Lake Colors—Their Nature and Manufacture.

UNDER the denomination lakes, are comprised all those colors which owe their origin to a coloring principle of the vegetable or animal kingdom, and which consist, either of the pure pigment, or contain the same combined with an earthy or metallic base. They serve as water and oil-colors, while a small number of them only, are employed in dyeing and calico-printing. Though they do not cover as well as ordinary paints, from the fact that they possess a certain transparency, and though their stability, with the exception of one or two, is not great, they are, nevertheless, extensively employed in the arts, for the reason that their shades, in most cases, can not be replaced by any color derived from the mineral kingdom.

To begin with a description of the manufacture of blue lakes, it may be remarked that though nature has furnished us with quite a number of plants which yield blue coloring matters—botanists describe above sixty species of the genus *indigofera*—there are but a few entering into the preparation of lakes. Those furnishing the *litmus* belong to some species of lichens, found in Southern Europe, Africa, South-America, and the East Indies; and those yielding the soluble indigo, a color resembling Prussian blue, belong to some species of the genus *indigofera* which are found chiefly in Malabar, in the East and West Indies, in Egypt, and in both Central and South America. As to the soluble indigo, it is prepared in the following manner: The indigo is reduced to an impalpable powder. Then in order to free the same from a glutinous substance, it is digested for several days in weak sulphuric acid; the latter is then removed by repeatedly washing the indigo with water. When free of acid, it is thoroughly dried upon a water-bath, and if not immediately used, the powder is put in cans to cool. To each pound of good Bengal indigo six pounds of strong oil of vitriol are put in a large jar, or a tub lined with sheet lead, furnished with a cover. To this the indigo is added gradually in small quantities, care being taken that the temperature of the mixture does not exceed 212° Fahr. When the indigo is all added, the mixture is allowed to stand undisturbed for a fortnight, in order that the desired chemical action may take place. For the preparation of the soluble blue it is necessary to neutralize the free sulphuric acid as well as to combine the sulphindylic acid formed—Crums' ceruline—with a base; the latter compound will then, on account of its slight solubility in solutions of salt, fall to the bottom of the vessel. To this end, the mixture of sulphuric acid and indigo is poured gradually into a proportionally large quantity of distilled water, the liquor obtained is left to settle until clear, and finally drawn off into another vessel, where it is neutralized with a strong solution of a carbonated alkali. The indigo-carmine thus precipitated is thrown upon a filter of woolen cloth, and when sufficiently drained off is ready for market. The coloring-matter remaining in the liquor may be obtained by steeping wool in the solution, which absorbs the color, and by then digesting the fibre thus impregnated with an alkaline solution. The latter is evaporated to one half of its volume and used in connection with the alkalies for throwing down the indigo blue. One pound of Bengal indigo yields from seven to ten pounds of indigo-carmine or soluble indigo. The same should possess copper-lustre, be perfectly soluble in water, and should not show any white spots. This would indicate that it had not been well washed.

Yellow dyes are furnished by the vegetable world in great abundance. Though not very permanent, they are of great vivacity of color. In order to prepare the lakes, a decoction of the vegetable is first prepared, and to the same, when clear, a solution of alum is added, and thereupon a solution of an alkali or powdered chalk, as long as there is any precipitate In case a soluble alkali has been employed, the precipitate is only a combination of the coloring matter of the dye with the base of the alum. If, however, the alum has been decomposed by the chalk and the alkali, a mixture of the former compound with sulphate of lime or gypsum is obtained. Sometimes the dye is exhausted by means of a weak alkaline lye, after which alum-water is added to the solution. When it is desired to have the lake of a lemon cast of color, a solution of tin instead of alum is employed, or it is used in connection with it. The precipitate must be filtered, washed, made into cakes, and dried. From the decoction of the yellow wood from which the morine has been separated, a yellow lake is prepared by simply pouring a solution of basic acetate of lead into it. The precipitate is of a chrome-yellow color. Sometimes, as in case of quercitron bark, the decoction is first purified by means of glue, or lime-water. It is thus freed from a dirty, brownish-yellow matter. Yellow lakes are produced from yellow berries, yellow wood, quercitron bark, the weld, and the annotto. Recently two new dyeing materials have been brought into the European market, which may, perhaps, be used to advantage for the making of yellow lakes. Both are obtained from China, the one is described by Von Martius as the imperfect flowers of the *Sophora japonica;* the other is called "wongsky," and consists of the seed-vessels of a plant belonging to the *gentianæ*.

Red and violet lakes are obtained from cochineal, madder, Brazil-wood, logwood, lac-dye, and the saffower. These materials are largely employed in dyeing and calico-printing. The beautiful pigment from the cochineal was accidentally discovered by a Franciscan monk at Pisa, Italy. In macerating the insects with salts of tartar, in the preparation of medicine, he obtained, upon the addition of an acid, a fine red precipitate. Carmine lakes are now generally prepared by first making a decoction of the insects with alum-water—one part of alum to thirty parts of water—and afterward precipitating with, generally, a solution of soda; though the liquor is often employed which was decanted from a preparation of carmine, obtained from a cochineal decoction, to which small quantities of certain acids or salts have been added, and which had been allowed to remain undisturbed for some time. Tin and mercury salts added to the alum-water brighten the color. The red lakes obtained from the other materials above mentioned, with the exception of the carthamine, are all prepared very nearly alike. In the preparation of the madder-lakes, however, not the dye-wood itself but the garancine is employed. This is a chocolate-colored powder obtained by the action of oil of vitriol upon the ground-roots of the dye-plant. From this a decoction of alum is prepared, which is filtered hot, allowed to cool, and decanted from the separated flocculæ, which themselves yield the darkest and finest lakes. The coloring-matter is thrown down from the liquor by means of carbonated alkalies with, or without the addition of salts of tin. Madder-lakes are the least fugitive of all the lake-colors, and are applied in oil and water. They fade but slightly, even upon exposure to the direct rays of the sun. In regard to the lakes which are prepared from Brazil-wood, it has been discovered that more brilliant shades are obtained when the hot decoction of the wood in water is allowed to ferment. The reason for this has, however, not yet been satisfactorily explained. The base of the finer Brazil-wood lakes is simply alum, earth, and protoxide of tin; that of the more common ones, alum, earth, starch, and gypsum. The balls that appear in the market are formed by the addition of dextrine, glue, or gum-arabic. Lakes with violet tints are produced from a decoction of logwood in the same manner as the red-lakes are from Brazil-wood. They are also made by using an excess of alkali in the preparation of the latter.