, Bakewell and Wirksworth; at Rochester in 1781 and at Cressbrook in 1783. Also in 1783 he built Masson Mill at Matlock Bath, the first of his mills to use the River Derwent. By 1789 Richard Arkwright and his family had made enough money to buy Peter Nightingale's share of the partnership, so the Cromford Estate now belonged to the Arkwright family.

Elsewhere, royalty agreements licensing the use of Arkwright machinery allowed the Arkwright system to be used all over the country.

Between 1776 and 1781 his first partner at Cromford Mill Jedediah Strutt built his first mills at Belper and at Milford.

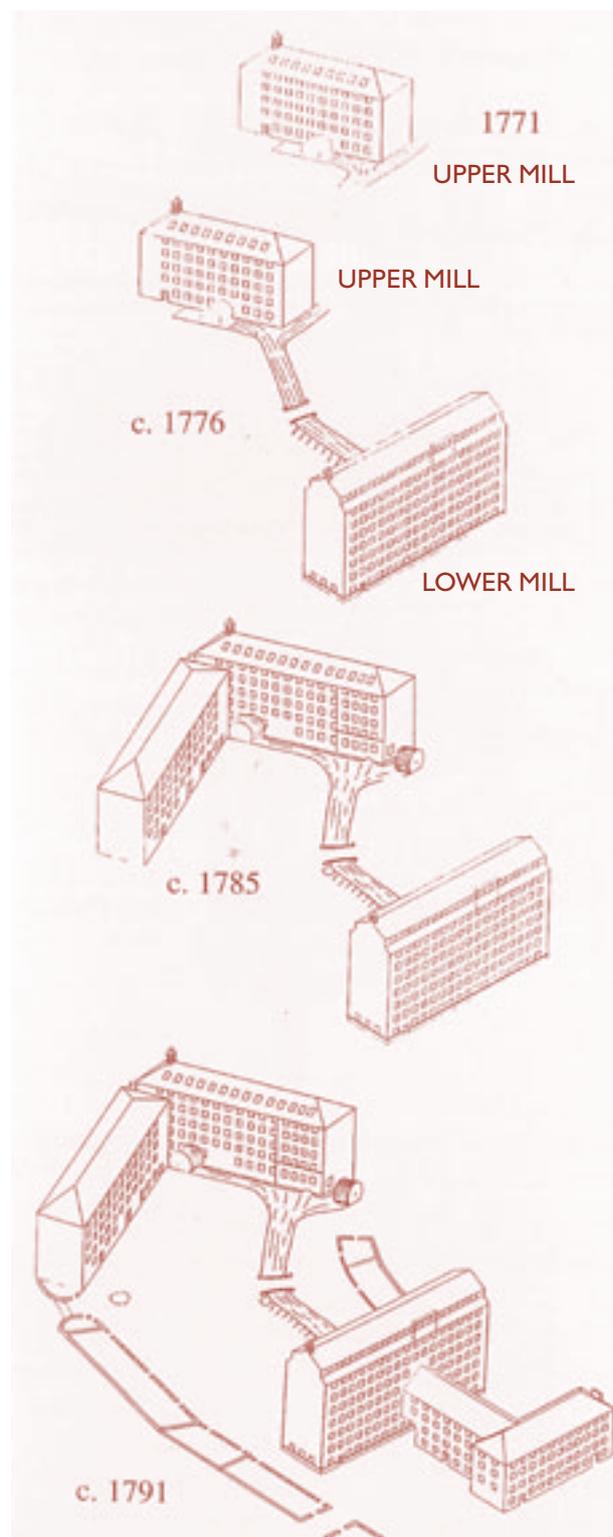
However although Richard Arkwright was building mills at other places, he continued to develop the Cromford site. This can be seen from the advertisement in 1781 in the Derby Mercury advertising for workers of all kinds to come and work in the cotton-mills (See Activity Sheet H).

It was at Cromford that Richard Arkwright extended the range and scale of his mechanisation of cotton spinning and devised the factory production techniques which yoked machinery, the workforce and water power as they had never been harnessed before. In his hands the factory system evolved and matured, creating a model which was recognised and copied across the world. The factory production of cotton yarn also led to cotton becoming the most important textile fibre in the world for a period of more than a century and the impact of large scale cultivation of cotton on countries such as the United States, Egypt and India was profound. The Arkwright

system made possible the production of cheap clothing and household textiles for a wide cross section of the population, improving comfort and personal hygiene.

So, yes, we can say that Richard Arkwright cotton mill idea was a success and Richard Arkwright became a very rich and famous man.

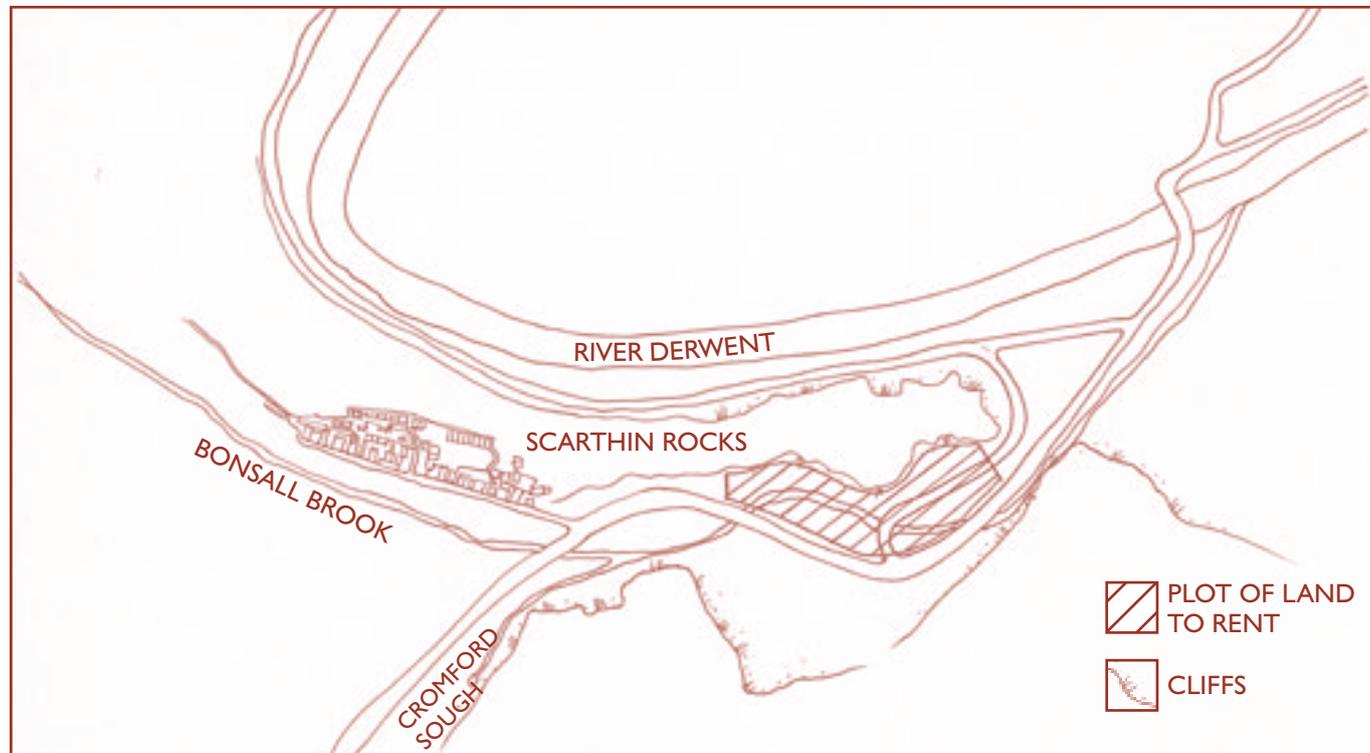
Diagram to show how success of the first or Upper Mill led to the building of the second or Lower Mill and the other buildings.



ACTIVITY SHEET A

Sketch Map showing the landscape of Cromford before Richard Arkwright built his cotton mill in 1771

PLOT OF LAND TO RENT



- Colour in the Derwent River, Bonsall Brook and Cromford Sough in blue
- Colour in the roads in red

What are the good points about this site? Make a list of the good points.

- 1
- 2
- 3
- 4
- 5

Write your advertisement to go in the paper here.

Drawing showing the road that ran behind Scarthin Rocks, artist unknown



- The large house or mansion of the left of the picture is Willersley Castle built by Richard Arkwright.
- The bridge is Cromford Bridge.
- The church is St. Mary's Church, on Mill Lane and was built as a private chapel by Richard Arkwright in 1779 and opened to the public for worship by his son, Richard, in 1858.
- The river is the River Derwent.
- It is just possible to see the road on the right of the river going under the rock face towards the church and Mill Lane.
- To the right of the church is the Gothic Warehouse, the terminus of the Cromford Canal built around 1792.

Map showing the route of the road between Derby and Matlock which went through Cromford at the time Richard Arkwright built his mill in Cromford



The Turnpike Road through Scarthin Nick

An advertisement appeared in the Derby Mercury in 1764 for a Stagecoach Service between Birmingham and Sheffield. Passengers arrived in Derby in the evening and slept the night at a coaching inn in Derby. The next morning they continued their northward journey. They had their breakfast in Matlock, their dinner in Chesterfield and reached Sheffield in the evening.

The A6 road was built in 1820 after an Act of Parliament gave permission to build a road from the Town of Cromford to the Town of Belper. This meant that for the first time there was a road along the Derwent river valley. To build the A6, a cut had to be made in Scarthin Rock. This is a drawing by T. Allom showing the turnpike road through Scarthin Nick. The drawing is taken from the top of the rocks to the south of Cromford village.

