Alizarin crimson: alizarin dyestuff, the synthetic equivalent of one of the constituents of madder dye was first prepared in 1868. The lake pigment prepared from it was available by the end of the 19th century.

Anhydrite: anhydrous calcium sulfate, CaSO₄. See also Gypsum.

Azurite: a blue pigment; basic copper carbonate, 2CuCO₃Cu(OH)₂. See also Malachite.

Black: these pigments were mostly made by burning plant material such as twigs (charcoal) or peach stones. Soot was also used.

Burnishing: polishing by rubbing. Gold leaf was burnished (usually with a smooth agate or a dog’s tooth) before being punched or otherwise decorated. It was a delicate and time-consuming occupation.

Cadmium yellow: a stable dense, deep yellow pigment consisting of cadmium sulfide. Invented in 1817, available from the mid - 1840s.

Canvas: the use of canvas as a support began to dominate over wood panel in the early-to-mid 16th century. Canvas is lighter in weight than wood, it is easier to transport and cheaper to buy.

Cassell earth: a dark brown earth pigment prepared from lignite (brown coal) and containing a good deal of organic material (from peat) as well as iron (III) oxide; later known as ‘Van Dyck brown’.

Cennino Cennini: an artist who wrote the earliest Italian treatise on easel painting, Il Libro dell’Arte, around 1390. This described traditional painting methods as practised in Italy throughout the 14th century.

Cinnabar: the mineral form of red mercuric sulfide used to make the pigment vermilion (although vermilion was also synthesised from early times).

Cleaning solvent: a great many organic solvents and solvent mixtures can be used to clean paintings and there are numerous different ones on the market.

Chloroform: trichloromethane, CHCl₃ - widely used as a solvent. It can also be used for killing insects, and it was a widely-used anaesthetic for operations in hospitals until about 1950.

Chrome orange: basic lead(II) chromate(VI), PbCrO₄·Pb(OH)₂.

Chrome yellow: lead(II) chromate(VI), PbCrO₄. This pigment is rather unstable and, in an atmosphere polluted with sulfur compounds, tends to turn black. Louis Nicolas Vauquelin discovered the element chromium in 1797 (named from the Greek word for colour), and later chrome yellow. Chrome yellow is made by precipitating the pigment by mixing two solutions of ionic compounds - eg lead(II) nitrate and potassium chromate (VI).

Cinnabar: the mineral form of red mercuric sulfide used to make the pigment vermilion (although vermilion was also synthesised from early times).

Cleaning solvent: a great many organic solvents and solvent mixtures can be used to clean paintings and there are numerous different ones on the market.
Cloth of honour: a length of a fabric (usually cloth of gold or brocade) placed behind an important person to single them out.

Cobalt blue: a mixed cobalt-aluminium oxide, CoO\textsubscript{3}Al\textsubscript{2}O\textsubscript{5}. The French government sponsored research on the compounds of cobalt, with the intention of producing a better range of blues. The work of L.J. Thénard on the ores of cobalt led directly to cobalt blue.

Cobalt violet: a pure mauve pigment consisting of cobalt phosphate or cobalt arsenate, sometimes a mixture of both. Invented in 1859.

Cochineal: a red dyestuff derived from a type of scale insect. There are two biologically distinct types, one from the Old World and one from the New World. However, the principal component of the dyestuff is the same in each: carminic acid.

‘Copper resinate’: the name often given to a green glaze, usually containing verdigris. It was widely used during the Italian Renaissance due to the lack of other good greens. Often the resin was simply a constituent of the glaze paint medium, with the oil; but sometimes the verdigris was warmed with the resin (pine resin) before mixing with the oil, and the product then is ‘copper resinate’. This product discoulers easily to give opaque brown, or even black, with exposure to light.

Craquelure: a network of cracks over the surface of a painting which appear as a result of ageing. The cracks are caused by shrinkage, the movement of the ground, paint and varnish. These are not the same as the cracks or defects caused by the inappropriate use of oil.

Crimson: the word comes from kermes: a type of scale insect. See also Llave.

Dolomite: a mixed calcium and magnesium carbonate; a hard limestone, found especially in the Dolomite mountains of the Tyrol.

