



papermaking



what is it?

It's the art of making a thin, flat sheet of material by pressing together cellulose fibres derived from plants, textiles or wood. Hand-made paper can be used for writing, printing or painting on, in sculpture and decoration or given as a gift.

History: the word paper derives from papyrus, a wetland plant that was used as a writing surface from the time of the ancient Egyptians. However, the structure and means of production of papyrus differ from true paper as we know it today. Ts'ai-Lun, a eunuch at the Chinese Han Emperors' court, is credited with inventing true paper in the year 105 by pulping old hemp fishing nets and parts of plants such as the paper mulberry tree. The Chinese attempted to keep papermaking techniques secret, but they eventually reached Korea and Japan, where they were further refined. However, the knowledge didn't arrive in the West until a battle in 751 when Arab troops captured some Chinese soldiers who were papermakers, and subsequently set them to work. Papermaking travelled slowly along the Silk Road towards Europe where the Moors introduced it in 12th century Spain. From there it spread across the continent, arriving in England around 1450. The availability of sources of fibre, and the increasing demand for writing materials - driven by rising literacy rates and the invention of moveable type - eventually saw paper overtake other materials such as parchment or vellum (both animal products).

The invention of mass production methods in the 19th century, the introduction of wood pulp instead of rags and the ability to produce long strips of paper (rather than individual sheets) contributed to the decline of hand paper making. Today papermaking is kept alive by a relatively small number of artists, craftspeople and teachers in the UK and is a popular choice for craft courses and workshops.



A simple, home-made mould and deckle.



Paper hanging to dry, still attached to felts.

what are the benefits?

Making your own paper means you can recycle household surplus or even paper that you've made previously. You can keep going until the fibres get too short to bind. You can take advantage of normally unwanted garden weeds or less desirable plants. (If you're picking plants away from your own garden make sure you have permission if needed and that you know exactly what you're picking - i.e. nothing endangered.)

Although you do need large amounts of water, it can be saved and reused again and again during the pulping process. The nastiest material you'll find in recipes is caustic soda (sodium hydroxide), which can be toxic to aquatic life due to its high pH, although it can be neutralised easily and doesn't accumulate in the food chain. However, its manufacture involves environmentally-damaging substances such as chlorine gas or mercury. We suggest that you use the much more benign washing soda (sodium carbonate) instead.

Hand-made paper is beautiful and unique. It makes a nice gift, adds aesthetic value to art and crafts and is visually and tactilely appealing. You can personalise it by embedding flowers or bits of printed text, or different colours and textures. While it's obviously not cheaper than buying mass-produced paper, you can certainly make your own cheaper than the same thing from a speciality retailer, which can set you back as much as £10 for a nice artisan sheet.

Kids particularly love papermaking: it's messy, colourful, fun and involves sloshing large amounts of water around - what's not to like? It's easy to learn and most people who try it for the first time will have something to show for it at the end of the day. If you decide to take it further and start manufacturing at home, the quality of your paper will depend on how much time you put in to perfecting and refining your technique.



what can I do?

Preparation: start with a course or workshop, or learn from books or online tutorials. You can get equipment up from hardware or charity shops or find them around the house. Basically you need:

- Pulping: a plastic tray or washing up bowl.
- Macerating: mallet or blender (don't use the same one for food).
- Mould: made from a picture frame with fine mesh stretched taught and stapled.
- 'Felts': cleaning cloths, old sheets or blankets.
- Boards for pressing out water.

You can also buy kit from art suppliers.

Process: the Japanese method involves a bamboo screen in a hinged frame known as a 'sugeta'. The Western method described here uses a mesh screen tacked to a frame (mould) and a separate frame (deckle) on top to keep the pulp in place. The ragged edge produced by this method is known as a 'deckle-edge' and is often desirable as an indicator of artisan production.

First, you need pulp, from fibrous material like cotton or linen rags, recycled paper (but not magazines - too many chemicals in shiny paper), or cellulose from the inner bark, leaves or stems of plants such as daffodils, reedmace (cattail), clematis or nettles. Once you've collected enough material, cut it into 2.5cm pieces and weigh, then soak in water for a few hours or overnight. Once soaked, cook it up in hot water and washing soda until the fibres separate and it starts to look like overcooked, stringy rhubarb. The alkaline washing soda breaks down the lignin - the 'cement' between the cellulose and cell walls of the plants - which can lead to the paper deteriorating.



A selection of coloured handmade paper.

Quantity-wise, dissolve 100g of washing soda in about 8 litres of warm water per 450g dry weight fibres. The pH during cooking should be between 9-11 (use a garden probe to check). Once cooked, rinse the mixture in water and test the pH again. You're aiming for pulp at pH 7 or neutral.

Next, macerate the pulp using a mallet to separate the fibres. You can also whizz up small amounts at a time in a blender with a generous amount of water (you're looking for a creamy consistency).

Next, place the pulp in a vat with water, dip the mould and deckle in to load it with pulp, allow water to drain out through the sieve, remove the deckle and turn the pulp out onto what's known as a 'felt' - anything from cleaning cloths to old sheets or blankets. If you're making several sheets, repeat the process, placing each sheet on top of the previous one with a felt in between. Finally, place the whole lot between two boards and press to squeeze the water out (standing on it works). Separate the sheets and leave to dry on a flat surface or hung on the washing line, or hang them whilst still attached to the felt. At this point you can roll the sheets out onto different surfaces to achieve textures and finishes. Perspex gives a smooth texture. Handmade paper can be very porous so if you're going to paint on it you'll need to finish it by sizing with a mix of natural glue and water once dry.

Create a variety of colours using different base materials. Hemp is a creamy colour. Pick the same plant at different times of year to see how the colour varies. You can also add colour by using coloured recycled paper or natural dyes like onion skins or beetroot. Pigments can be bought from art suppliers but the more chemicals and manufacturing you introduce, the greater the environmental impact.

resources

- see lowimpact.org/papermaking for more info, courses, links & books, including:
- Maureen Richardson, *Grow your own Paper*
- Angela Ramsay, *the Handmade Paper Book*
- Helen Hiebert, *Papermaking with Garden Plants and Common Weeds*
- iapma.info/ - international association
- exploratorium.edu/exploring/paper/handmade.html - papermaking technique
- handpapermaking.org - magazine with free articles online

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