The large house in the background is Willersley Castle, the house that Richard Arkwright built for himself when he was rich and famous. He died before it was finished.

ACTIVITY SHEET B

Richard Arkwright's lease for the site at Cromford

The Cromford venture had its visible beginnings on 1 August 1771, when the partners agreed with Robert Nall, a hosier, of Chesterfield, and a trustee of William and Mary Milnes of Aldercar Park, near Heanor, to lease land upon which to build a water-powered spinning mill. A yearly rent of £14 secured for them a twenty-one-year lease extendable by a further sixty-three years of:

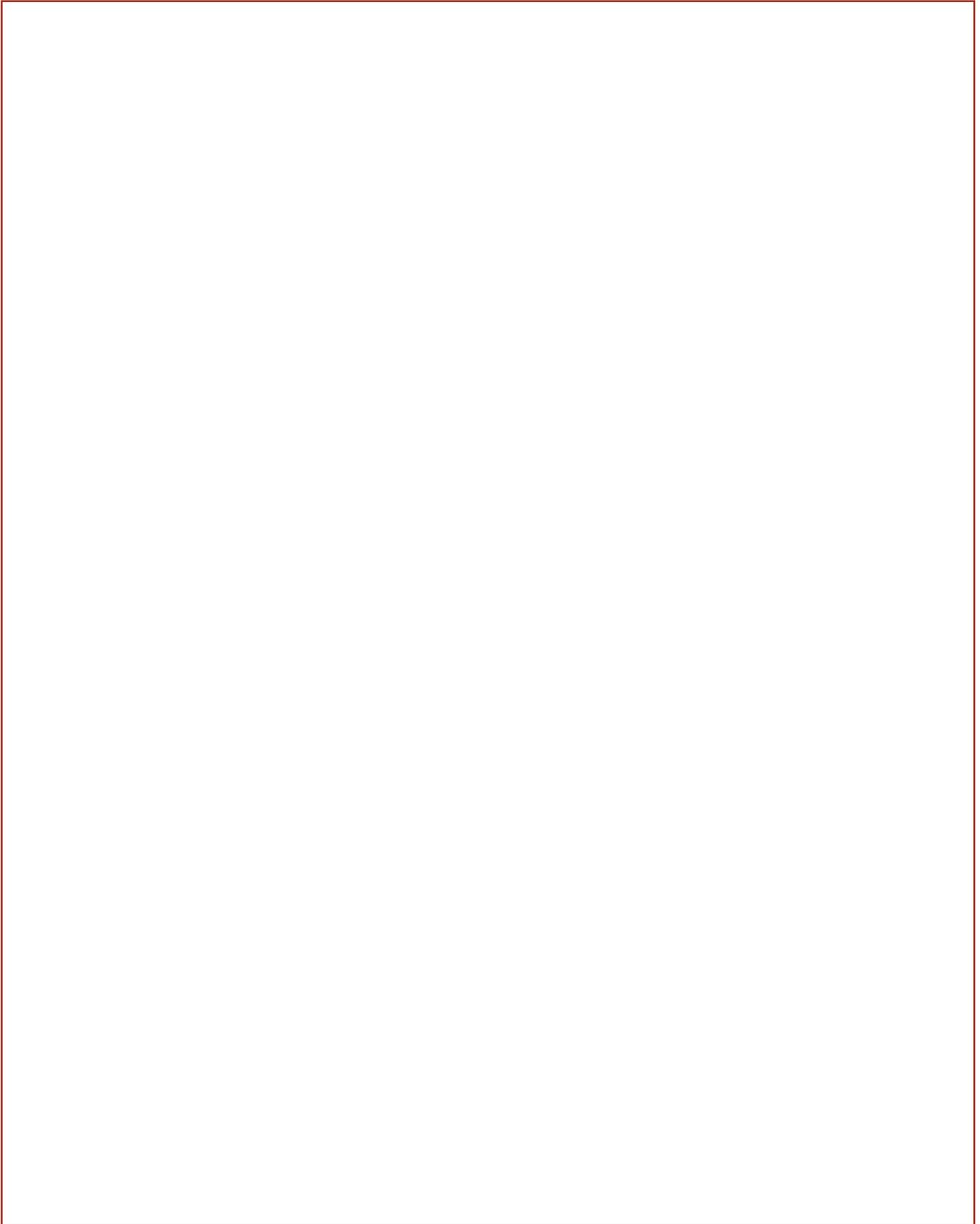
All that River Stream or Brook called Bonsall Brook Situate and being within the Liberty of Cromford... together with the Stream of Water Issuing and running from Cromford Sough in Cromford... into the said Bonsall Brook with full Liberty and power... to divert Turn and carry the said Brook Stream and Water down the South Side of the High Way in Cromford... and under or over the said Highway And also all that piece or parcel of Ground situate... between the said Bonsall Brook and the intended new Cutt and extending the length of the Turnpike road leading to Matlock Bath to a Garden in the Possession of James Cooper... Together with full and free Liberty Power and Authority... to Errect and Build one or more Mill or Mills for Spinning Winding or throwing Silk Worsted Linen Cotton or other Materials and also such and so many Waterwheels Warehouses Shops Smithies and other Buildings Banks and Dams Gails Shuttles and other Conveniences as they should think proper for the effectual Working the said Mills.

Extract from The Arkwrights – Spinners of Fortune, RS Fitton.

**Read the extract from the book and the lease.
Then make a list of the key points of the lease.**

**What is Richard Arkwright going to be able to do with the site?
Write in your own words what he is allowed to build on the site and what he can do with the Bonsall Brook and Cromford Sough.**

What legal phrase or phrases are used to show that Richard Arkwright is free to do these things?

Title map of Cromford Town and the Cromford Mills from 1842

ACTIVITY SHEET C

What did Richard Arkwright's first mill, the Upper Mill look like?



The Upper Mill from a watercolour by William Day 1789

How many storeys or floors did the building have? _____

How many bays or windows were there on each floor? _____

Describe the building and compare it to the other buildings in the picture.

Note the second mill in the background to the left of the Upper Mill and Rock House, Richard Arkwright's home on the cliff above.

ACTIVITY SHEET D

What did Richard Arkwright's second mill, the Lower Mill, look like?



The Lower Mill from a watercolour by Zachariah Boreman 1787

How many storeys or floors did the building have? _____

How many bays or windows were there on each floor? _____

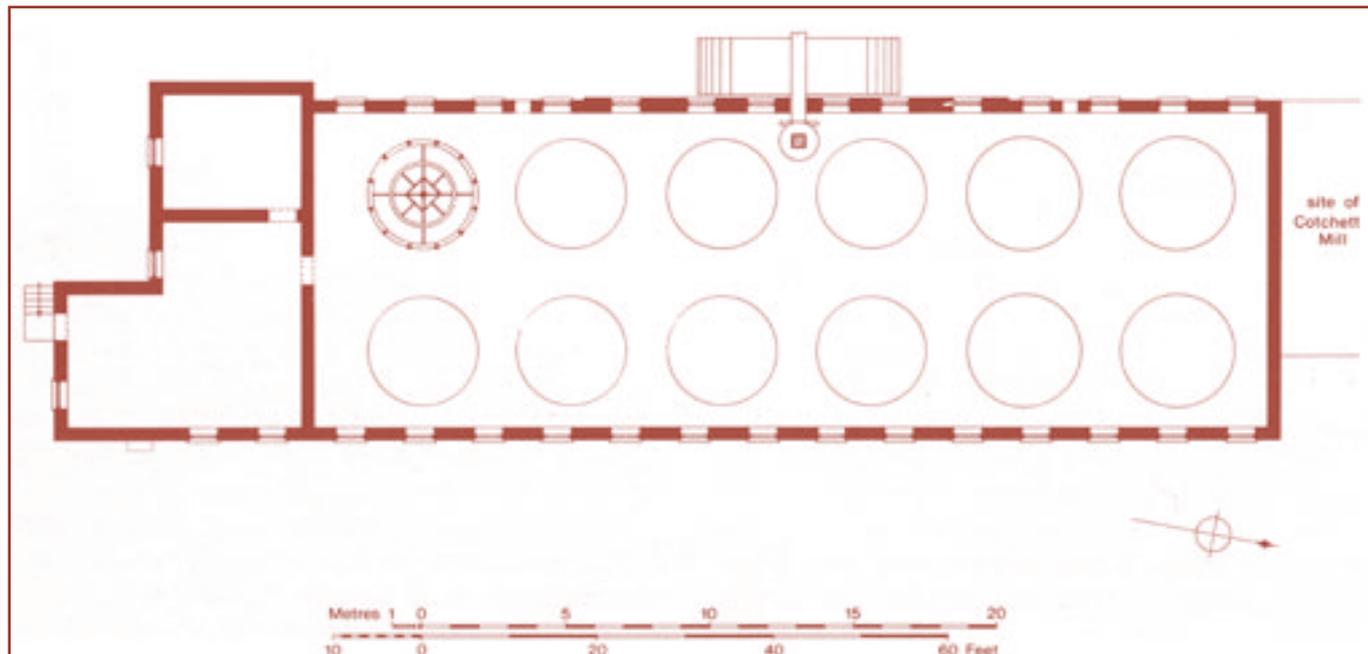
Was the building short or tall? _____

Was the side of the building wide or narrow? _____

Describe the building and compare it to the other buildings in the picture.