Earth pigments: (brown, red, yellow, orange and black) – natural silica/clay mixes, with the colour due to iron(III) oxide in various proportions. (See Green earth and Ochres)

Egg tempera: pigment mixed with egg yolk and water to make paint. The egg is the medium. (Cennini recommends that the pale yolks of town eggs should be used as the medium for painting young flesh, whereas the deeper-coloured country yolks should be used for older, rougher faces).

Emerald green: a brilliant green pigment – ‘copper acetarsenite’ invented in 1814 and manufactured on a large scale from then on.

Energy dispersive X-ray microanalysis (EDX). For an outline of this process see page 14.

Fourier transform infrared spectrometry (FTIR). For an outline of this process see page 15.

Fugitive pigment: a pigment which is likely to fade in light.

Gas chromatography (GC): eg to find the ratio of carboxylic acids in an oil medium to identify the oil. (For an outline of this process see page 16) Before sensitive and reliable techniques like gas chromatography, there had been much argument about the medium used in certain paintings. Some artists had made plausible copies of famous works by using egg-oil and oil-resin mixes; and, because they could copy the surface appearance of a painting, they assumed that the original artist had used the same materials and techniques as they had.

Gesso: Italian for gypsum: hydrated calcium sulfate, CaSO\textsubscript{4} \cdot 2H\textsubscript{2}O. This is the familiar white material used for ceiling coving and other plasterwork in homes and elsewhere. Gypsum, anhydrite or chalk (calcium carbonate, CaCO\textsubscript{3}), mixed with glue, was used to coat panels or canvass to make a suitable surface – or ground – before painting began. (A partially hydrated form of calcium sulfate, 2CaSO\textsubscript{4} \cdot H\textsubscript{2}O, is Plaster of Paris, used in making plaster casts and for broken bones).

Glaze: a layer of translucent paint applied over other paint to modify its colour or to give depth and richness of colour.

Gold leaf: pure gold, beaten to a very thin sheet. It was often made from gold coins and required great skill and delicacy of handling, both in its manufacture and application.

Green earth: a marine, volcanic or igneous sediment containing silicates and iron(II) minerals, used alone or mixed with lead white. This colour was commonly used in early Italian painting for the underlayers of flesh.

Ground: this is the preparatory layer put over the support before the paint is applied.

Gypsum: a white mineral composed of calcium sulfate dihydrate; used in the preparation of gesso.

Haematite: a very hard red pigment, similar to red ochre: iron(III) oxide ore, Fe\textsubscript{2}O\textsubscript{3}.

Impasto: thickly applied paint which stands out from the surface of a picture – in relief.

Imprimatura: a thin layer applied to a basic ground to modify its colour preparatory to painting.

Indigo: a blue dye, obtained from the plant Indigofera tinctoria and other species, including woad.

Infrared reflectography. For an outline of this process see page 17.
Isinglass: a whitish semi-transparent glue-like substance, a form of gelatin made from the viscera of some fish, especially sturgeon. See Sturgeon glue.

Lapis lazuli: a complex sulfur-containing naturally occurring sodium aluminium silicate used to make the bright blue pigment ultramarine.

Malachite: a green pigment; a basic copper carbonate, \( \text{CuCO}_3\text{Cu(OH)}_2 \) (see also Azurite). Both azurite and malachite occur as natural copper ores. They can also be synthesised - eg artificial malachite.

Orpiment: a bright yellow mineral pigment; an arsenic sulfide, \( \text{As}_2\text{S}_3 \). Commonly found in conjunction with realgar.

Patination: a pleasing appearance of age normally acquired through the passage of time, but sometimes simulated by forgers.

Pendants: paintings often of identical size and complementary subject matter, painted to hang together.

Pentimento (plural - pentimenti): a visible alteration - where an artist changed his/her mind, as the work on a painting progressed. The word comes from Italian 'pentire' - to repent.

Pouting: transferring a design by dusting coloured powder (usually crushed charcoal), through holes pricked along the outlines of a drawing on paper or parchment.

Prancing: a preparatory coat put onto the support or ground to prevent subsequent layers from being absorbed.

Prussian blue: a complex iron cyanide of approximate composition \( \text{Fe}_3[\text{Fe(CN)}_6]_2\cdot \text{H}_2\text{O} \). First discovered accidentally in Berlin, between 1704 and 1710.
Punching: a process of gently hammering decorative indentations into gold leaf.

