

What Is Ink Made Of?

Research by Stewart Wild, Trustee of The Stephens Collection

The question most frequently asked by visitors to The Stephens Collection at Avenue House is: **What is Ink Made Of?** Unfortunately, there is no simple answer.

Ink is a liquid that contains a chemical composition of pigments or dyes used to transfer an image, text or a design onto a suitable surface. Ink is used for drawing or writing with a pen, a metal nib, a brush or a quill. Thicker inks, often in paste form, are used in letterpress and lithographic mechanical printing.

Ink can be a complex mixture, containing a variety of substances such as solvents, resins, alcohol, lubricants, carbon, pigments, dyes, aniline, dextrine, glycerine, fluorescents and other materials. The components combine to affect the free-flowing qualities, colour intensity, durability, speed of drying, resistance to sunlight and appearance of the created image.

A brief history of ink

The word *ink* comes to us from Ancient Greece: *enkaiein* meant 'to burn' ; adj. *enkaustikon*, English *caustic*. Impressions made by a hot instrument in a tablet of beeswax could produce impressions or hieroglyphics which could be read, creating an early form of writing. The word has survived in a number of disparate languages: Latin, *encaustum*; Old English, *enke*; French, *encre*; Italian, *inchiostro*; Dutch, *inkt*; Welsh, *inc*; Czech, *inkoust*.

Ink in the Ancient World

The Chinese, Egyptians, Greeks and Romans used a variety of black ink made from lamp-black soot mixed with water and some sort of gum or plant mucilage.

Excavations at Pompeii and Herculaneum have revealed inkwells containing *atramentum*, a black substance similar to octopus ink; the black comes from melanin produced in a wide range of cephalopods.

The Romans also knew of substances such as *auripigmentum*, derived from sulphur freely available from volcanoes such as Mount Vesuvius near Naples, and Vulcano on the Lipari Islands. The *auri* part indicates its gold colour (Latin *aurum*). A related sulphide, realgar, is similar but with more of a reddish colour.

Cuttlefish ink – which came in a range of browns generally called *sepia* – was widely used too, but expensive. *Sepia* is the Greek word for cuttlefish. Red was obtained from the roots of the madder plant; bright red from cinnabar (sulphide of mercury).

The medieval period

Medieval scribes, who were usually monks, created manuscripts – usually for religious purposes, such as the Lindisfarne gospels – using a variety of substances to colour their inks. Pigments included orange-red from red lead (lead oxide), green from verdigris (copper acetate), yellow/gold from orpiment (arsenic sulphide) and black from carbon such as soot. Brown could be achieved by using copper oxide. A deep blue could be obtained by grinding up azurite or lapis lazuli, or less expensively, copper sulphate.

It was necessary to add a small amount of gum arabic (acacia gum) to the ink to inhibit the separating out of the fine particles of solid matter as a sediment. This caused some inks, as they evaporated, to leave a sticky clogging mess.

A Sixteenth-century Recipe for Yncke

These directions for making ink appeared in a book about handwriting published in 1571 entitled: *A Book containing divers Sorts of Hands*:

To make common yncke of Wyne take a quarte,
Two ounces of gomme, let that be a parte,
Five ounces of galles, of copres* take three,
Long standing dooth make it better to be.
If wyne ye do want, rayne water is best,
And as much stuffe as above at the least:
If yncke be to thick, put vinegar in,
For water dooth make the colour more dimme.
In hast for a shift when ye have a great nede,
Take woll, or wollen to stand you in steede;
Whiche burnt in the fire the powder bette small
With vinegre, or water make yncke with all.
If yncke ye desire to keep long in store,
Put bay salte therein, and it will not hoare.
If that common yncke be not to your minde,
Some lampblack thereto with gomme water grinde.

If you can understand this Old English, you can see that a principal ingredient is galls, that is the round growth (oak-apple) produced on an oak tree bud as a result of the deposition by a gall-wasp (*Cynipidae*) of an egg. The tree reacts by creating a gall, which is mainly dark tannin and resembles a Malteser. When crushed, the gall disintegrates into a fine jet-black powder which, when mixed with water, wine and/or vinegar, produces a black fluid recognizable as ink.

It was discovered that the addition of one of the salts of iron, usually copperas* or green vitriol (ferrous sulphate), to the gallic acid produced a dense blue-black ink, which became blacker as it dried.

The nineteenth century

Some iron-gall ink formulations became unpopular when they were found to be corrosive to metal pen nibs which were introduced in the 1830s. Other inks were not much use as they were fugitive, which mean they faded and eventually vanished when exposed to light.

Finally, a perfect ink

Dr Henry Stephens spent years in his workshop in Stamford Street, London, experimenting with chemicals, solvents and ingredients in the right proportions to produce an ink that was not too acidic, remained free-flowing at all times and in all temperatures, became black as it dried, was indelible and did not fade. His enterprise became a registered company in 1832.

The ink was an instant success and Stephens' "blue-black writing fluid" was patented in 1837. Variations in the secret formula enabled the introduction of a variety of colours, and inks for a wide range of uses, as well as dark wood stains for furniture.

This was the foundation for a company that achieved popular acclaim, won prizes and government contracts, expanded worldwide and dominated the market for over 150 years. The Stephens Collection tells the story.