ACTIVITY SHEET E

Plan of Derby Silk Mill



This ground floor plan is a reconstruction of the Derby Silk Mill as it might have been in 1721

Look at the plan of the Derby Silk Mill

It shows us what was so good about the design of the mill that Richard Arkwright was inspired to use a similar design for his cotton mill at Cromford.

After talking to your teacher about the design of the building, fill in the missing words to complete the sentences. You will then have worked out which three key design features made the mill so good.

Choose from these words: power, middle, windows, machines.

A lot of _____ could be put on one floor.

Each machine got lots of natural light from the _____.

The water wheel was in the _____ of the long wall so that each

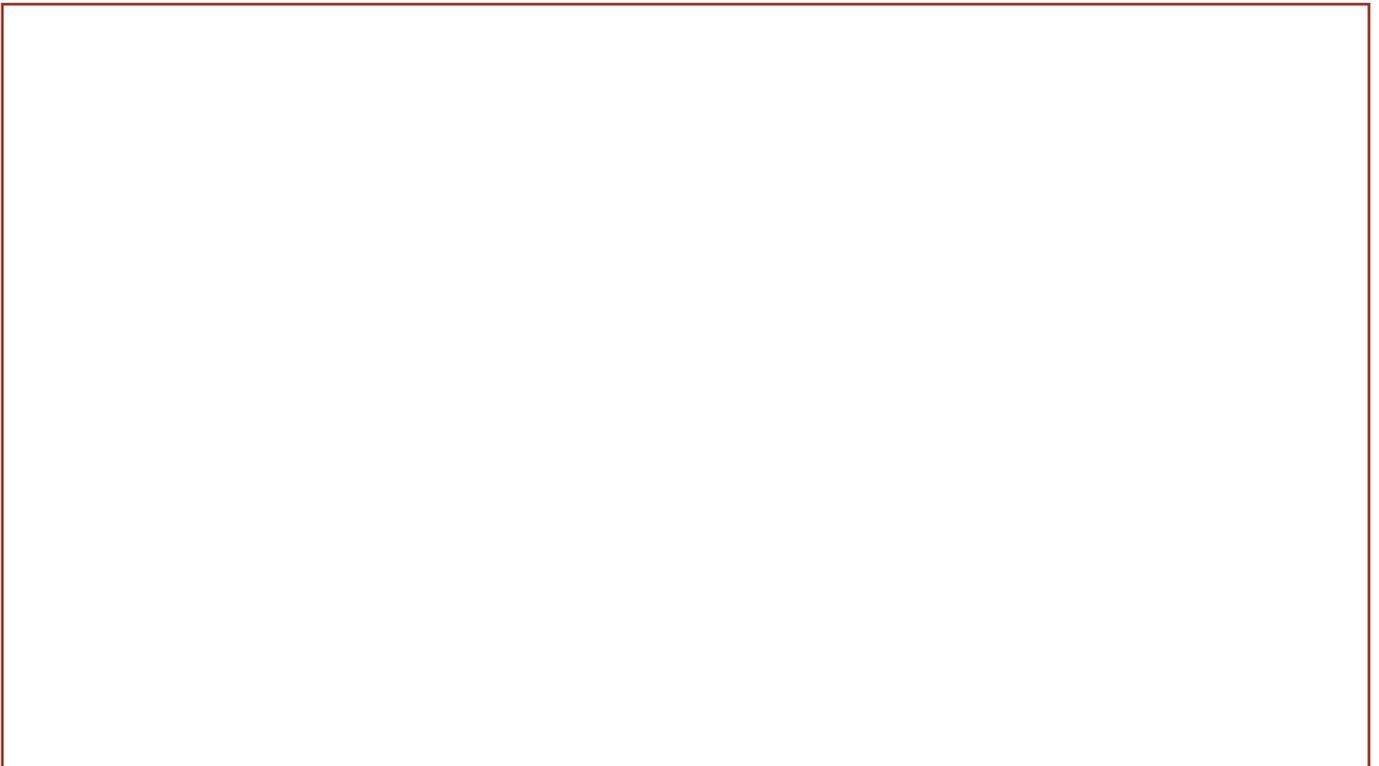
machine was not too far away from the source of _____.

Ordnance Survey Map of 1890



Arkwright's Cotton Mills by day and by night by Joseph Wright of Derby

By day

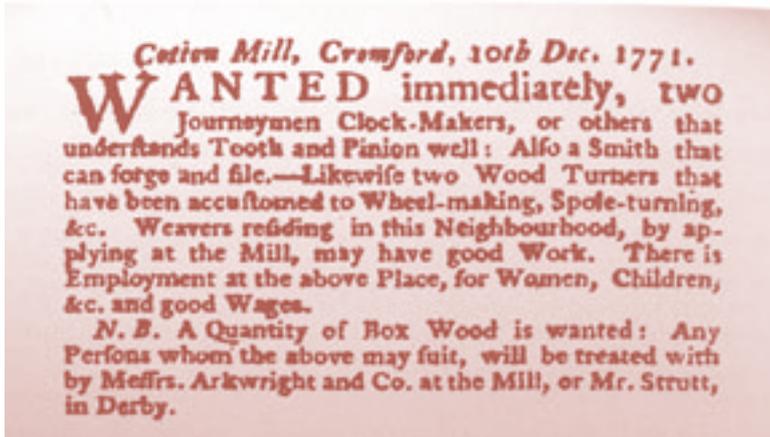


By night

The Tithe Map of 1842 showing a detail of Cromford Town

ACTIVITY SHEET F

Derby Mercury Advertisement of 1771



Copy of an advertisement in the Derby Mercury, 10th December, 1771.

Cotton Mill, Cromford, 10th Dec. 1771.

WANTED immediately, two Journeymen Clock-Makers, or others that understands Tooth and Pinion well: Also a Smith that can forge and file. — Likewise two Wood Turners that have been accustomed to Wheel-making, Spoke-turning, etc. Weavers residing in this Neighbourhood, by applying at the Mill, may have good Work. There is Employment at the above Place, for Women, Children, etc. and good wages.

N.B. A Quantity of Box Wood is wanted: Any Persons whom the above may suit, will be treated with by Messrs. Arkwright and Co. at the Mill, or Mr. Strutt, in Derby.

A transcript of the above.

This is a copy of an advertisement that was placed in the Derby Mercury in 1771 by Richard Arkwright.

Richard Arkwright is advertising for people to come and work at the mill. The mill was being built in 1771. He is looking for three types of craftsmen to make his spinning machines.

Read the advertisement and find the names of the three types of craftsmen.

What experience must they have had?

What must he be able to do?

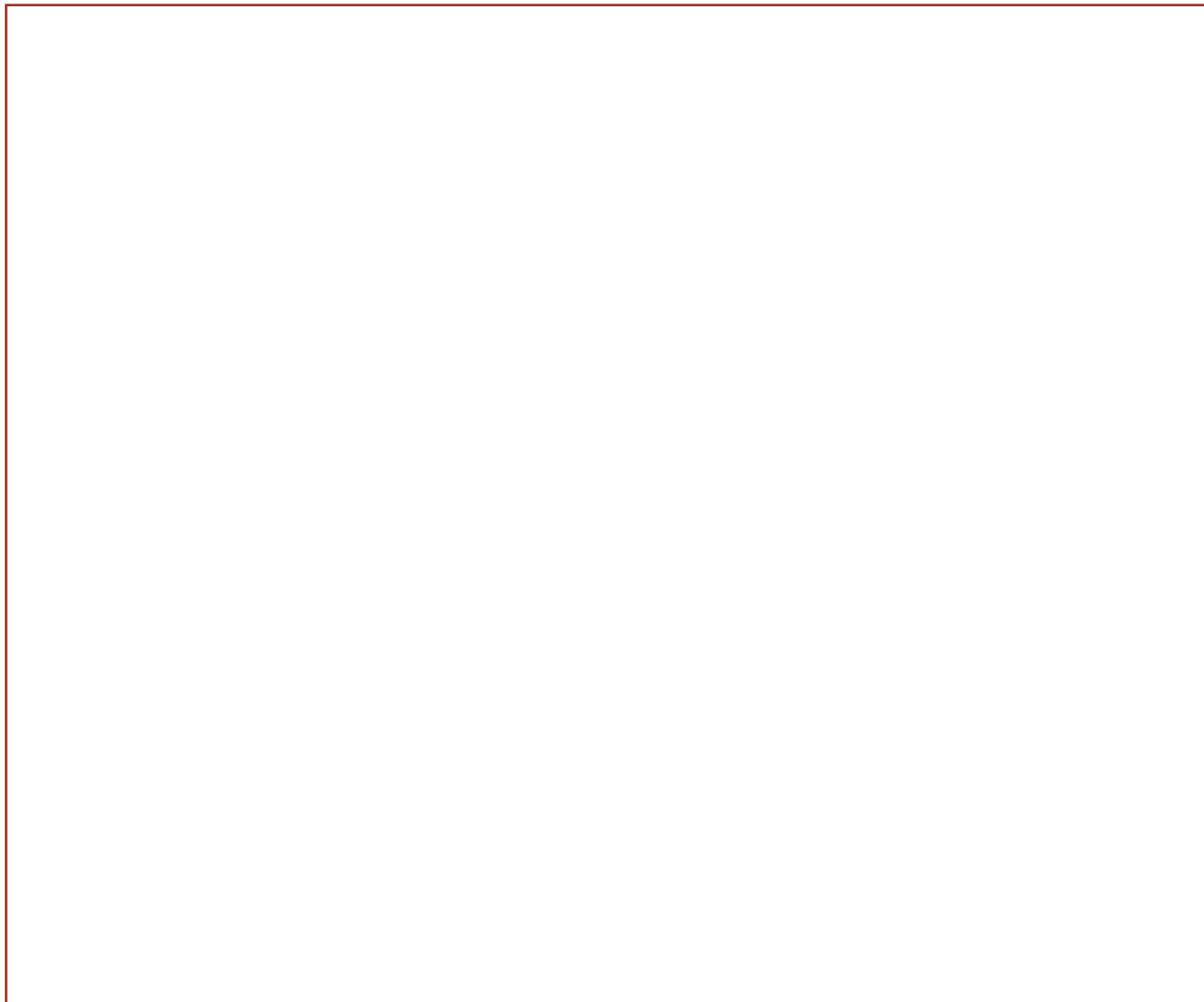
What experience must they have had?