Raking light: light at a very shallow oblique angle to the surface of a painting, which shows up the texture and irregularity of the paint.

Realgar: an orange-red mineral pigment; an arsenic sulfide, As$_2$S$_3$. (Mineral realgar is As$_4$S$_9$). Commonly found in conjunction with orpiment.

Red earth: (see Earth Pigments)

Red lead: Pb$_2$O$_4$ is quite rarely used in paintings, except as underpaint for the much more expensive vermilion or red lake. But examples where it has been used on its own for its bright orange do occur – eg in 14th century Florentine painting.

Resin: a sticky substance which oozes out of certain trees. It is insoluble in water.

Rose madder: prepared from madder root under carefully controlled conditions by a method first developed in the 19th century.

Scheele's green: a dull green copper arsenite pigment invented in 1775 but not commonly used until the late 19th century.

Scumble: a thin opaque or semi-opaque coat of paint applied to the surface of a picture to modify it. The verb 'to scumble' refers to the process of applying this layer.

Size: a gelatinous solution used to stiffen fabric or paper.

Sgraffito: Italian for scratched. A technique in which paint is applied over gold or silver leaf and then partially scraped away to reveal the shiny metal. Most often used to represent cloth-of-gold textiles.

Smalt: a blue glass, ground to powder and used as a pigment. To make smalt, cobalt ore was roasted to make blue cobalt oxide. This was heated with quartz and potash; the blue melt was then poured into cold water to form glassy particles. These were coarsely ground to make the smalt. The deepest blue smalt contains more cobalt and has the largest particle size.

Soap: For cleaning paintings. A salt of a long chain organic acid (such as those found in animal fat or vegetable oil, or a more complex aromatic acid). The soap can be designed for use under very carefully controlled conditions of pH. It must not be too alkaline, to prevent damage to the paint surface. It can then be removed from the paint surface without leaving a residue. Ordinary toilet soap contains a high proportion of sodium stearate, C$_{17}$H$_{35}$COONa.

Sturgeon glue: a glue made from the viscera of sturgeon; superior for some uses to animal-skin glue. See also Isinglass.

Turpentine: an oily sticky substance which oozes out of certain coniferous trees, and is then distilled to make a volatile and pungent oil used in mixing paints and varnishes. It is a mixture of quite complicated hydrocarbons called terpenes.

Ultramarine: a bright blue pigment: a complex sodium aluminosilicate containing some sulfur. Until it was manufactured chemically in the 19th century it was obtained only from the blue mineral lapis lazuli mined in Afghanistan. It was more expensive than gold. Lapis lazuli is still mined from the same mountain in Afghanistan. 'Ultramarine' means 'from across the sea'.

Varnish: a transparent layer used for coating and preserving the surface of paintings. One common old varnish was made of mastic dissolved in turpentine. The discolouration of varnishes is the main reason why paintings are cleaned.

Verdigris: a bright green pigment; basic copper(II) ethanoate, Cu(CH$_3$COO)$_2$.2Cu(OH)$_2$. It was prepared by exposing sheets of metallic copper to vinegar vapours.

Vermilion: a bright red pigment – mercury(II) sulfide, HgS. Vermilion was made artificially from an early date, although it could also be obtained by pulverising the mineral cinnabar. It has a tendency to convert to metacinnabar, HgS$_3$, which is black.

Yellow lake: prepared the same way as red lake. The dyestuffs come from plant species such as dyers broom, weld and buckthorn.

X-ray diffraction (XRD). For an outline of this process see page 20.

X-ray radiography: lead white absorbs X-rays strongly, but so does vermilion (containing mercury), lead-tin yellow, and lead chromates. But it is the fact that lead white absorbs X-rays strongly, and is also widely used in painting, that gives an X-ray image in which the dark-light contrasts are more or less the same as those seen in the painting. Gesso does not absorb X-rays to any great extent. The total X-ray absorption in any area is the sum of the absorption in each of the paint layers in that area, so that it is possible to see whether the painting is directly on to gesso, or on top of blue sky or sea – both of which contain lead white in the paint mix. Flesh colours often contain lead white, so faces, hands etc. usually show up well in X-ray photographs. Titanium white is less opaque to X-rays than lead white (NB Lead is used to protect hospital radiographers from X-rays).