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COLOURING MATTERS, ARTIFICIAL AND NATURAL.

A Systematic Survey of the Organic Colouring Matters. Founded on the German of Drs. G. Schultz and P. Julius. By Arthur G. Green, F.I.C., &c., Professor of Tinctorial Chemistry at the Yorkshire College, Leeds. Second edition. Pp. x+280. (London: Macmillan and Co., Ltd., 1904.) Price 21s. net.

A PART from its special value to experts as a standard work of reference, the present compilation is of general interest as enabling chemists to gauge the progress in a department of industry which is perhaps more intimately associated with scientific research than any branch of manufacture that has been called into existence as the result of laboratory work. The first English edition bears the date 1894, and it was noticed in these columns at the time of its appearance (vol. 1. p. 267). The present edition, therefore, enables us to measure the development which has taken place during the last decade. First, with respect to the actual number of coal-tar colouring matters on the market. The edition of 1894 enumerated 454 distinct compounds; the present edition comprises 695; an apparent addition of 241 definite organic products of tinctorial value in ten years is an instructive illustration of the resources of chemical science when these are requisitioned in the service of industry. The actual number of new products is, however, even greater than this, since 59 dyestuffs which were included in the last edition have been removed from the list as being obsolete. The total number of new colouring matters is thus 300, so that the increment has been taking place at the rate of 30 per annum.

A more detailed analysis of the tables will also serve to bring out the new departures which have been made, and which are, in part at least, responsible for the large number of new products added to the list. Thus in 1894 artificial indigo was entered as "not in commerce," although the fundamental process which has since been developed with such marked success in Germany was known at that time, and the references to Heumann's paper and the first patents of the Badische Company are included in the literature. In the present edition five processes for preparing synthetic indigo are tabulated, and five new products derived from or related to indigo are added to the tables as the outcome of the industrial development of the chemistry of this group of colouring matters.

In the great domain of the azo-colours, the development is quite astonishing. From 234 recorded in the last edition, the number has now reached 383, grouped into 125 monazo, 203 disazo, 45 trisazo, and 10 tetrakisazo compounds. The first representative of the group of colouring matters now known as the oxazines was discovered by the writer of this notice in 1879. In 1894 thirteen compounds belonging to this group were recorded as technical products; in the present edition 31 oxazines are in the tables. The

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first member of the sulphur-containing compounds, known as the thiazol or thiobenzenyl colouring matters, was discovered and introduced into commerce in 1887 by Prof. Green under the name of "primuline." The monopoly conferred by the right of discovery of this important compound was lost to the firm in the laboratory of which the discovery was made by the adoption of the short-sighted policy that a new product could be protected as a "trade secret." Within a year of its introduction the Germans had found out its chemical constitution and were manufacturing it, and a German firm actually obtained patents for producing it in this country as well as in Germany. Those who are now bidding for notoriety by directing public attention to the ways in which British industries have been lost may draw some very instructive conclusions from the consideration of this little chapter in the history of industrial chemistry.

Another very striking development, familiar, of course, to tinctorial chemists, and brought out conspicuously by a comparison of the two editions of the present work, is to be found in the group of sulphide colouring matters. In 1873 the French manufacturers introduced under the name of "Cachou de Laval" a brown dyestuff prepared by fusing sawdust, bran, &c., with sodium sulphide. This figures in the 1894 edition as the only compound of its class. The action of fused sulphides upon definite organic compounds of known constitution has led since 1894 to the introduction of no less than 20 new colouring matters, into the composition of which sulphur enters as an integral constituent of the molecule. Some of these compounds are black dyestuffs of great value on account of their fastness. They are, moreover, of particular scientific interest as offering a new field of research in connection with the question of the constitution of what may perhaps prove to be thiocyclic compounds. With the exception of the "immedial sky blue" of Messrs. Cassella and Co., for which a probable formula is given, not one of these new compounds has even an empirical formula assigned to it. We have here, in fact, another illustration of the well-known principle that technology is often in advance of pure science.

In many other directions can the industrial and scientific development of this great branch of chemical technology be traced in the pages of the present work. The raw and intermediate products of which the translator and editor gave an account in the English edition numbered about 243 and occupied fifty-seven pages of the first edition. In the present edition some 60 new intermediate products have been introduced, and their description extends to more than seventy pages. Neither must the theoretical developments be overlooked in connection with an industry which is so intimately associated with the advancement of our knowledge of the chemical constitution of organic compounds. Evidence of this advancement is to be found throughout the tables before us, one of the results being a more detailed and perfect classification of the groups of colouring matters and the transference of many compounds of which the constitution was formerly unknown to definite places under their group type. It is of interest to note also in passing that the

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quadrivalent character of the oxygen atom, which received such remarkable confirmation a few years ago through the researches of Prof. Norman Collie and his colleagues, now finds definite expression in the formulæ of the oxazines and certain other colouring matters.