He is also looking for Weavers who are living in the neighbourhood.
He is also looking for women and children to work in the mill.

What jobs do you think the women and children did?

ACTIVITY SHEET G

Arkwright's Spinning Frame showing the three sets of rollers



Can you find where the three sets of rollers are in the machine?

If you compare this picture with the portrait of Richard Arkwright that shows his invention on the table you may be able to find them more easily.

Which parts of the machine would have been made by each of the three different craftsmen Richard Arkwright was advertising for in 1771?

The Clockmaker _____

The Smith _____

The Wood Turner _____

ACTIVITY SHEET H

Derby Mercury Advertisement of 1771.



Copy of an advertisement placed in the Derby Mercury in 1781.

WANTED AT CROMFORD

Forging and Filing Smiths, Joiners and Carpenters, Framework-Knitters and Weavers, with large families. Likewise Children of all Ages; above seven Years old, may have constant Employment. Boys and young Men may have Trades taught them, which will enable them to maintain a Family in a short Time. Two or three young Men who can write a good Hand are also wanted.

By personal Application at the COTTON-MILLS, Particulars may be known.

September 19, 1781.

A transcript of the above.

This is a copy of an advertisement that was placed in the Derby Mercury. It is ten years after the first advertisement.

Richard Arkwright needs more craftsmen to make and repair more spinning machines.

He is also looking for Framework-Knitters and Weavers with large families.

Why do you think he is interested in employing Framework-Knitters and Weavers with large families?

At what age can children find work in the mill?

How can this advertisement be used to show that Richard Arkwright's cotton mills were proving to be successful?

KEY QUESTION FIVE

Why were lots more cotton mills built along the Derwent Valley in Derbyshire?



Purpose

- To understand why the early cotton industry developed along the valley of the River Derwent in Derbyshire
- To collect information from a range of sources
- To draw conclusions about the early development of the Industrial Revolution.

Resources not included in this section

- Map of the United Kingdom showing the Pennines and the Rivers Trent, Severn and Thames
- Map of the East Midlands showing the Rivers Trent, Soar and Derwent and the towns of Nottingham, Derby and Leicester
- Map of the Midlands showing Preston, Liverpool and Sheffield and Chesterfield.

Resources included in this section

- Map of the Derwent Valley showing Cromford, Lea Bridge, Milford, Belper, Darley Abbey and Derby.

Where is the River Derwent?

Introduction

So, rhetorical question, where is the Derwent Valley? Give the children a copy of the map of the United Kingdom showing the River Trent, the River Severn and the River Thames, the rivers they learn about in geography. Ask the children to add to the map, by drawing the River Derwent as a tributary of the River Trent. Show the children where to put Derby and Nottingham on the map. Ask the children to put Leicester and the River Soar on the map. The river Soar is a tributary of the River Trent.

Give the children a copy of the map showing the River Derwent from Matlock Bath to Derby. Ask the children to find Matlock Bath, Cromford, Belper, Milford, Darley Abbey and Derby. Ask the children to think about what natural feature links all these places. They should realise that all these places are linked by the River Derwent. Ask the children what they remember about the Silk Mill in Derby. What power source was used to make the silk throwing and winding machines turn? They should remember that the machines were worked by water power. Tell the children that being near to flowing water was important for the development of the Industrial Revolution because the early spinning machines were powered by water power in the form of water wheels.

Why did other business men build cotton mills along the Derwent Valley?

So, rhetorical question, why did other men build cotton mills along the River Derwent? That's a good question and it's hard to give a very definite answer. One answer is probably that there was a market for the thread.

Where was the market for thread?

The possible answer was that the Midlands which included Nottinghamshire, Leicestershire and Derbyshire were the main hosiery manufacturing counties in England. The hosiery industry had always been the main employer and economic driver for the area. Hosiery is the making of hose or silk stockings which were worn by men of fashion at the time. The silk was spun into thread in the silk mills and put out to framework knitters who worked at home. This was still mainly a cottage industry. This meant that in the towns of Leicester, Nottingham and Derby there was a demand or a market for silk and cotton thread. These formed a triangle around which small business had set up in peoples' homes in the town and the countryside to weave and spin and knit.

Activity

To help the children understand this, give out copies of the map of the East Midlands and get them to draw a triangle joining the towns of Nottingham, Derby and Leicester.

Tell the children that business men were already making money out of technological inventions that made improvements in the textile industry, such as Jedediah Strutt (show the children the picture of Jedediah Strutt) who had two silk mills in Derby and had invented a machine that could knit stockings or hose which were worn by fashionable men of the time, with a rib pattern that meant that the stockings fitted better and stayed up instead of falling down around the ankles. The machine was called the Derby Rib and it had made Jedediah Strutt a very rich man (It is possible to go to Strutt's North Mill in Belper and see a Derby Rib machine and find out more about Jedediah's invention).

Perhaps transport which gave access to the markets was part of the answer.

The River Trent was navigable upstream from the Humber Estuary as far as Derby. That meant that boats could travel along the river carrying the heavy loads of goods to the markets in the various towns. The river joined up with the Rivers Trent and Soar which meant that boats could travel to Nottingham on the River Trent and to Leicester on the

KEY QUESTION FIVE

River Soar. From the 1770s the canal network had grown and this provided routes to even more towns. This meant that raw silk and cotton could be transported from London by ship up the east coast and then by boat inland to the three towns.

Activity

To help the children understand this, ask them to find the Rivers Soar, Trent and Derwent on the map of the East Midlands. They could colour them in blue.

However the River Derwent was not navigable above Derby so the River Derwent could not be used to transport goods. But perhaps that meant that it was easier to rent river side sites for building mills. This was because as boats did not have navigation rights up the river it was possible to build weirs across the river to make a head of water that could be channelled into the mills to work machinery.

The sites along the Derwent River were still within easy reach of the hosiery towns in the south but also with the textile towns in Lancashire and Cheshire to the north-west and to Sheffield and Chesterfield in the east.

The growth of the mills along the valley.

However, although all these factors were important the main reason must have been that Jedediah Strutt lived in Derby and had his business interests in the area. As we have seen, Jedediah Strutt owned two silk mills in Derby. He had become a very rich man as a result of his invention of the Derby Rib Machine which could knit material with a rib pattern. The raw silk was bought in from London, prepared at Strutt's Silk Mills in Derby and put out to be knitted, on the firm's own frames. It was a very successful business which continued in the family's hands until 1803 and it was the profit earned in Derby which enabled Jedediah Strutt to back Richard Arkwright's water-powered spinning frame and the building of the first water-powered cotton mill in Cromford. By waiting until Richard Arkwright had been able to demonstrate the full potential of his mechanical inventions and production systems at Cromford, Jedediah Strutt was able to invest in a full scale production unit without having to embark on his own expensive research and development.

It is thought that he began building his first mill at Belper in 1776, although it may not have been in production until 1781. A second mill was added in 1784 and it was out of the shell of this building that the fireproof North Mill, which still stands today, was created in 1804 after fire had destroyed the earlier structure.

Jedediah Strutt then began to buy land in Milford and had built two cotton spinning mills by 1788. Another bleaching mill was built in Milford in 1793.

In both Milford and Belper, Jedediah Strutt had to build houses, schools, churches, public houses and all the building that go towards making a community.

The development of cotton spinning mills in Darley Abbey and at Lea could also both be said to have been

as a result of a connection with Richard Arkwright and Jedediah Strutt. As we have seen, Richard Arkwright went into partnership with Peter Nightingale, who lived in Lea village next to Cromford. Peter Nightingale funded the building of the second mill at Cromford and much of the building in Cromford town. Peter Nightingale was a wealthy landowner and lead merchant. Having seen the success of the mills at Cromford, Peter Nightingale must have wanted to benefit himself from the business. He built the cotton spinning mill at Lea in 1783 with the help of Benjamin Pearson junior, hitherto one of Richard Arkwright's trusted employees. It was not an enterprise that Arkwright had authorised and he pursued Nightingale through the courts; but the mill continued to operate. It was built on the Lea Brook, a stream which already powered a lead smelting mill and a rolling mill both in Nightingale's possession. Lea Brook is a tributary of the River Derwent.

Darley Abbey was a small settlement just two kilometres to the north of Derby. By the 17th century this small settlement had become established as an industrial hamlet. In the early 1700s there were five separate water powered mills; a paper mill, a corn mill, two flint mills and a leather mill. It was to this well established industrial settlement that the Evans family added their cotton mill development in 1782 and subsequently their factory village. The Evans family had bought all the mills and mill sites in Darley Abbey by 1775 but the site on which they were going to build the cotton mill was not bought until 1778. The Long Mill was built between 1782 and 1789 and West and East Mills in 1819-21. The Evans family also built housing and schools, and a church for their workforce. This enterprise must have had the full co-operation of Richard Arkwright, with whom the Evans worked closely. Indeed it would appear that in the early days Richard Arkwright and the Evans family were partners. The Evans family must also have seen the success of the cotton spinning business and wanted to share in the profits that could be made.

