Spinning and Weaving: Meaning, Difference and Early Textile Production by Hand

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In one paragraph

Spinning and weaving are the two steps that turn fibre into cloth. Spinning draws fibres out and twists them into a continuous thread, the yarn; weaving interlaces two sets of those yarns, the warp and the weft, at right angles to make fabric. That is the whole difference between spinning and weaving: spinning makes the thread and holds it together with twist, weaving makes the cloth and holds it together by interlacing, and spinning always comes first. Before machines, early textile production ran in three stages. The fibre was prepared (flax retted and hackled, wool plucked and combed, cotton ginned), spun by hand on a spindle and, in Europe from about AD 1250, on a spinning wheel, and then woven on a hand loom. Spinning was the slow stage: in experiments at the Centre for Textile Research in Copenhagen a spinner with a drop spindle made about 40 metres of wool thread an hour, so the thread for one square metre of plain cloth took more than 50 hours.

At a glance

Spinning and weaving at a glance: the difference

	Spinning	Weaving
What it does	Draws out fibres and twists them into one continuous thread	Interlaces two sets of threads at right angles
Goes in	Prepared fibre: hackled flax, combed or carded wool, ginned cotton	Spun yarn: the warp, set up first under tension, and the weft
Comes out	Yarn (thread)	Woven cloth
What holds it together	Twist, in an S or a Z direction	Interlacing: each weft passes over and under the warp
Hand tools	Spindle and whorl, distaff; later the great wheel, the flyer wheel and the charkha	The loom: ground, warp-weighted and backstrap looms, then treadle looms
Oldest direct evidence	A three-ply cord of twisted inner-bark fibre, 41,000 to 52,000 years old, from Abri du Maras, France (Hardy et al. 2020)	Impressions of interlaced, woven material in clay, about 26,000 years old, from Pavlov I, Czech Republic (Adovasio, Soffer and Klíma 1996)
Speed by hand	About 30 to 53 metres of wool thread an hour on a drop spindle, depending on the whorl (CTR experiments)	About 30 wefts an hour for one weaver on a 30 cm warp-weighted sample, 45 for two working together (CTR 2006, p. 17)
Share of the work	332 of the 529 hours that one reconstructed 3 × 2 m cloth took (below)	The other 197 hours, weaving and every remaining step
First machines	Spinning jenny, about 1766; water frame; mule, 1772 to 1779 (below)	The power loom and its successors: see the history of looms

Spinning tools and dates

Tool or technique	What it added	Dated evidence	Source
Twisting by hand	Fibres twisted and plied into cord	41,000 to 52,000 years ago: a three-ply cord of inner-bark fibre on a Neanderthal stone tool, Abri du Maras, France	Hardy et al. 2020, Scientific Reports 10, 4889
Twisted plant fibres	Fibres reported as spun, dyed and knotted wild flax	Layers dated 32,000 to 26,000 years ago and later, Dzudzuana Cave, Georgia; the identification as flax was challenged in 2010	Kvavadze et al. 2009, Science 325, 1359; Bergfjord et al. 2010
Splicing	Flax thread made by joining fibre bundles end to end	Neolithic Europe	Gleba and Harris 2019
Hand spindle with a whorl	A flywheel that keeps the twist going: thread of any length	Central Europe from about 5,600 BC; complete spindle with its thread, Arbon Bleiche 3, Switzerland, about 3,370 BC	Grömer 2016, pp. 75, 81, 83
Distaff	Holds long fibre while the hands draft	Short metal distaffs in Late Antique graves (an Iron Age one at Frög is disputed); a tall rod on a stand on a Greek red-figure cup of the 5th to 3rd century BC, read by Grömer as a flax distaff	Grömer 2016, pp. 79 to 80
Spinning wheel, China	A hand-turned wheel drives the spindle	Northern Song dynasty (960 to 1127): The Spinning Wheel, a handscroll by Wang Juzheng	Palace Museum, Beijing, 新 00087180
Great wheel	A large hand-turned wheel drives a horizontal spindle; spinning and winding are still separate	Europe, about AD 1250 to 1300; a great wheel of about 1750 in the Science Museum, a type used extensively in Lancashire for spinning cotton	Grömer 2016, p. 77; Science Museum Group Y1969.12
Flyer wheel, then the treadle (Saxony wheel)	Twists and winds on at the same time; the treadle frees both hands	Flyer known by 1480; treadle drive added in the 16th century	Science Museum Group 1903-82
Charkha	India’s spinning wheel, in single-spindle, multi-spindle and portable forms	A stainless-steel Hind Pocket Charkha made in Pune between 1923 and 1947	V&A IS.83-2016; charkha types
Spinning jenny	One wheel turns many spindles; still hand-powered	James Hargreaves’s original of about 1766	Science Museum Group 1970-174
Water frame	Pairs of rollers turning progressively faster draw out the cotton before it is twisted; water power	Arkwright’s machine of 1775, run by water power at Cromford, spinning eight threads	Science Museum Group 1860-5
Mule	Rollers plus the jenny’s moving carriage: fine yarn for weft	Samuel Crompton, 1772 to 1779	Science Museum Group 1912-317

