

PAPYRUS MANUFACTURE

صناعة البردي

Bridget Leach

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صناعة البردي

Bridget Leach

Papyrusherstellung
Fabrication de papyrus

The papyrus plant that grew along the River Nile was used to manufacture writing material in ancient Egypt. It was employed throughout the Classical Period and beyond until superseded by paper in about 800 CE.

استخدم نبات البردي الذي نَمى على طول نهر النيل في صناعة ورق البردي الذي استخدم للكتابة عليه بمصر القديمة، وكان مستخدماً إلى ما بعد العصور الكلاسيكية حتى حوالي عام ٨٠٠ ميلادياً حين استُبدل البردي بالورق المتعارف عليه الآن.

A blank papyrus roll found in the Early Dynastic tomb of Hemaka at Saqqara dating from approximately 3,000 BCE (Emery and Saad 1938) attests to the early use of the plant to manufacture a material clearly intended for writing. It was used throughout Dynastic and Ptolemaic and Roman times and into the Byzantine and early Islamic Periods until it was gradually superseded by paper. The latest extant papyrus is an Arabic document from 1087 CE (Pattie and Turner 1974: 7). Some of the best known examples are the finely illustrated funerary papyri such as *The Book of the Dead* of Any (fig. 1) from the New Kingdom. Papyrus was used for a wide variety of documents, administrative records, and letters, as well as didactic, literary, or medical texts (Parkinson and Quirke 1995). There is no account describing the papermaking process itself until Pliny (the Elder) provided one in Roman times (Book XIII, xxiii; translation by Rackham 1952: 143 - 151).

In antiquity, papyrus grew plentifully in Egypt along the Nile Valley, and the art of ancient Egypt shows numerous paintings of rural scenes in which the plant is seen growing in the river marshland. Today it grows in

central and east Africa and parts of the Mediterranean, including Sicily (Täckholm and Drar 1950).



Figure 1. A section of the illustrated *Book of the Dead* of Any from the 19th Dynasty. EA 10470/3.

The botanical name given to the plant is *Cyperus papyrus* L. (fig. 2). It belongs to the large *Cyperaceae* family of sedge plants, *Cyperus* being the genus name and *papyrus* the species; the 'L' refers to the name of the Swedish botanist Linnaeus, who first classified it in 1753 (Leach and Tait 2000). The plant grows to about four meters high and has a tall, green triangular shaped stem, which is wide at the base and tapers to the top where it separates into a wide flower-head or umbel. At its base,



Figure 2. The papyrus plant today growing in the Royal Botanic Gardens Kew in London.



Figure 3. Cut papyrus stems ready for preparation.

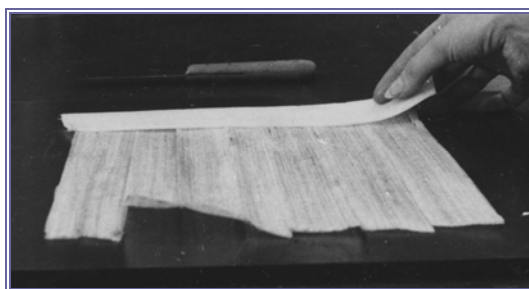


Figure 4. Laying strips of papyrus pith. The horizontal layer in the process of being laid over the vertical layer.

the stem is approximately five to eight centimeters thick. The stem encases the papyrus pith, from which the writing material is made and in which fibers are embedded that carry nutrients from the roots to the umbel. The pith, or parenchyma, is cream colored with a spongy texture and a high cellulose content, but the fibers are woody or ligneous; thus, the plant is very suitable for producing sheets of paper as the fibers give rigidity and the pith substance to the manufactured sheet.

Pliny's account of making paper from papyrus is generally accepted although some details remain unclear. However, examination of the ancient material (Flieder and Delange 2001; Wiedemann and Bayer 1983) and experiments (Lucas 1962; Owen and Danzing 1993; Ragab 1980) have established the basic principles of manufacture. The lower, and therefore wider, part of the stem is used as it contains the most pith (fig. 3). A length of between 20 and 30 centimeters is cut off and the outer rind peeled off. The pith is then sliced longitudinally to produce strips, which are laid side by side to form one layer; more strips are then placed on top at right angles to form a second layer (fig. 4). The whole is then beaten or pressed together to form a homogeneous sheet, which is then dried. Aided by the natural sap contained in the plant, the pressure applied during this procedure fuses the cellulose in each layer together physically and chemically (Hepper and Reynolds 1967; Roland et al. 1987), in a similar way to the formation of modern paper. Individual sheets of papyrus were then joined together to form rolls using a starch-based paste (figs. 5 and 6) (Barrandon et al. 1975). A study by Basile and Di Natale (1999) of the preparation of the papyrus surface for writing found coatings including egg, gum, and milk on several ancient samples.

In the Ptolemaic and Roman Periods, state control was clearly a significant factor in papyrus production (Lewis 1974). It is difficult to imagine that this was substantially different in the preceding periods, but we lack documentation or evidence. Papyrus was

certainly a valued material as the number of palimpsests from Dynastic Egypt shows (Camino 1986). Papyrus (especially the sturdy rind or epiderm) was also used to make rope, sandals, and other everyday objects.