Of the three Derwent Valley factory masters talked about here, none went into cotton spinning from a position of greater wealth than Thomas Evans. He and his brothers Edmund and George grew up in a Bonsall family involved in the lead industry but they had others business operations all over Derbyshire, including Evans' Bank in Derby and owned large amounts of land in the area. As a matter of interest, Thomas's son William married Jedediah Strutt's daughter Elizabeth.

To conclude, the Derwent Valley was in a good position for the development of the early cotton spinning industry, because of its trade and transport links. Most important however must have been the catalyst of Richard Arkwright and the support he received from the wealthy business men who were prepared to back his ideas and invest in the business themselves. To sum up the 'Arkwright System' was so successful and so profitable that many more mills were built in the United Kingdom and the textile mill became the standard typical factory building of the Industrial Revolution. Factory production came to dominate the manufacturing economy, not only of Britain, but also of much of the world for most of the next two centuries. However the centre of textile industry moved to Lancashire

KEY QUESTION FIVE

and Cheshire in the 1850s and the Derwent Valley became a bit of a backwater. This has meant that many of the mills and the industrial settlements have survived unaltered by further development. This means that it is possible to study the beginnings of the factory system using evidence in the form of the buildings and other structures that are linked to the mills, including the mills themselves.

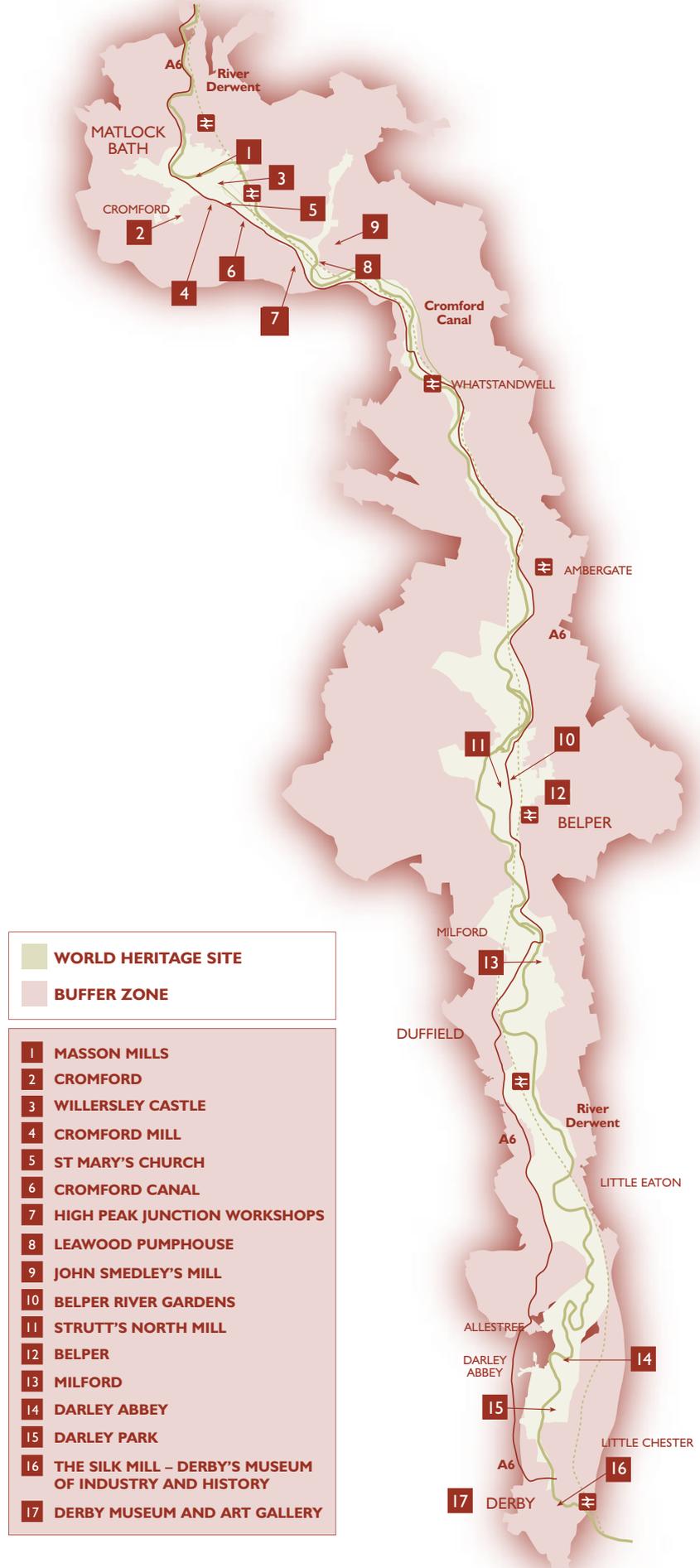
Activity

To help the children understand where all cotton mills were built along the valley, ask them to look at the map of the Derwent Valley and to find all the towns, Cromford, Lea Bridge, Milford, Belper, Darley Abbey and Derby. They could colour in the River in blue and the mill towns in red. Make a card for each of the mill sites with the date when each mill was built, the name of the mill and the name of the mill owner. It may be possible to include a picture from the pack of the mill or to download pictures from the Derwent Valley Mills website. Have a length of blue string to represent the River Derwent with other piece of string attached to represent the tributaries of the Bonsall and Lea Brooks. Pin the labels along the string to make a map of the Derwent Valley and the cotton mills.

The children could carry out research into one of the Derwent Valley Factory Masters, Thomas Evans, Jedediah Strutt, William Evans, William Strutt, or Peter Nightingale and make a presentation to the others about them. Tell the children that in the next section they are going to learn something about what it was like to live in one of the industrial settlements and work in the cotton mill.

RESOURCE SHEET

Map of the Derwent Valley



KEY QUESTION SIX

What was it like to live and work in a mill village or town?



Purpose

- To understand what it was like to live in an industrial settlement at the beginning of the Industrial Revolution
- To understand what it was like to work in one of the early cotton mills.

Resources that would be helpful to have for this section

- The book 'The Derwent Valley Mills and their Communities' published by the Derwent Valley Mills Partnership price £14 and available from Cromford Mill, Masson Mills and Strutt's North Mill, Belper
- Teachers Pack – What was it like to live in Belper in the Past? published by the Derwent Valley Mills Partnership.

Activities

- To make a fieldwork visit to Darley Abbey village and the mills
- Or to Strutt's North Mill, Belper and the industrial settlement of Belper
- Or to the industrial settlement of Cromford and either Masson Mills at Matlock Bath or Cromford Mill.

What is available for schools at Darley Abbey?

See pages 28 and 29 in the Derwent Valley Mills World Heritage Site Education Directory.

What is available for schools at Strutt's North Mill and the industrial settlement of Belper?

See pages 24 and 25 in the Derwent Valley Mills World Heritage Site Education Directory.

What is available for schools at Cromford Mill and Masson Mills and the industrial settlement of Cromford?

See pages 16 to 19 in the Derwent Valley Mills World Heritage Site Education Directory.

Accommodation and Transport Links

Look for details in the Derwent Valley Mills World Heritage Site Education Directory – Section Five and Section Six.

Introduction

So, rhetorical question, what was it like to live and work in a

mill village or town? Let's try to find out. What evidence can we use? Well, the best way would be to make a visit to one of the settlements and to visit one of the cotton mills and that is what we are going to do.

Some Background Information for Teachers

Cromford

Cromford is the first industrial settlement and survives pretty much intact today. It was built at the same time as the mills for the mill workers to live in. Cromford was remote and sparsely populated before Richard Arkwright came to the place. He could only get enough young people to come and work for him if he provided houses for their parents. In Cromford a new kind of community grew, an industrial community, which was copied and developed in other Derwent Valley settlements. See Question Four in this pack for more details of the growth of the Cromford settlement.

Belper

Modern Belper represents at least four phases of development: the original medieval settlement of Beaufort that centres on the chapel of St John; the later growth lower down the hill which by the middle years of the 18th century included a market place on a lower level than the present one, the industrial community established by Jedediah Strutt in the late 18th century on the northern edge of the existing settlement and around Belper Bridge Foot and up Belper Lane; and the 19th century expansion of the commercial centre along King Street and Bridge Street.

The most prominent of the Strutt industrial housing stands on land to the south of the mill complex and to the east of the Derby-Matlock road. The land was acquired largely through numerous individual purchases, with its end use for workers' housing clearly in mind. The houses were all of a high standard with gardens and, in certain areas, allotments for the residents. The housing constructed from Derbyshire gritstone or locally made brick, and roofed with Staffordshire blue clay tiles or Welsh slate, was largely placed in an east-west alignment connected by narrow passages giving an almost grid-iron character to the layout. Construction of housing by the Strutt estate continued into the 20th century.

The houses vary in form from row to row as the Strutts experimented with different designs.

As well as the land on the slopes to the east of the mills, the Strutts had also in the 1790s acquired land and property

KEY QUESTION SIX

short terraces of three or four houses, mainly in gritstone, though some are in brick, on levels up the hillside formed by earlier quarrying or along Belper or Wyver Lane. Good examples can be seen in the terraces in the Scotches: in the stepped terraces on the northern side of Belper Lane, culminating in the cluster block which housed the Belper Parish Workhouse; and in the small groups of houses such as pump yard, set back from Belper Lane.

