Bast
Rushes
Stinging
Nettles

Textile Materials from the Stone Age
Reconstructions by Anne Reichert
In the Neolithic, lime bast was the most frequently used bast for all sorts of textile items. But we also see examples which use bast from other trees. Different bast materials need different periods of water retting.

- Willow bast was used in the Mesolithic for twined string and woven items as well as for nets.
- Maple saplings are easily stripped during the Spring. When twisted the outer, thicker bark separates from the bast.
- Oak bast is not suitable for twisting as it breaks after a few turns.
- Alder bast can be used after a few weeks retting. Like poplar bast, it is quite brittle.
- Poplar bast must only be retted for a short time. It is rather brittle and cords and plain-twined materials made from it are not very durable.
- Elm bast does not need to be retted. Before use it only needs to be placed in water for a short time, so the bast layers can be separated.
Lime Bast

After several weeks retting in water, then rinsing and drying, the strips of lime bast are especially good for twisting, twining and weft-twining.

Retting the bark in water releases a stinking slime which must be rinsed away.

After retting in water, the individual bast layers separate from each other. In Spring it is very easy to remove the bark with the bast layers from the wood.

The cloak has three sections: the weft-twined body and two additional layers of bast strips hanging from twined strings.

The two additional layers are attached to the second and third rows of the main section. The cloak is warm and waterproof. The water runs off the outer layers of bast. However, in heavy, prolonged rain the water will gradually work its way through the separate layers.

In the second and third rows from the top, each strand is separated into two bundles to widen the cloak at the shoulders.

Fruiting twigs and leaves of the small-leaved lime

Bast from twigs can also be used after retting.
Bast, Rushes, Stinging Nettles...

Textile Materials from the Stone Age

Twining and weft-twining are the oldest known techniques which show knowledge of thread and fabric manufacture. In contrast to spinning and weaving, neither of these techniques need tools. They can be carried out using only the hands.

In weft-twined textiles, the ‘U’-shaped fibre bundles forming the warp are securely held between the twists of a twined cord.

Closely-worked weft-twined textiles made from thick and thin strips of lime bast

The hanging bast bundles are lightly twisted before being secured by the weft rows. This enhances the stability of the finished textile.

Twining and Weft-Twining

‘Oetzi’s’ 12 cm long dagger sheath (with its accompanying dagger) is the oldest completely preserved, weft-twined item made of lime bast (3350-3100 BC). During the rescue operation, it was damaged by a blow from a pickaxe.

Reconstruction of the sheath made of lime bast

Sheath, dagger and sheath reconstruction from lime bast at original size (only at the poster)
Archaeological Reconstructions by Anne Reichert

Textile Materials from the Stone Age

Netting

Knotted nets made from twined lime bast strings. 'Oetzi' (the Man in the Ice) was found with the remains of a net like this. Similar nets were used for centuries by mountain farmers to carry grass.

In this example (where the work hangs from a zS-twined cord) the strands are not twisted before being caught into the binding. Patterns can be made by varying the distances between the rows of binding.

Knotless netting is made by threading a twisted bast strip through a loop of the previous row. The result can be either rectangular or circular and the loop can have single (←), double (→) or triple twists. This technique is known from the Mesolithic period.

Weft-twining with S and Z bindings

Weft-twining with plaited threads

This narrow band which recreates a find from Wangen, Bodensee, is made with eight active pairs of warp threads.

It is possible to change the direction of the work, as with an example from Hornstaad, Bodensee (c. 3900 BC), reconstructed here as the corner of a bag.

Bag in double-twisted looping technique made from elm bast.
From the Neolithic lake settlements on the Bodensee and the Swiss lakes different sorts of twined items are known, called wert-pile, or ‘fur’ twining, because of the bast bundles which hang down loosely on the outer surface and resemble fur. This also gives better protection from the rain as the water can run off the hanging strips, just like on a thatched roof.

‘Fur’ Fabrics

- The loosely hanging bast fibres cover the opposite side and give the fabric its ‘furry’ appearance.
- The hat from Sipplingen, Bodensee, which is started from the apex, must have the bast bundles added afterwards.
- This fabric, which resembles the hat from Wangen, Bodensee, has the ‘U’-shaped bast bundles attached as the work progresses.
- Fabric made of thin plaits with loosely-hanging ends, after a fragment from Wangen, Bodensee (3800-3600 BC)

Reconstruction of the hat from Sipplingen, Bodensee (3800-3600 BC), with its ‘fur’
Bast, Rushes, Stinging Nettles... Textile Materials from the Stone Age

The Hat from Wangen-Hinterhorn

The weft-twining can only be seen on the inside.

From the third row, 15 cm long, hairpin-shaped bast bundles are worked into the twist bindings.

As the hat tapers to the apex, now and again two bast strands are fixed together and partially cut off. At the top the remaining bast bundles are bent and pass inside, being fixed with a twined cord.

The conical hat with ‘fur’ covering from Wangen-Hinterhorn, Bodensee (3800-3600 BC)

Reconstruction of the conical hat from Wangen-Hinterhorn, with its hanging bast strips.