Figure 5. A section of an ancient papyrus of the Late Period seen by transmitted light, showing the structure of the writing material with the fibers forming a crisscross pattern.

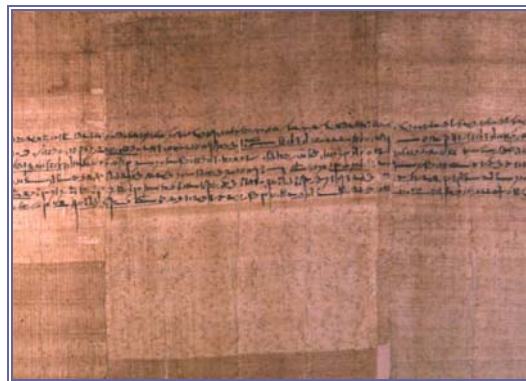


Figure 6. Variations in color show some of the individual strips of the plant used to make the top, horizontal layer of an ancient papyrus dated 243 BCE. Also visible to the left and right of the image are the joins between individual sheets.

Bibliographic Notes

Leach and Tait (2000) give a full discussion of the papyrus plant, manufacture, and use as a writing material in ancient Egypt, in addition to an extensive bibliography. Lewis (1974) also contains a comprehensive account of manufacture together with information on the commercial aspect of this industry in the Classical Period.

References

- Barrandon, Jean-Noël, Jean Irigoin, and Gérard Schiffmacher
 1975 Nouvelles techniques applicable à l'étude du livre de papyrus. In *Proceedings of the XIV International Congress of Papyrologists, Oxford, 23 - 31 July 1974*, Graeco-Roman Memoirs 61, pp. 7 - 10. London: Egypt Exploration Society.

- Basile, Corrado, and Anna Di Natale
1999 *Indagine analitica per l'identificazione dei composti usati dalle antiche fabbriche di carta di papiro*. Monografie del Museo del Papiro 4. Siracusa: Museo del Papiro.
- Caminos, Ricardo
1986 Some comments on the re-use of papyrus. In *Papyrus: Structure and usage*, ed. Morris Bierbrier, pp. 43 - 61. London: British Museum Press.
- Emery, Walter B., and Zaki Yusef Saad
1938 *Excavations at Saqqara: The tomb of Hemaka*. Cairo: Government Press.
- Flieder, François, and Elisabeth Delange
2001 Papyrus: The need for analysis. *Restaurator* 22(2), pp. 84 - 106.
- Hepper, Frank Nigel, and Tom Reynolds
1967 Papyrus and the adhesive properties in its cell sap in relation to papermaking. *Journal of Egyptian Archaeology* 53, pp. 156 - 157.
- Leach, Bridget, and John Tait
2000 Papyrus. In *Ancient Egyptian materials and technology*, ed. Paul T. Nicholson, and Ian Shaw, pp. 227 - 253. Cambridge: Cambridge University Press.
- Lewis, Naphtali
1974 *Papyrus in classical antiquity*. Oxford: Clarendon Press.
- Lucas, Alfred
1962 *Ancient Egyptian materials and industries*. 4th edition, revised and enlarged by John Richard Harris. London: Edward Arnold. (Originally published 1926.)
- Owen, Antoinette, and Rachel Danzing
1993 The history and treatment of the papyrus collection at the Brooklyn Museum. *The Book and Paper Group Annual* 12, pp. 36 - 43. (Published by the Book and Paper Group (BPG) of the American Institute for Conservation of Historic and Artistic Works.)
- Parkinson, Richard, and Stephen Quirke
1995 *Papyrus*. London: British Museum Press.
- Pattie, Thomas, and Eric Turner
1974 *The written word on papyrus: An exhibition held in the British Museum, 30 July - 27 October 1974*. London: British Museum for the British Library Board.
- Pliny
1952 *Natural history*. Volume 4. 2nd edition. The Loeb Classical Library. Translated by Harris Rackham from the Greek work by Pliny the Elder. London: William Heinemann Ltd.
- Ragab, Hassan
1980 *Le Papyrus*. Cairo: Dr. Ragab Papyrus Institute.
- Roland, Jean-Claude, Michèle Mosiniak, and The University of Paris
1987 Sur l'ultrastructure et la cytochimie des parois cellulaires du papyrus en relation avec la malléabilité, la résistance et l'autoadhésivité des interfaces dans le support d'écriture. *IPH Information: Bulletin of the International Association of Paper Historians*, pp. 133 - 138.
- Täckholm, Vivi, and Mohammed Drar
1950 *Flora of Egypt*. Volume 2. Bulletin of the Faculty of Science 28. Cairo: Fouad I University Press.
- Wiedemann, Hans-Georg, and Gerhard Bayer
1983 Papyrus: The paper of ancient Egypt. *Analytical Chemistry* 55(12), pp. 1220A - 1230A.

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