Also of interest is the brick terrace on the southern side of Belper Lane which still retains the arch which was a former entrance to Bridge Hill house. These houses have the appearance of being built for estate rather than for mill workers.

Darley Abbey

Darley Abbey contains examples of the three-storey mill workers' terraces similar to the earliest Cromford housing; but it also has a significant number of back-to-back houses, a house type not found in Belper and Milford, and it has the earliest known example of the cluster house. The growth of the community followed the development of the mills. Between 1788 and 1801 the settlement doubled and by 1831 there were 172 houses with a population of 1170.

As in Belper and Cromford the mill owners' concern was to develop a sense of community. To this end a church was built in 1819 and a school in 1826. School had begun 30 years earlier in 1791 when a Sunday School was made in the attic floor of the mill. Darley Abbey didn't have a market but the Evans' family had farms. The tenant farmers sold milk, vegetables and meat to the residents.

Detailed descriptions of the houses in Cromford, Belper and Darley Abbey are contained in the book 'The Derwent Valley Mills and their communities'. This would be a brilliant resource for a fieldwork visit to any of the towns.

To learn more about the mill communities read the book, 'The Derwent Valley Mills and their communities' published by the Derwent Valley Mills Partnership in 2001, £14.00 and available from the mill shops in Cromford Mill and Strutts North Mill, Belper and Masson Mills in Matlock Bath. Read pages 79 to 91.

Fieldwork

It is possible to arrange for a visit to Cromford Mill and a tour of Cromford Village. It is also possible to arrange a visit to Strutt's North Mill and a tour of the industrial settlement of Belper. The guides will be able to tell the children about life working in the mill and living in the mill town or village. See the Education Directory for details of both these fieldwork opportunities. Unfortunately there is not a Visitor Centre at Darley Abbey yet, but don't let that put you off taking the children on a fieldwork visit. There are interpretation boards in various key places and Darley Abbey is delightful to explore.

In the next section

Tell the children that in the next section they are going to be thinking about what impact the building of the cotton mills had on the Derwent Valley.

KEY QUESTION SEVEN

What impact did the building of factories have on the Derwent Valley?



Purpose

- To consider what impact the building of the cotton mills had on the landscape of the Derwent Valley.

Resources

Copies of paintings, drawings of the valley to show the changes, such as:

- The view of Strutt's Cotton Mill at Milford from a watercolour by Zachariah Boreman 1787
- A drawing of Willersley Castle and St Mary's Church, Cromford
- The pre-Arkwright landscape
- The Derby Silk Mill from a watercolour of 1776
- The view of Masson Mill
- The Upper Mill from a watercolour by William Day 1789
- The Lower Mill by Zachariah Boreman 1787
- Arkwright's Cotton Mills by night by Joseph Wright of Derby
- A prospect of Derby.

Activities

- Looking at the paintings and drawings
- Writing descriptions of the views and thinking about the impact of these large buildings on the landscape
- Using the paintings as if they were the front of a postcard and they write on the back telling people from home about the excitement of seeing these buildings for the first time
- Using the illustrations to help the children write a 'Place poem'.

Activity one

Give groups of children copies of one of the paintings, drawings or watercolours from the resources above. Ask the children to write a description of the mill and the landscape around it. Ask the children to write about the impact the mill might have had on people seeing it for the first time.

Activity two

The children could also use these illustrations and imagine that each had been used as the front of a postcard. The children could write the postcard telling friends or family of their excitement at seeing these buildings for the first time.

Activity three

The children could use the illustrations as inspiration to make a Place poem. The idea is that the children in their groups think of a list of descriptive words that could be used to describe the mill and the landscape. They put each of these words into a sentence and then put the sentences together to make the poem.

ACTIVITY SHEET

Strutt's Cotton Mill at Milford by Zachariah Boreman, 1787

Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

ACTIVITY SHEET

The Derby Silk Mill from a 19th century engraving by J. Nixon

Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

ACTIVITY SHEET

A view of Masson Mill by George Roberston prepared for use by Derby China Manufactory to decorate a plate



Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

ACTIVITY SHEET

The Upper Mill at Cromford by William Day 1789

Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

ACTIVITY SHEET

The Lower Mill at Cromford by Zachariah Boreman 1787



Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

ACTIVITY SHEET

Arkwright's Cotton Mill by Night by Joseph Wright of Derby

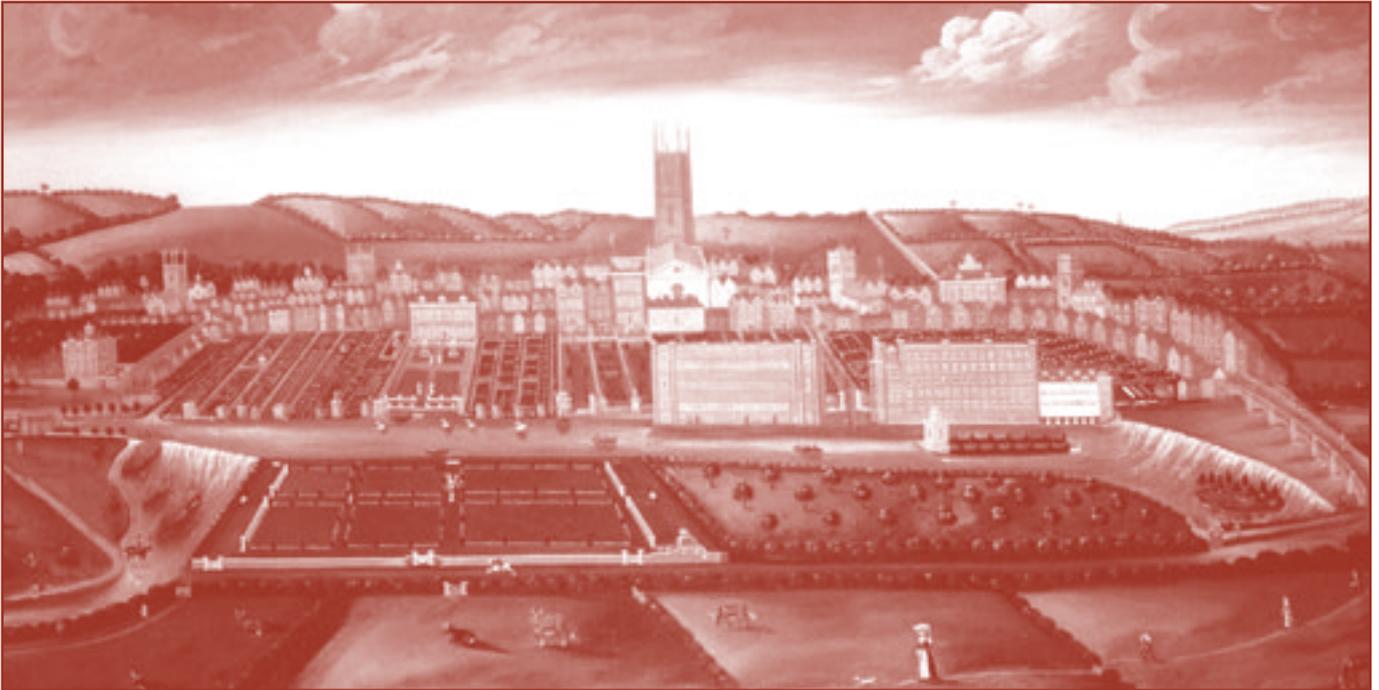
Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

(Reproduced by permission of the owner).

ACTIVITY SHEET

'A Prospect of Derby' 1725 by an unknown artist



This painting can be seen at Derby Museum and Art Gallery.

Look carefully at the illustration then describe the building and the landscape.

Imagine the illustration is the picture on a postcard. Write to your friends or family telling about your excitement at seeing the mill for the first time.

(Image courtesy of Derby Museum and Art Gallery).

KEY QUESTION EIGHT

Why has the Derwent Valley been made a World Heritage Site?



Purpose

- To understand the significance of the Derwent Valley as the birth place of the Industrial Revolution
- To understand the need to protect this landscape so that people can study the early developments of the Industrial Revolution and enjoy exploring the historic industrial landscape
- To understand that there are ways of protecting and preserving the built environment.

Resources needed in order to teach this section

- World Heritage in Young Hands – an educational resource for teachers (aimed at Key Stage 3 and 4 pupils but with some excellent resources, including a photo-pack of 26 laminated A4 pictures of World Heritage sites throughout the World, maps and posters). ISBN 92-3-103843-5 Price £36 available from Young People's World Heritage Education Project – UNESCO – 7, place de Fontenoy 75352 Paris 07 SP FRANCE. www.unesco.org/education/asp. A pack may be borrowed from Chesterfield Urban Studies Centre – 01246 208267 subject to availability
- World Heritage Sites – a teacher's guide by Genevieve Wheatley for English Heritage. One of the Education on Site Series. ISBN 1-85074-446-7 Price £7.99 English Heritage, Education Service, 23 Savile Row, London W1S 2ET Tel: 020-7973-3385 www.english-heritage.org.uk

Activities

Supplementary Questions

- What is meant by the word Heritage?
- Why is Heritage important?
- What is a World Heritage Site?
- What World Heritage Sites are there in the United Kingdom?
- What World Heritage Sites are there in the World?
- Why is the Derwent Valley a World Heritage site?

Activity one

What World Heritage Sites are in the World?

Purpose

- To learn about the geographical locations and types of World Heritage sites
- To develop their interest in World Heritage conservation.