Key figures and their sources

- In the Centre for Textile Research’s first spinning experiment, a 2.7 kg Shetland fleece was sorted down to 1.1 kg of usable wool; preparing it by hand with one wooden comb discarded 22% more, and it took the two spinners about six hours to prepare 170 g (Mårtensson, Andersson, Nosch and Batzer 2006, pp.
  Source: Mårtensson, Andersson, Nosch and Batzer 2006 (ctr.hum.ku.dk)
- Clay impressions of interlaced, woven material from Pavlov I in Moravia, possibly basketry rather than cloth, are about 26,000 years old (Adovasio, Soffer and Klíma 1996).
  Source: Adovasio, Soffer and Klíma 1996 (doi.org)

Formulas

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100 cm × 11 threads × 2 systems = 2,200 m of thread per square metre (Grömer 2016, p.
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2,200 m × 97.09 g per 1,000 m = about 214 g of spun wool.
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2,200 m ÷ 40.7 m an hour = 54 hours of spinning, before the hours spent preparing the wool.
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Revision questions

The questions readers ask most, with the article's own answer.

What is the difference between spinning and weaving?

Spinning turns fibre into yarn by drawing it out and twisting it; weaving turns yarn into cloth by interlacing two sets of threads, the warp and the weft, at right angles. Spinning uses a spindle or a spinning wheel, weaving uses a loom.

Which step comes first in making cloth, spinning or weaving?

Spinning. The fibre is prepared, then spun into yarn, and only then woven.

When was yarn first made, and who invented it?

No one person invented it. The oldest direct evidence is a three-ply cord of twisted inner-bark fibre on a stone tool from Abri du Maras in France, dated to 41,000 to 52,000 years ago and made by Neanderthals (Hardy et al.

Where was spinning traditionally done, and by whom?

Mostly in the home, by women.

What is hand weaving?

Weaving on a loom worked by the weaver’s hands and feet, with no motor: the weaver opens each shed, passes the weft and beats it in. Indian law defines a handloom as “any loom, other than power loom” (Handlooms Act, 1985, section 2(b)).

How does a spinning wheel work?

A large wheel, turned by hand or by a treadle, drives the spindle by a band and does the whorl’s work. On the older great wheel the spinner twists a length and then winds it on; on the flyer wheel a flyer of two curved arms and a bobbin turning at different speeds twist and wind at the same time, so spinning is continuous (more above).

Test yourself

Ten questions on this topic. Answer them without looking, then check on the last page.

1. In hand flax preparation, what does hackling do to the fibre?
2. How does combed wool yarn differ from carded wool yarn?
3. Why does cotton have to be ginned before it can be spun?
4. In the Copenhagen spinning tests, how did the weight of the spindle whorl affect the thread, with the same fibre?
5. Why does a light whorl with a large diameter give a harder-twisted yarn than one with a small diameter?

6. Why is plying done in the opposite direction to the spinning, and what do z-spun singles make?

7. How did the flyer wheel improve on the great wheel?

8. How many of the 529 hours taken to make the Düppel Museum's 3 × 2 m twill cloth went into spinning?

9. How much thread is needed per square metre of plain-weave cloth at 11 threads per centimetre in warp and weft?

10. What did the Science Museum call Hargreaves's spinning jenny of about 1766, and how was it powered?

Answers

Each answer is stated in the article; the section to read again is named after it.

1. **It splits the fibre lengthwise and separates the long, fine fibre from the short tow.**
   See: Fibre preparation: flax, wool and cotton › Flax: retting, breaking, scutching and hackling
2. **Combed wool spins into a smooth, firm, shiny worsted thread; carded wool into a looser, warmer, more elastic woollen thread.**
   See: Fibre preparation: flax, wool and cotton › Wool: plucking, combing and carding
3. **Cotton fibre grows attached to the seed.**
   See: Fibre preparation: flax, wool and cotton › Cotton: ginning
4. **The lighter the whorl, the thinner the thread.**
   See: Hand spinning with a drop spindle › What the whorl’s weight and diameter do to the yarn
5. **It turns longer, so it puts in more twist.**
   See: Hand spinning with a drop spindle › What the whorl’s weight and diameter do to the yarn
6. **It balances the yarn; z-spun singles make an S-plied thread.**
   See: S twist and Z twist
7. **It twisted the yarn and wound it on at the same time, so spinning never stopped.**
   See: Spinning tools and dates › How the spinning wheel works
8. **332 hours, close to two thirds.**
   See: What hand spinning produced, and how long it took
9. **2,200 m, before take-up and loom waste.**
   See: What hand spinning produced, and how long it took › Worked example: the thread in one square metre of cloth
10. **The first machine to improve upon the spinning wheel; still turned by hand, driving many spindles at once.**
    See: From hand to machine: mechanised textile production

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