In two respects the present edition differs from its predecessor. The tables for the qualitative examination of colouring matters have been omitted, and in their place a section on the natural dyestuffs has been added at the end of the tables of artificial colouring matters. This new section is of interest from many points of view. It serves, in the first place, to remind us that natural dyestuffs have not yet been entirely superseded by synthetical coal-tar products. It also brings out the fact that with respect to the chemistry of these vegetable colouring matters pure science is in advance of technology, inasmuch as the constitutional formula of the majority of these compounds has been determined with more or less probability. With the exception, however, of luteolin, the colouring matter of weld, which has been synthesised by Kostanecki and his colleagues, none of the products entered in this last table have been produced by laboratory processes. Such important colouring matters and dyestuffs as hæmatoxylin from logwood, brazilin from Brazil wood, quercetin from quercitron, and rhamnetin from Persian berries have for many years been undergoing investigation here and abroad, and some or all of these may have to be transferred to the tables of artificial products by the time this work reaches a new edition. Supposing such syntheses to be accomplished, the struggle between the synthetical and the natural products will no doubt furnish the industrial world with further material for serious reflection. Whether the result of the artificial production of these outstanding members of a group which supplied the world with dyestuffs before the discovery of the coal-tar products will be the same as that which followed the synthesis of alizarin, and threatens to follow the synthesis of indigo, it would be extremely rash to predict.

The usual considerations respecting the loss of the coal-tar colour industry to this country cannot but arise in looking through the present series of tables. The enormous development to which attention has been directed in this notice is almost entirely due to German discoveries. The hundreds of patents referred to in the bibliographical columns are German by an overwhelming majority. The causes of this decadence of what was originally a British industry have been so frequently discussed that it would appear that nothing further is to be gained by their reiteration. Of late years, however, two subordinate causes of this decline have been thrust upon public notice with such vehemence that the uninitiated may be led to believe that the "imperfection of our patent laws" and the want of "duty free spirit" have together wrecked manufacturing enterprise in this direction. The present writer is glad of this opportunity of expressing dissent from these statements. An amendment of our patent laws is certainly desirable, and duty free spirit would unquestionably be a boon for certain branches of manufacture. But to exalt these, which may be called minor deterrents, into the rank of a complete explanation of

British failure and German success is simply dragging the proverbial red herring across the trail.

No further commendation of the well-known work which has led to these reflections is necessary than the statement that it is as indispensable as its predecessor to all who are in any way concerned in this branch of chemistry and of chemical technology.

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THE MALAY FAUNA.

Fasciculi Malayenses. Results of an Expedition undertaken by N. Annandale and H. C. Robinson. Zoology. Parts i., ii. and Supplement. By various authors. (London: Longmans, Green and Co., 1903.)

OF late years, mainly owing to the labours of Captain Stanley Flower and to the collections made by the *Skeat* Expedition (of which, by the way, Mr. Annandale was a member), very considerable advances have been made in our knowledge of the vertebrate fauna of the Malay countries. So large, indeed, was the amount of new information thus acquired that it might have been supposed little more remained to be accomplished. If such an idea were ever seriously entertained, it is, however, at once disposed of by the work before us, which, as stated on the title-page, is intended, when complete, to give a full account of the anthropological and zoological results of an expedition to Perak and the Siamese Malay States undertaken during the years 1901 and 1902 by Messrs. Annandale and Robinson, under the auspices of the Universities of Edinburgh and Liverpool. That the wise liberality of these two bodies has been amply justified is fully demonstrated by the present parts, which form only a foretaste of what is to come.

In the introductory note to the mammals, Mr. Robinson states that he was not so successful in the capture of these creatures as he had hoped to be, and that, in his opinion, there are many new small forms yet to be discovered. Nevertheless, Mr. J. L. Bonhote, to whom this section of the work has been entrusted, announces the discovery of eight new species. Among these, the most interesting are, perhaps, a cat and a squirrel respectively allied to *Felis badia* and *Sciurus lowei* of Borneo, and thus indicating a close relation between the faunas of that island and the Malay Peninsula. Not less important is the identification of the Malay porcupine with the *Histrix grotei* of Gray, hitherto known solely by one young example.

Of even greater interest is the series of reptiles and amphibians, which is described by Mr. G. A. Boulenger. In collecting reptiles for the *Skeat* Expedition, Mr. Annandale paid special attention to snakes; on the second occasion his attentions were mainly devoted to lizards; consequently the two collections are complementary. Mr. Boulenger describes as new two frogs, as many tortoises, a lizard and a snake, while he adds one snake and three lizards to the fauna of the Malay Peninsula. The new tortoise (*Testudo pseudemys*) is a near relative of the Burmese brown tortoise (*T. emys*), an isolated species, with the limbs enveloped in a complete bony panoply, which also ranges into the peninsula. In regard to frogs, the most interesting observations are by Mr. Annan-