'U'-shaped lime bast bundles are laid round a twined cord and secured with a row of plain-twining.

From the second row of plain-twining, 1.5 cm from the first, the fabric is worked all the way round.
The Hat from Seekirch-Achwiesen

The inside of the hat from Seekirch-Achwiesen, Federsee (2900-2600 BC)

The outside of the hat from Seekirch-Achwiesen is recognizable through the round knob on the top of the cone.

Lime bast strands about 40 cm long are fastened in the middle. One half is bundled into a ‘handle’, the other is spread out into bundles and twined all round from the centre.

1. The fine twined rows can be seen only on the outside. On the last row, ‘U’-shaped bast bundles are attached so that one half of a bundle is fixed together with one half of the next bundle in one stitch.

2. The inside of the raised knob at the top of the hat. After five rounds, the strips of the ‘handle’ had been untied and fastened into the work with four more rows of weft-twining.

3. Tied weft-twined rows were covered with new bast bundles which are fixed together in the two following rows as shown here. The last five rows are again covered with hanging bast bundles.

4. The twining rows can only be seen from the inside.

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Bast, Rushes, Stinging Nettles

The gathering and use of different sorts of bast and bark (lime, beech, oak, elm, poplar, alder, maple, wild cherry, pine, willow, birch) are described. The possibilities for working with rushes, grasses, reeds and stinging nettles are explained. Textile technologies are presented:

- The gathering and use of different sorts of bast and bark (lime, beech, oak, elm, poplar, alder, maple, wild cherry, pine, willow, birch) are presented.
- The process of reconstructing Neolithic and Bronze Age items, principally bast fibres (reeds, rushes, grass stalks, stinging nettle fibres, etc.) together at the end and divide them into two equally thick bundles. Hold the knot tightly between your thumb and forefinger, twist one of the bundles away from you (in a clockwise direction) and lay it over the other bundle (in an anti-clockwise direction). Hold the crossing point between your fingertips. Do the same thing with the other bundle ... and so on. If, after a turn, you spread the twisted bundles slightly, while holding the whole securely, the twisted string will become tighter and more regular. Important: You must keep to your chosen twisting direction! If you come to the end of a bundle, you need to add in additional suitable material. Overlap the ends by 1 or 2 cm and twist together.
- An S-twined cord can be obtained when you hold the work in the left hand and twist with the right, and a Z-twined cord when you work in a mirror-image, holding with the right and twisting with the left hand (see page 4: Twining and Welt-Twining).

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The gathering and use of different sorts of bast and bark (lime, beech, oak, elm, poplar, alder, maple, wild cherry, pine, willow, birch) are described. The possibilities for working with rushes, grasses, reeds and stinging nettles are explained. Textile technologies are presented:

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Photos and text: Anne Reichert, Ettlingen, Baden-Württemberg
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English translation: Kate Verkooijen, Weymouth, Dorset
Bast, Rushes, Stinging Nettles...
Archaeological Reconstructions by Anne Reichert

Textile Materials from the Stone Age

The Sieves from Hornstaad (↑) and Auvernier (↓)

The sieve mesh was sewn to a bent twig using lime bast thread, with the edges overlapping the twig. 📌

Fine, twined threads of lime bast were stretched across a frame and secured by weft-twined rows. As the warp threads easily slid down the frame, the weft-twining process was awkward and involved and the experiment was abandoned. 📌

The underside of the sieve. The bast strips of the first row of coiled basketry overlap the threads which hold the mesh onto the twig. 📌

Next, a square sieve base was weft-twined with warp threads of 1.2 mm thickness and weft threads 0.8-0.9 mm thick. 📌

The side of the sieve is made in coiled basketry technique with bundles of rush, secured with lime bast strips. 📌

The stitches holding the sieve bottom to the birch bark sides of the sieve are placed at different distances to the edge to prevent the bark splitting. 📌

In each row, the warps of the mesh are split into two halves. Each half is fixed together with half of the neighbouring warp, giving a zigzag pattern. Later, this rectangular mesh is attached to a twig frame. 📌

The sides of the Auvernier sieve are made from bark. In this reconstruction birch bark was used. 📌

The side of the sieve from Hornstaad, Hoernle, Bodensee (c. 3900 BC) 📌

Sketch of the sieve from Auvernier, Neuenburger See, Switzerland 📌

Sieve from Hornstaad-Hoernle, Bodensee (c. 3900 BC) 📌

The mesh base is enlarged with coiled basketry of rushes and secured with lime bast strips. 📌
In 1991, the Man in the Ice, ‘Oetzi’, was found 3000 m up in the Oetztal Alps, where he had died 5000 years ago. In addition to his fur and leather clothing, which had been preserved by the ice, were many items of his equipment made of lime bast: the dagger sheath, cords and a knotted net of twined strings, as well as the inner nets of his three-part shoes.

From the upper cord of the net-structure hang longitudinal cords of different length.

