Recent Industrial Research in Cotton.[1]

THE volume of memoirs before us includes eight summaries of the current literature on such properties of cotton and cotton materials as are studied in more detail in the majority of the twenty-three other original papers. Although the plant is the source of supply of raw cotton, it is strange that these memoirs contain only one summary of existing literature on the application of botanical knowledge to immediate cotton industrial needs. The reason is that little trustworthy literature on this important subject exists.

The summaries are well compiled, and the length of the appended bibliographies (one includes 200 references) illustrates the care taken in their production. They are invaluable to scientific workers, in cotton and other allied textile materials, who are outside the British Cotton Industry Research Association.

The original papers are contributions from the botanical, physical, chemical, and physico-chemical departments of the Shirley Institute. Papers on the measurable characters of raw cotton, the morphology of the cell-wall of the cotton hair—which embodies some excellent photo-micrographs—and the conditions causing, and the prevention of, mildew in certain dyed cloths, form the bulk of the contribution from the botanical side. It is stated that infection of a cloth with a moisture content of 7·8 per cent. developed in nine weeks. Since raw cotton will absorb this quantity of moisture on exposure to an atmosphere of 0·66 relative humidity, which is far below the average value for the Lancashire district, the oft-recurring appearance of mildew in the raw material is not surprising.

The physical papers on the behaviour of cotton yarns under alternating stresses are characterised by the enormous number of tests made. Periodic variations which have previously been established in yarns tested by continuous loading methods, are found, in many cases, either to have disappeared or to have been considerably modified. Also, as neither of the two methods of testing is directly applicable to the study of stress effects in cloth, it is very doubtful whether, at this stage, the results obtained from thousands of tests on the peculiarity of any one yarn, very often the product of poor workmanship or the effect of efforts to increase production in the mill, are worth the highly trained labour expended on them. The writer is well aware of the variability of yarns spun under the best conditions, but cannot this be paralleled in the large scatter of rounds about a target engaged by a gun well and truly laid? A good gunner knows well that a comparatively long bracket is sufficient information to enable him to register the target roughly, if many other targets are to be registered in a limited time. Later, the interesting targets are then given the further attention which appears to be adequate.

The physical papers on the rigidity and plasticity of cotton hairs are very carefully done. It is doubtful whether the determination in absolute units of the coefficient of rigidity of a cotton hair, with its characteristically open structure, can be justified, especially when the influence of the relative humidity of the atmosphere on the physical constants of the hair is almost ignored. The force required to bend a dry cotton hair is greater than the force to bend the same hair containing 20·0 per cent. of moisture, even though the wet hair has the greater cross-section. The work on the plasticity of cotton hairs is of much higher order, and the magnetic torsiometer employed in this investigation is a cleverly designed instrument, well suited to the continuous measurement of small forces.

Two good methods of measuring the lustre of doubled yarns are described. The first is a direct photographic, and the second a photometric, method, in which the intensity of the light reflected from the yarn is compared with the intensity of light transmitted through a ground glass screen, illuminated in a controlled manner. A satisfactory method of measuring the lustre of yarns has been much needed, and the definiteness of the results obtained with the photometric method is encouraging. The general utility of the investigation is marred by the absence of information on the mercerising process used in preparing the yarn, on which process the lustre of yarns so much depends.

The investigations on the chemical constituents of the benzene extract from American cotton, and the volatile products derived from cotton by the action of water and sodium hydroxide at 40 lb. pressure, almost lead one to ask whether there is anything which cotton does not contain. The detailed examination of the extracts reveals the skill and patient labour involved.

Braidy's method of determining the copper number of modified and unmodified cotton cellulose has been found satisfactory after critical examination. The application of the results of colorimetric and titrimetric methods of determining the quantitative absorption of methylene blue by cotton cellulose of varying purity to the control of the bleaching process, to the detection of oxidation of cellulose (over-bleaching), and to the distinction between some raw Egyptian and American cottons, is perhaps the most interesting of the chemical contributions. The absorption of methylene blue by cotton cellulose is shown to vary directly with the ash content, thus confirming the conclusions of Rona and Michaelis and opposing the views of Bayliss.

On the physico-chemical side, work on the properties of starches used in sizing yarns is described. The results of the investigation on the moisture-absorbing properties of thin films of cooked starch bear a striking resemblance to those obtained on the moisture-absorbing properties of cotton. The botanical origin of the starch is found to have no appreciable bearing on the moisture-absorbing power. In contradistinction to this, the viscous properties of pastes made from maize and farina starches are shown to differ considerably.

Using a more sensitive form of the Justin-Mueller turgometer, the swelling of cotton cellulose in sodium hydroxide solutions has been examined. Although this attempt to find a means of eliminating discrepancies due to differences in the visible structure of cotton hairs was not successful, some interesting structural changes are noted.

Although these memoirs are an encyclopædia of information on the measurable properties of raw, spun, and chemically treated cotton, there is comparatively little cross-connexion or generalisation. They might be compared favourably with a Greek temple in the first stages of construction. The foundations have been thoroughly explored, and a number of pillars have been begun at very short spacial intervals. We are hopeful that the superstructure will be worthy of the stoutness of the supports; meanwhile, those who are only interested in the commercial value of the knowledge can trust in this solidity until such time as the superstructure takes a form which they can recognise. F. P. S.

[1] Shirley Institute Memoirs, vol. 2, 1923. Pp. vi + 394 + v. (Manchester: British Cotton Industry Research Association, 1924.) n.p.