

THE INFLUENCE OF CHEMISTRY ON THE DYER'S ART.

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A century is nearing its end which has been well named the iron age—the generation of discoveries. It is characteristic of this cultured epoch that in all matters it is penetrated, as regards the practical questions of life, by the clear and elucidatory spirit of science. New points of vantage have been always reached by means of scientific explanations and scientific analysis of what has gone before and have enabled us to get a better idea of the secrets of nature.

All kinds of progress testify to the co-operation of science and trade in an astonishing manner as we look back upon the achievements of the nineteenth century. There are many real triumphs celebrated by theory and practice hand in hand, and they continue to be gained. Above all, it is natural sciences—and particularly the sister sciences of chemistry and physics—that have set their mark upon the present age, and one branch of industry which chemistry has revolutionized and mightily advanced is the art of dyeing. In the beginning of the present century, Vitalis wrote in France, "Of all the services which chemistry can render to the arts, there are none finer than those by which it has laid securely the foundations of the art of the dyer. Till chemistry had turned its light upon dyeing it was not worthy to be called an art. There is no trade which presents greater difficulties, both in theory and practice, and which, therefore, requires deeper knowledge. How great the labor has had to be, and how persevering the study of nature before people learned how to use colors and to impress them durably upon the fabrics, the value of which they so largely increase." If this learned man could write in such a fashion at a time when chemistry was only just beginning to develop into an independent science, and the foundations of the since ever-increasing art of making artificial organic coloring matters had only just been laid, an art which opened up an entirely new field for the dyer, what words of inspiration would he have used had he foreseen what chemistry would be to the dyer now, what influence it has over him, and with what abundant proofs of its creative power it has now endowed him? To recognize the effect of chemistry upon dyeing and properly to appreciate it, we must look more closely into both earlier and more recent times.

Up to the middle of the century the dyer was exclusively dependent upon the natural dyes. These had been used from remote antiquity to improve the appearance of fibers, and to satisfy the taste of men for harmonious colors. With time the range of natural colors widened, and some of them have such excellent qualities that they still enjoy the preference of many dyers. Among these logwood, redwood, madder, sandal wood, fustic, quercitron, woad, curcuma, catechu, archil, indigo, cochineal, and some others of animal, vegetable, or mineral origin, still hold their ground. These dyes were used by strictly adhering to certain recipes, transmitted from one person to another, both verbally and in writing. Experience and close observation had taught under what conditions the dyeing processes were most successful, but the why and wherefore of the precautions to be taken was either known imperfectly or not at all. The dyer usually worked more or less in the dark, and his art was wholly empirical. As a material result, inexperienced hands used processes requiring all sorts of really unnecessary labor, and the art at last reached a point beyond which the knowledge in existence could not bring it. At soon, however, as chemical science acquired strength it was at once applied to dyeing, and with the wonderful results which we all know. It replaced isolated and inadequate efforts by the organized research of learned men and those enlightened members of the trade who foresaw what science was likely to do for them. Wilhelm von Kurrer writes in 1848: "What science has done

during the last fifty years for the dyers' art, before then entirely carried on by rule of thumb, surpasses the whole progress of the art before that time. Such thinking and creative spirits as Bancroft, Berthollet, Dangler, Hermbstadt, Kreyrig, Kurrer, Koechlin, Vitalis, Schlumberger, Thilloge, Chevreul, Persoz, Dumas, etc., have caused the dyeing and color printing trades to make enormous strides by basing them upon fixed and well-defined principles, and have given them their present degree of perfection, both scientific and practical. Results are no longer left to chance, but are based on scientific knowledge of the various coloring matter and of the materials such as wool, hair, feathers, leather, silk, cotton and linen, to which they are to be applied. During the last half-century men have arisen, thanks to the propagation of works on dyeing, to the institution of research laboratories, who have been induced to devote themselves with enthusiasm to the application of chemistry to dyeing. This has happened in every European country, and they have devoted themselves to its scientific and practical application to the trade. The light has found its way even into the smallest workshops, and has rooted out many a deep-seated prejudice, and paved the way for a knowledge of better things."

Thus we see dyeing becoming a branch of applied chemistry, and subjugating itself and its processes to the wide-reaching laws of that great science. But what had only begun in the first half of this century was victoriously continued in the second. The artificial dyes were yoked to the triumphal chariot on which the beneficent science made its entry into the dye-house. Scientific investigation of the products of the distillation of coal-tar has led to the erection of the coal-tar color making industry, a monument more enduring than bronze to those to whom it owes its existence. The first of these colors did not appear until at the end of the first half of this century, but by the happy combination of science and practice the number of these dyes has been increased in unexampled fashion during the last few decades. While the dyer was previously dependent upon the comparatively few dyestuffs furnished to him ready-made by nature, he has now an unbounded choice at his disposal. This immediately put him into a position to produce shades such as are only seen elsewhere in the productions of nature, and at the same time dyeing processes became to some extent simpler than formerly, because the accurate knowledge of their constitution which was possible in the case of the artificial dyes, enabled the best methods of using them to be worked out. Light was thrown on all dyeing processes by the exact chemical researches carried out in the laboratories which were erected in connection with all the larger dyeworks, and it became possible to regulate the methods with precision. The researches into the nature of the dyes were combined with investigations into the properties of the substances which had to be dyed, and the two kinds of work laid the foundations of the art securely. Not a few new branches of the art owe their origin to the discovery of artificial methods of making dyes, and all others owe at least immense development to the same cause. For example the Turkey-red process was directed into entirely new channels by the discovery of artificial alizarine, and the troubles caused by having to use madder, never pure and never the same thing twice running, disappeared.

We must also remember the immense impetus given by the coal-tar colors to silk dyeing. Cotton dyeing, too, has become quite a different industry since the introduction of the substantive colors and of basic mordant dyes fast to washing. The former are the cotton dyes par excellence. Everyone knows the part which acid and alizarine dyes have played in the growth of wool dyeing. Just imagine a piece dyer now without artificial coloring matters! There is no kind of textile material which has not benefited by the discovery of these bodies. One thing remains to be noted in conclusion. The present