The remains of the right shoe of the Man in the Ice and the inner net structure of the left shoe (3350-3100 BC)

Inner Nets of Lime Bast from ‘Oetzi’s Shoes

The longitudinal twined cords of the net structures for the left and right shoes. In a second process they will be knotted together with twisted strips of lime bast.

The inner net structure is secured to the bearskin leather soles by a 2 cm wide leather strap, so that there is a space available for the insulation layer. The longitudinal strings of the net for the left shoe are knotted together going around the shoe, those for the right shoe going to and fro. The left net is worked to precisely follow the shape of the foot, the right is kept closed by a cord which laces over the top of the foot.

The longitudinal twined cords of the different right and left inner net structures of lime bast hold a 2 cm thick layer of hay between the net and the deerskin upper. When the shoes are worn, the strings of the nets are quickly compressed into the grass layer and are scarcely noticed.

Reconstruction of ‘Oetzi’s’ three-part shoes:
Textile Materials from the Stone Age

Bast, Rushes, Stinging Nettles...

Archaeological Reconstructions by Anne Reichert

The Sandals from Allensbach and Sipplingen

Four lime bast strips are laid in a 'U' formation and are plaited together.

Sandal find 1 from Allensbach, Bodensee (3200-2800 BC)

Reconstruction of the sandals from Allensbach 1 made from lime bast

Reconstruction based on the find from Sipplingen, Bodensee

The mats are drawn together using a separate cord. The edges are sewn with strips of lime bast.

The sandals from Allensbach 2 can be made on a fixed frame using half-weaving technique.

The sandals from Allensbach 2 are comfortable. They only rub a little where they are tied around the ankle. Of course, the sandals do not last very long.

The mats are folded in the middle.
**Plains-weave Materials**

This technique corresponds to plain weaving in cloth. In both directions there is only one element in the material - by comparison to weft-twining where two horizontal weft threads are worked.

- **Plaits made from three and six strips of lime bast**
- **Straight-sided mat:** Both directions of the weave are parallel to the edges.
- **Diagonal weaving:** Both weaving directions run diagonal to the edges. When the weave is broad enough the free-hanging bast strips are woven back into the fabric.
- **Bronze Age plain-weave mesh from Auvernier, Neuenburger See, Switzerland**
- **In this reconstruction, lime bast strips were stretched across a twig bent into a round shape, and woven in plain weave.**
- **Reconstruction of a basket found at Sutz-Lattigen, Bieler See, Switzerland (3200-3100 BC), woven from lime bast strips.**
Textile Materials from the Stone Age

Working with Rushes, Bast and Grasses

Several rushes or other materials are lightly twisted into a coil which is sewn securely to the previous coil using strips of bast.

Soft Rush: abundant everywhere

Baskets made in spiral coil technique from rushes with lime and elm bast bindings

Twined mat from a kind of sedge

Impression of a mat from the base of a clay vessel, Michelstetten, Lower Austria (c. 4300 BC)

Reconstruction of this mat using leaves of Greater Reedmace

Twining a mat from a type of moorgrass

Sample of a plain-twined mat made from moorgrass

Moorgrass (Molinia caerulea): abundant on boggy, poor soils

Lesser Reedmace

Common Clubrush
In the Stone Age, many different forms of containers were made from bark. In Northern Scandinavia and Siberia, people still make all sorts of boxes, sandals and handbags from birch bark.

Different sewing techniques were tested on these spruce bark boxes.

Bark Containers

This piece of beech bark broke while being folded over and stitched together.

Peeling the stem of a young, wild cherry tree gives you ready-to-use bark and layers of bast. The bark can be made into containers and the bast into cordage.

In this birch bark container, 'Oetzi' transported charcoal embers wrapped in maple leaves for insulation.

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Archaeological Reconstructions
Textile Materials from the Stone Age

The Stinging Nettle: once a Fibre Plant, now a ‘Weed’

Stinging nettle fibres can be twisted and spun. Remains of nettles are known from the Middle Stone Age, nettle cloth is known from the Iron Age onwards and was produced until the middle of the last century. (What is today sold as ‘nettle’ is actually cheap cotton.) While stinging nettles are today widely found on fertile ground, during the prehistoric period they were mainly found around areas of human activity and were harvested as wild plants, without necessitating their cultivation.

The Man in the Ice, ‘Oetzi’, bound the feather fletching to his arrows using nettle fibre. As the binding is fixed with birch bark pitch, the fibres can hardly be seen. Very little of the fletching itself has remained.

The Stinging Nettle:

Once a Fibre Plant, now a ‘Weed’

Large stinging nettle (Urtica dioica)

When the stem is broken, the fibres between the outer skin and inner pith are exposed.

Retted and cleaned nettle fibres (here from what is called Boehmeria or Ramie, an Asiatic nettle) are very fine and soft and can be spun.

Unretted and retted stinging nettle fibres and their twined strings

Twined stinging nettle strings are very stable and strong.

Unretted and retted stinging nettle fibres and their twined strings
Bibliography (the upper ones can be read online):