Resources

- Set of 26 A4 laminated photographs of World heritage Sites from the World Heritage in Young Hands pack from UNESCO. (This pack may be borrowed from Chesterfield Urban Studies Centre subject to availability) The photographs are in five sets: 1. Asia and the Pacific – four photographs. 2. Arab States – five photographs. 3. Africa – five photographs. 4. Latin America and the Caribbean – five photographs. 5. North America – one photograph (Canada). 6. Europe – four photographs.
- The World Heritage Map in the form of a large poster
- Worksheet – Locating World Heritage Sites
- Worksheet – Writing a postcard to a friend about your visit to a World Heritage Site.

Activity

Tell the children that there are World Heritage Sites all over the world and that you have some pictures of some of them. Tell the children that the photographs are in sets from different parts of the world and that you are going to divide the class into five groups and give each group a set of photographs from a different part of the world. Do this, then say that each group will also have a copy of a map of the world. Ask each group to read the information on the back of the photograph and see if they can work out which part of the world they are going to study. Then find out which country each World Heritage is in. Then to find out the name of it, to say when it was listed and to say why this is a special place. The children could use the Activity Sheet A 'Locating World Heritage Sites'.

Discuss what is meant by **cultural** and **natural** sites.

Then ask the children in each group to share the photographs so that each child has one. Tell the children to imagine that this is the picture on the front of a postcard. Tell the children to imagine that they are visiting this place. Tell the children to write to a friend telling them all about their visit. Some points to think about are, where are they, what is the weather like, what have they been doing, what have they seen. They can use the information on the back of the card to give them some ideas, they can also use the information they can get from looking at the photograph. (Activity Sheet B).

Groups could be asked to give a presentation about their part of the world and the World Heritage sites that can be found there.

ACTIVITY SHEET A



LOCATING WORLD HERITAGE SITES

Your group has been given four or five photographs of Heritage Sites from one part of the world.

You have been given a map to help you find out where this part of the world is.

Answer these questions with the help of the information on the back of the photographs and the map.

Which area of the world are you going to study?

Then look at the back of each photograph and find out which country the photograph was taken in. Write down the number of the photograph and then the name of the country.

1. _____
2. _____
3. _____
4. _____
5. _____

Then find out the name of the site. Write down the number of the photograph and the name of the site.

1. _____
2. _____
3. _____
4. _____
5. _____

Then find out when the site was put on the World Heritage List. And whether the site was listed as of natural or cultural importance. Write down the number of the photograph and then the date and whether it is a natural or cultural site.

1. _____
2. _____
3. _____
4. _____
5. _____

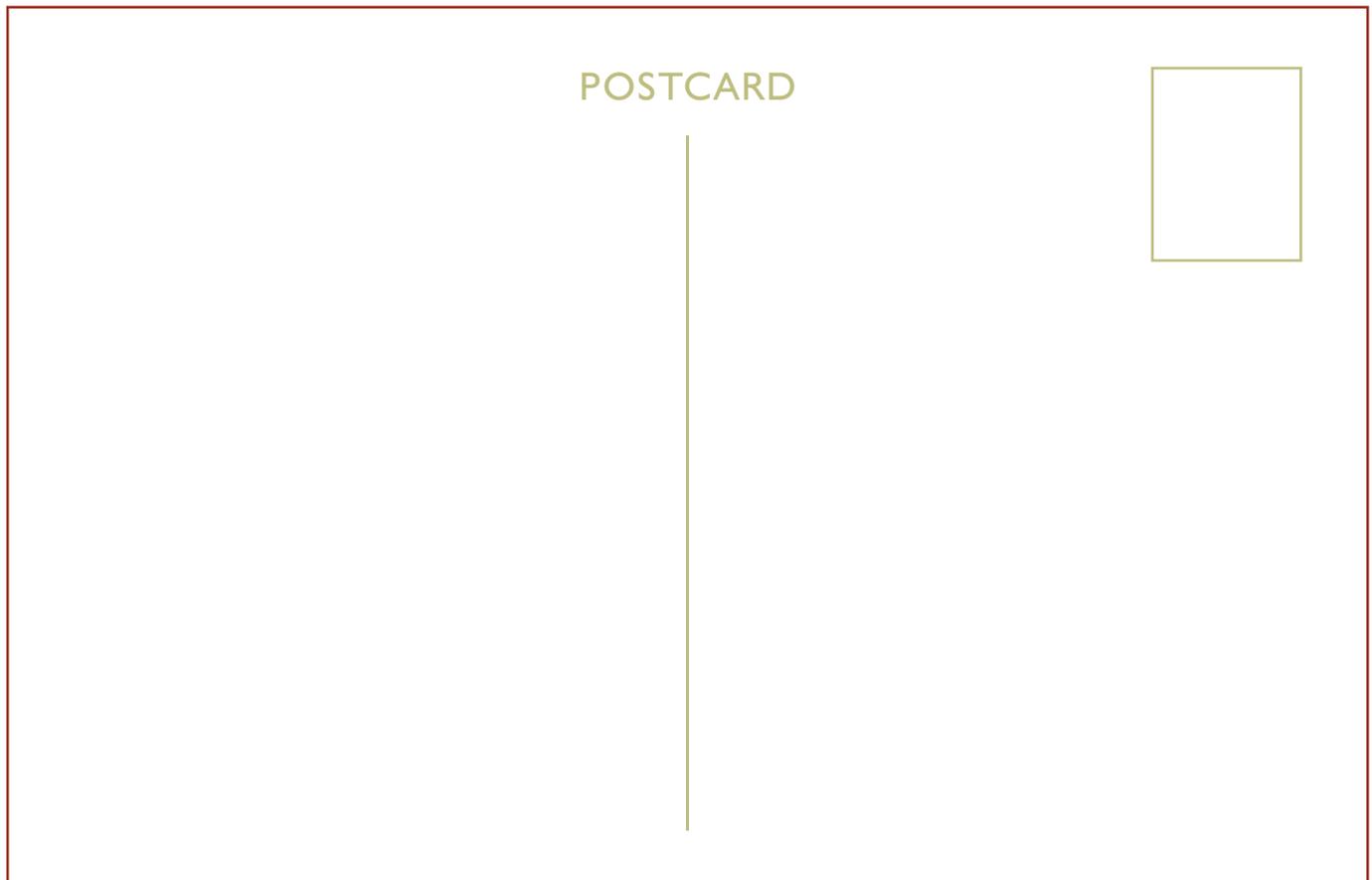
ACTIVITY SHEET B

Writing a postcard to a friend about a visit to a World Heritage Site

You have a set of photographs in your group showing pictures of World Heritage Sites.

Share the photographs within your group so that you each have one. You are to imagine that your photograph is the front of a postcard. You have made a visit to this place. Now you are going to send a postcard to a friend telling them about your visit.

POSTCARD



Points to think about:

- where are you?
- what is the weather like?
- what have you been doing?
- what have you seen?

Look closely at the photograph to give you ideas of what to write about. Read the description on the back of the photograph to give you some more ideas about what to write about.

KEY QUESTION EIGHT

Are there any World Heritage Sites in the United Kingdom?

Purpose

- To learn more about World Heritage in the United Kingdom
- To develop their interest in conservation.

Resources

- The map of the World Heritage sites in the UK from UNESCO
- Worksheet identifying World Heritage sites in the United Kingdom.

Activity

Tell the children that there are lots of World Heritage sites in the United Kingdom. They may have visited some of them. Ask them to work in groups with a copy of the World Heritage map from UNESCO. Ask them to find the map of Europe and the word Europe with the lists of sites. Ask them to find the United Kingdom on the map and on the lists. Ask the children to make a list of ten of the sites. They could choose ones they have heard of or have visited, or that sound interesting. They could use the Activity Sheet C – ‘Identifying World Heritage sites in the United Kingdom’.

Why is the Derwent Valley a World Heritage site?

Tell the children that live either in or near the Derwent Valley that they live near or in a World Heritage Site. Tell all the others that live in Derbyshire, that there is a World Heritage site in Derbyshire. It is called the Derwent Valley Mills World Heritage Site. If you have been on site visits to mills in the valley you could remind the children that they have visited this World Heritage site.

Now ask them to think about what they have found out about the mills in the valley that makes them so important. Give each a picture you have taken of different locations along the valley or use images taken from the Derwent Valley Mills World Heritage website. Ask the children to write the text for the back of the photograph. They should give information about the part of the world the site is in, which country the site is in, the name of the site, and a description to explain why the site is special, in the same way that the photographs in the World Heritage in Young Hands teachers pack were presented.

Conclusion

The Derwent Valley was the place where a mechanically powered factory system was developed for the textile industry by Richard Arkwright and others in the 18th century. The Valley has been called ‘the cradle of the factory system’. The factory system that was developed here changed a whole way of life.

Some background information about World Heritage Sites

What is meant by the term World Heritage Site?

A site considered by UNESCO (United Nations Education, Scientific and Cultural Organisation) to be of OUTSTANDING UNIVERSAL VALUE to HUMANITY and which has been included on the World Heritage List.

What is the World Heritage List?

The World Heritage List includes all the sites that UNESCO has agreed are of outstanding universal value to humanity. The World Heritage List has three aspects. It includes monuments and groups of buildings and sites which are considered as cultural heritage. It includes areas of landscape which are considered as natural heritage. It includes sites which are considered to combine cultural and natural heritage.

Who decides which sites should be put on the World Heritage List?

The Intergovernmental Committee for the Protection of the Cultural and Natural Heritage of Outstanding Universal Value, called “the World Heritage Committee”. This committee has been established within the United Nations Education, Scientific and Cultural Organisation known as UNESCO.

How do sites get onto the list?

