TWO CHAPTERS IN THE HISTORY OF AN INDUSTRY

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The art of dyeing began with the first attempts of men to ornament their bodies by staining them with the juices of plants and the few minerals of striking colors which were easily obtained and did not require much skill in preparation. The North American Indians painted themselves with yellow and red ochres, while some of our ancestors in the British Isles stained their bodies with woad, the blue coloring matter formerly used in place of indigo. Doubtless, as soon as men began to wear clothes "capable of artistic treatment," these colors were transferred from the natural covering to the fabrics. It is not astonishing, then, to find that the craftsmen of the capital of Phœnicia were famous for their magnificent dyes—the Tyrian purples—fourteen or fifteen centuries before the Christian era. But while this art is interesting from its great antiquity and from the frequent references to it in the most ancient literatures, it also attracts attention on account of its intimate connection with the development of many of the sciences. Like other arts, it was at first purely empirical, its advances were mostly by accidental discoveries—jealously guarded as trade secrets by the guilds, and progress which might have been made by the aid of the developing sciences was hindered by the ignorance and the prejudice of the artisans or by the indifference of the learned to the bearing of their studies and investigations upon the lowlier life around them. The two chapters referred to in the title relate instances of what can be done by a people who have bridged over this chasm between the student and the artisan.

The improvements in the manufacture of dyes have in the remoter past been mostly in the purification of the natural material from those substances which sullied the purity of the color, or rendered the dye more difficult to fix upon the fabric. Later began attempts to isolate the "active principles" of the vegetable and animal dyes, i.e., the particular chemical compounds which give the colors to the dyes. When success crowned such efforts, the final stage of improvement was entered upon, viz., to replace by laboratory methods the natural processes by which these active principles of dyes are produced in plants and animals. This last stage became possible only when organic chemistry had begun its wonderful career of synthesis. The chemical molecular theory has pointed the way to discoveries which have revolutionized the art. The revolution, while bloodless, has not been unaccompanied by those distresses which are incidental to the more rapid changes in industries; and just now it has brought India and Great Britain face to face with an economic problem of no small importance, viz., the almost certain loss of the trade in indigo, and the probable loss of a large part of the dyeing industry depending on that trade. This chapter is not yet complete, and it will be interesting to follow out first one which has been finished, viz., the history of the madder dye.

Madder is the dried and crushed roots of Rubia Tinctorum and related species. It has been used for thousands of years The fine linen cloth found on Egyptian mummies has in some cases been dyed with madder; and so fast is this color that these ancient fabrics still show it distinctly. It was the ereuthedknon used for dyeing the cloaks of the Libian women in the days of Herodotus.* and the ereuthrodknon of Dioscorides, in whose lifetime the plant was cultivated in Caria. But it is probable that the original source of this, the fastest and, except the purple of Tyre, the most beautiful of ancient dyestuffs, was in the mountainous districts of India, where Rubia Munjista grows wild. Its use was brought westward by the migrations of the Aryan races, and several European species of the plant were found to yield the dye. Among these, Rubia Tinctorum was found to be best, and came to be cultivated exclusively It has been grown extensively in France, Holland and Italy, and to some extent in the United States. Rubia Peregrina, or Alizari, was the species cultivated in the Levant; and the root (Turkey roots) was formerly imported into England in large quantities. This dye was thus evidently very widely used, even in early times; and later it came to be so extensively used for red, pink, purple, lilac and chocolate dyeing, that it was considered by far the most important material of the dyer's art. In 1828 Daniel Kœchlin-Schouch writes, "Of all the dye-materials in general use, none exceeds in importance madder, which has become the basis of almost all our dyes." Crookes, quoting this in his Hand-book of Dyeing and Calico Printing, adds, "These words are scarcely out of date, even at the present day" (1874). In 1900 we find this statement in Sadtler's Industrial Organic Chemistry, "The importance of madder, and madder preparations, has almost entirely disappeared with the development of the artificial alizarin manufacture." Thus, during the last quarter of the nineteenth century, this great industry which gave profitable employment to whole districts in Europe and Asia, was replaced by manufactures of a purely chemical nature. To trace the course of events which led to this remarkable result it will be necessary to go back to the beginning of last century, when the finest madder was that grown in the calcareous soil (palus) around Avignon, (where its cultivation had been introduced by Colbert); that cultivated in Alsace being much inferior in quality, the difference being due to the lack of lime in the Alsatian soil. In Ure's Dictionary of Arts and Manufactures is an account of one of the first steps towards an understanding of the madder dyes "Before the time of Haussmann, an apothecary of Colmar, the madder bath was subject to many risks, which that skilful chemist taught dyers how to guard against, by introducing a certain quantity of chalk into the bath. A change of residence led Haussmann to this fortunate result. After having made very fine reds at Rouen, he encountered the greatest obstacles in dyeing the same reds at Logelbach near Colmar, where he went to live. Numerous trials, undertaken with the view of obtaining the same success in his new establishment, proved that the cause of his favorable results at Rouen existed in the water, which contained carbonate of lime in solution, while the water of Logelbach was nearly pure. He then tried a factitious calcareous water by adding chalk to his dye bath. Having obtained the most satisfactory results, he was not long of producing as beautiful and as solid reds as he had done at Rouen. This practice soon became general among the calico-printers of Alsace, though in many dye works the chalk is now replaced by lime, potash or soda. But when the madder of Avignon is used, all these antacid correctives become unnecessary, because it contains a sufficient quantity of carbonate of lime; an important fact first analytically demonstrated by that accurate chemist, M. Henri Schlumberger of Mulhausen or Mulhouse. Avignon madder indicates the presence of carbonate of lime by effervescing with dilute acids, which Alsace madder does not." M. Haussmann's name would indicate that he, too, had come from that fusion of Gaul and Teuton on the banks of the Rhine, and that he was returning to the home of his fathers when he made the long journey across France, from Rouen to Logelbach in Alsace. Not far

* Book IV., Chap. 189.—The passage is as follows, "The vestments and the ægis characteristic of the statues of Athene were borrowed by the Greeks from the Libyan women. The only difference is that the robes of the latter were made of leather, and with them the tassels of the ægis are not snakes but straps. In all other respects the style of garb is identical. Indeed the very name betrays the Libyan origin of the equipment of the statues of Pallas. The Libyan women wear over their dress bare goat-skins (aigeai) with tassels dyed with madder, and it is from these goat-skins that the Greeks have derived the word ægis."