

Drawing materials used by Leonardo da Vinci

As all artists of the period, Leonardo had access to only a small range of drawing materials, but he used those with unparalleled inventiveness. His early drawings, in the 1470s and 1480s, were executed in either metalpoint, mostly for drawings from life, or the looser medium of pen and ink, for sketches from the imagination.

Metalpoint involves drawing with a stylus, usually of silver, on paper coated with a preparation of finely ground bone, often with pigment added. The stylus leaves a grey trace of the metal on the slightly abrasive ground. Varying the pressure on the stylus does not change the character of the line, and the mark cannot be erased. Metalpoint thus demands control and discipline, and was the standard medium for training young artists in 15th-century Italy. It largely fell into disuse after 1500 following the introduction of chalks (see below).

Pens were cut from a goose's wing feather. The ink was made by mixing iron salts with tannic acid from oak galls (oak apples) to give a thick black ink, '**iron gall ink**', that over the centuries has mellowed to a warm chestnut colour.

In the early 1490s Leonardo began to use natural **red and black chalks** (a red-ochre variety of haematite or iron oxide, and a soft carbonaceous schist respectively), which soon supplanted metalpoint in his drawings. He often used toned papers or coloured grounds for his chalk drawings, most frequently an orange-red ground for red chalk drawings, thereby restricting the tonal range to allow the most subtle modelling.

The years around 1510 were marked by Leonardo's increasingly experimental use of all available media. He layered black, red and occasionally white chalks with liquid media (such as ink, wash or water) on a red ground, to give a richness to studies of hair, drapery and atmospheric landscapes. But in his last years he purged his drawings of much of their former colour, eliminating red chalk and restricting his materials to black chalk, pen and ink, and wash, even in a few drawings working in black chalk on a dark grey ground.

All Leonardo's drawings are executed on **paper** (usually white, but occasionally blue) made from clothing rags of hemp or linen. The book-printing revolution of the 15th century had led to an expansion in the manufacture of paper throughout Europe. The price of paper was falling relative to that of parchment, and during Leonardo's lifetime paper became an everyday commodity, encouraging artists to use it more freely and experimentally.

The strength of hand-made paper and the stability of Leonardo's materials – and good fortune, in the avoidance of flood, fire and simple loss – have ensured that many of his drawings have survived the last 500 years in excellent condition, and that they can be seen much as Leonardo drew them.