A country that has signed the World Heritage Convention becomes a State Party and pledges to conserve the cultural and natural heritage within its borders for present and future generations. The United Kingdom signed the convention in 1984. A State Party can nominate sites which they think have outstanding universal value within their state or country. When a State Party decides to nominate a site it must do so by completing a nomination form. The State Party must outline why the site is important enough to be included on the World Heritage List by using selection criteria decided on by the World Heritage Committee and also demonstrate that the site is properly protected and managed. In the case of the nomination of the Derwent Valley Mills Site, part of the nomination form, the historical section, called the Derwent Valley Mills and their Communities, is available as a book and is available on line and in print. The management plan for the World Heritage Site is also available on line. Visit www.derwentvalleymills.org

What are the criteria for selecting World Heritage Sites?

The Operational Guidelines include the following six criteria to be applied to the selection of cultural heritage monuments and groups of buildings and sites that may be considered part of the World heritage:

Cultural sites nominated should:

- represent a masterpiece of human creative genius, or;
- exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology,

KEY QUESTION EIGHT

monumental arts, town planning or landscape design, or:

- (iii) bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living or which has disappeared, or:
- (iv) be an outstanding example of a type of building or architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history, or:
- (v) be an outstanding example of a traditional human settlement or land use which is representative of a culture (or cultures), especially when it has become vulnerable under the impact of irreversible change, or:
- (vi) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance (the Committee considers that this criterion should justify inclusion in the List only in exceptional circumstances and in conjunction with other criteria, cultural or natural).

Why were the Derwent Valley Mills inscribed on the World Heritage List?

The Derwent Valley Mills were inscribed on the World Heritage List because the site met two of the criteria established by UNESCO.

Which criteria did the Derwent Valley Mills meet?

Derwent Valley Mills satisfied two of the criteria, as follows:

Criterion (ii) The site should exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design.

The nominated site relates to developments in technology in the 18th century that introduced the mechanically powered factory system within the textile industry. It began with the construction of the Silk Mill in Derby in the early 1720s for the brothers John and Thomas Lombe, which housed machinery for silk, based on an Italian design. The scale, output and numbers of workers employed were without precedent. However, it was not until Richard Arkwright constructed a water-powered cotton spinning mill at Cromford in 1771, and a second larger mill in 1776-77 using power from a tributary of the River Derwent to operate his machinery, that the 'Arkwright System' was truly established. Arkwright's mills were so efficient and profitable that they were replicated hundreds of times before the end of the Industrial Revolution. Factory production came to dominate the manufacturing economy, not only of Britain, but also of much of the world for the next two centuries.

Criterion (iv) The site should be an outstanding example of a type of building or architectural or technological ensemble or landscape, which illustrates a significant stage in human history.

A large proportion of the textile mills of the Derwent Valley, including some of the earliest examples known to have been built in the world, are still standing. Apart from the buildings themselves, important elements of the supporting infrastructure have survived, including the engineering

structures which carried the water power systems from the River Derwent and its tributaries, and the transport infrastructure including toll roads, tramways and canals. The listing of Cromford Mill, Darley Abbey Mills and North Mill, Belper, as Grade I or II, together with the inclusion of five industrial sites in the Schedule of Ancient Monuments, is recognition that they were already formally acknowledged as being of national importance.

Furthermore, the factory settlements that were constructed at Cromford, Belper, Milford and Darley Abbey are almost completely preserved including in Cromford and Milford, the factory masters' own residences, in Darley Abbey the managers' houses and village school and church and notably in Belper and Cromford, farms and estate buildings. The settlements' special architectural and historic interest was already recognised through their designation as conservation areas.

The overall result is an ensemble of buildings, structures and settlements, all grouped within a distinctive landscape that is dominated by the river that attracted the initial investment in the area. The integrity of the scene remains evocative of the period in the late 18th and early 19th centuries when, in this hitherto obscure Derbyshire valley, the factory system was born.

To find out more about UNESCO and World Heritage visit one of these addresses.

Associated Schools Project Network (ASPnet)
www.unesco.org/education/asp

UNESCO World Heritage Centre
www.unesco.org/whc

KEY QUESTION EIGHT

The World Heritage Process in 10 steps

The process for including a site onto the World Heritage list involves a number of steps. At the beginning of this process countries commit themselves to World Heritage conservation by becoming States Parties to the Convention and then nominating sites for inclusion in the World Heritage List.

The steps below show the nomination process.

- 1 A country becomes a State Party by signing the World Heritage Convention and pledging to protect their cultural and natural heritage. The United Kingdom joined in 1984
- 2 A State Party prepares a tentative list of cultural and natural heritage sites on its territory that it considers to be of outstanding universal value
- 3 A State Party selects sites from its tentative list for nomination to the World Heritage List
- 4 The completed submission is sent to the UNESCO World Heritage Centre. To see part of the nomination document for the Derwent Valley Mills World Heritage Site visit [www. derwentvalleymills.org](http://www.derwentvalleymills.org)
- 5 The UNESCO World Heritage Centre checks that the nomination is complete and sends it to IUCN* and/or ICOMOS* for evaluation. (*see note)
- 6 Experts visit sites to evaluate their protection and management
- 7 ICOMOS and/or IUCN evaluate the nominations using the cultural and natural heritage criteria
- 8 ICOMOS and/or IUCN make an evaluation report
- 9 The seven members of the World Heritage Bureau review the nominations and evaluations and make recommendations to the Committee
- 10 The final decision by the 21 member World Heritage Committee: inscribed – deferred – rejected.

Note

IUCN is the International Union for the Conservation of Nature now known as the World Conservation Union. It is a non-governmental organisation.

ICOMOS is the International Council on Monuments and Sites. It is a non-governmental organisation.

Both these organisations were instrumental in the preparation of the World Heritage Convention.

The United Kingdom and the Convention

The United Kingdom ratified the World Heritage Convention in 1984. The drawing up of a United Kingdom list of potential nominations for submission to the World Heritage Committee is officially the responsibility of the Department for Culture Media and Sport. The Department consults with various national agencies with responsibility for heritage with respect to the cultural sites in England, English Heritage being the principal one.

There are 26 Sites on the World Heritage List for the United Kingdom.

- 1986 Giant's Causeway and Causeway Coast
- 1986 Durham Castle and Cathedral
- 1986 Ironbridge Gorge
- 1986 Studley Royal Park and the ruins of Fountains Abbey
- 1986 Stonehenge, Avebury and Associated sites
- 1986 Castles and Town Walls of King Edward in Gwynedd
- 1986 St Kilda
- 1987 City of Bath
- 1987 Blenheim Palace
- 1987 Hadrian's Wall
- 1987 Westminster Palace, Westminster Abbey and Saint Margaret's Church
- 1988 Henderson Island
- 1988 Tower of London
- 1988 Canterbury Cathedral, St Augustine's Abbey, and St Martin's Church
- 1995 Old and New Towns of Edinburgh
- 1995 Gough Island and Wildlife Reserve
- 1997 Maritime Greenwich
- 1999 Heart of Neolithic Orkney
- 2000 Historic Town of St George and related fortifications, Bermuda
- 2000 Blaenavon Industrial Landscape
- 2001 Dorset and East Devon Coast
- 2001 Derwent Valley Mills
- 2001 New Lanark
- 2001 Saltaire
- 2003 Royal Botanic Gardens Kew
- 2004 Maritime Liverpool

Only five of these monuments represent a period in which Britain held centre-stage as the world's first industrial nation. The Derwent Valley Mills is part of this sub group of industrial sites as are Ironbridge Gorge, Blaenavon Industrial Landscape, New Lanark and Saltaire.

The Derwent Valley Mills is the only site to be located within the East Midlands Region.

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The Silk Industry by Sarah Bush, A Shire Album, Shire Publications Ltd.

Spinning and Spinning Wheels by Eliza Leadbeater, Shire Album 43 Shire Publication Ltd.

The Arkwrights – Spinners of Fortune by R.S. Fitton, Manchester University Press.

World Heritage Sites by Genevieve Wheatly, A Teacher's Guide for English Heritage.

KEY QUESTION EIGHT

World Heritage in Young Hands an educational resource kit for teachers published by the Young People's World Heritage Education Project UNESCO.

Peaklands Roads and Trackways by A.E. Dodd and E.M Dodd.

Illustration Acknowledgements

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Derby Museum and Art Gallery, Adrian Farmer, Nottinghamshire and Derbyshire County Councils, Crown copyright NMR, The Arkwright Society, Shire Publications Ltd, Derbyshire Record Office. Derby Local Studies library and www.picturethepast.org.uk, Derby City, Moorland Publishing, Chris Aspin, Quaderni, Storici, Diane Peake, National Monuments Record Centre, Swindon.

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This Teacher's Pack has been compiled by Jane Featherstone, Environmental Studies Services, Manager, Derbyshire County Council.

Jane Featherstone BA (Hons) Art & Industrial Design PGCE. I am a qualified primary school teacher although my degree is in the field of art and design. I have worked as a primary school teacher, as an advisory teacher for environmental education and now manage the Environmental Studies Service includes two urban studies centres, one in Chesterfield and one in New Mills.

My work with teachers and their classes is concerned with the built environment. Through day programmes of classroom and fieldwork activities I hope that children and young people will develop the knowledge and understanding and interest in the built environment, past, present and future. I hope that they will come to understand the factors and processes of change within the built environment and the impact that this has on our lives and that this will lead to a concern for the environment and a willingness to participate in the decision making processes that will shape our environment in the future.

ACTIVITY SHEET

Identifying World Heritage sites in the United Kingdom

Find ten World Heritage sites in the United Kingdom.

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