August Wilhelm von Hofmann, 1818-1892.

FOR those well past the meridian of life, a glimpse of early stages in a vast enterprise may have exceptional interest, because many of the later stages have come under their own observation. To a younger generation, such glimpses come as an inspiriting suggestion that seemingly unimportant occurrences, and sometimes even failures, may carry the germs of a great discovery, or conceal the foundations of a flourishing industry. From these two points of view the admirable Hofmann Memorial Lecture, lately delivered by Professor G. T. Morgan at the Imperial College of Science and Technology, will make a wide appeal.

It was appropriate that this lecture should have been delivered at the Imperial College, and by Professor Morgan. The chemistry department of the Imperial College is the lineal descendant of the Royal College of Chemistry founded in 1845 by Hofmann, who remained there as director until he returned to Germany in 1865. Professor Morgan's first appointment was in the famous Huddersfield dye-factory of Read Holliday and Sons, and although his direct contact with dye-making was broken for twenty years, his interest in that branch remained ardent, and in 1915 he rendered valuable service to the war-time isomeride of his old firm, which had then been renamed British Dyes, Limited. As might be expected, therefore, Professor Morgan's address provides an illuminating survey of Hofmann's contributions to coal-tar colour-chemistry, and elucidates the theoretical aspect of the organic branch prevailing in the 1860's.

Delicately, and perhaps wisely, it does not decide the paternity of the aniline-dye industry. While continental chemists have claimed this for Hofmann, British chemists have recognised the agency of W. H. Perkin. If dates alone are taken as the determining factor, the latter claim has the sounder foundation, because Perkin discovered mauve in 1856, while Hofmann's first preparation of rosaniline (fuchsine) was made in 1858. Moreover, Perkin was led by his discovery without delay to manufacture the product on a commercial scale, while Hofmann continued to manufacture chemists. Thus it is that, even if Hofmann was not the father of modern dye-making, he was undoubtedly the step-father, his pupils including Perkin himself, and the brilliant, but ill-fated Mansfield, along with Nicholson, Greville Williams, Caro, Martius, O. N. Witt and Griess, names which remain illustrious in the romantic history of this remarkable industry.

Furthermore, with so much heavy material for assemblage, Professor Morgan did not speculate on the origin of the early label for rosaniline, namely fuchsine. This dye was introduced commercially in 1859 by the French firm of Renard and Frank, so that *renard* the fox may have suggested the German *Fuchs*; alternatively, the lovely red colour of the then fashionable fuchsia may have inspired the dye-name.

Probably the general reader will find most attraction in the sections dealing with (1) the foundation of the Royal College of Chemistry in 1845, and (2) the development of Read Holliday and Sons. There is a queer element of the fortuitous in both events. In 1842 Justus von Liebig had visited England under the guidance of his former student at Giessen, Lyon Playfair, and after ample inspection of cities, and numerous contacts with bigwigs, had concluded that *England ist nicht das Land des Wissenschaftes*. Either the gibe or the contacts bestirred the natives, for the Prince Consort and the Queen's Physician, Sir James Clerk, were well supported in founding the Royal College of Chemistry, where, for the first time in England, chemistry became the main subject of study, instead of being a lowly handmaiden to medicine.

The development of Read Holliday and Sons, though free from pageantry, is more romantic. Born in 1809 at Bradford, Read Holliday began in 1830 to distil ammonia from gas-works liquor, and offered this new wool-cleanser to the manufacturers of Huddersfield, where he bought a strip of land on the river Colne and invited the local gas-works to dump its tar thereon. Thus he came to recognise the other volatile possibilities concealed by this unsavoury refuse, and in 1848 patented his naphtha-lamp, long used in gipsy-caravans and country-fairs. He became the owner of six tar-distilleries in the north of England and one in London, while Mansfield, just before his death in 1855, enabled Holliday to separate the benzenoid components in reasonable purity. The stage was now set for commercial application of Perkin's mauve, or aniline purple, discovered in

1856. The price of benzole rose to 20s. a gallon in 1860, when aniline was 20s. a pound.

Those were empirical days, and Professor Morgan's picture of Dan Dawson illuminates the period. This great Yorkshire personality was born in 1836 to a Huddersfield dyer, and his first 10 lb. of magenta, made in the kitchen-oven, not only realised £100 sterling, but coloured the succeeding loaves of bread. By 1874 he had made a fortune, and elected to study chemistry under Hofmann, whose researches had laid the foundation of his prosperity. Accordingly, in 1875 he proceeded to Berlin, while retaining association with his Yorkshire factories, Messrs. John W. Leitch and Company with the Colne Vale Dye and Chemical Company; and after returning from Germany, lectured for several years on the chemistry of coal-tar products at the Huddersfield Technical College.

Professor Morgan has laid under deep obligation all those to whom the early history and the early chemistry of artificial dye-manufacture appear momentous and engrossing. The dramatic evocation of lovely colours, beneficent drugs and agreeable perfumes from a disgusting waste-product must appeal to all who can savour the contrasts of life, and can appreciate the importance of the seemingly unimportant. In romance and enlightenment this industry remains unrivalled, while Professor Morgan brings both attributes vividly to mind.

Data on Post-Glacial Climatic Changes in North-West India.

By H. de Terra and G. E. Hutchinson.

IN the course of explorations carried out in the Himalayas, in Indian Tibet and the Punjab foothills, we have come across a number of phenomena which throw some light on post-glacial climatic changes. In view of the growing interest which geologists, meteorologists and archæologists have recently shown in this problem, it seemed desirable to present our observations and to give a brief summary of the multiple evidence of subrecent climatic pulsations.

This evidence may conveniently be classified as follows :—

(1) morainic deposits lying in an intermediate position between terminal moraines of the last Pleistocene glaciation and recent moraines of existing glaciers ;

(2) terraces connected with post-glacial movements of valley glaciers ;

(3) lake terraces or raised beaches indicating high water levels ;

(4) data inferred from ancient chronicles and prehistoric monuments ;

(5) indirect data from observations on rock engravings, patination, etc.

1. Recent studies on the Pleistocene glaciation in Kashmir, which were carried out by the first author and Mr. T.T. Paterson, show that valley glaciers advanced five times, leaving distinct traces of moraines and glacio-fluvial outwash deposits in the valleys. Previously already Oestreich, and especially Dainelli, had presented proof for a complete Pleistocene glacial cycle in neighbouring areas, but only through recent work has it become possible to correlate the glacial and interglacial deposits of the mountainous tract with fossiliferous (mainly Upper Siwalik) formations in the adjoining foothills. This correlation permits of dating the second Himalayan ice-advance as being of Boulder Conglomerate or Middle Pleistocene age, so that the following third and fourth glaciations would fall into the Upper Pleistocene. The terminal moraines of the fourth glaciation were observed between 7,500 and 8,500 feet above sea-level, and in most cases the corresponding trough was appreciably smaller than the higher trough scooped out by the third glaciers. This feature already indicates a progressive weakening of the climatic changes so far as their intensity is concerned. Moreover the fifth ice advance was so weak, as compared with the fourth, that hardly any distinct new troughs were made, the glaciers having formed small ice tongues which may have looked like recent glaciers in a somewhat advanced position. That this fifth ice advance was appreciably weaker than the fourth, is clearly seen from the high position of the last terminal moraines which lie 500 to 2,000 feet higher than the moraines of the fourth glaciers. Commonly there is one terminal moraine wall, but in a few valleys there are two sets, the highest and latest of which lies only 500 feet below the recent glacier snout.

These observations make one suspect a post-glacial age for the fifth ice advance in