# PHYSICAL AND PHYSICO-CHEMICAL PROBLEMS RELATING TO TEXTILE FIBRES

## *REPORT OF DISCUSSION AT NOTTINGHAM.*

This discussion was continued at University College, Nottingham on October 30th, 1924, in conjunction with the Nottingham Section of the Society of Chemical Industry, the Chairmen being Sir Robert Robertson, K.B.E., F.R.S., Past-President of the Faraday Society and Mr. G. T. Ward, Chairman of the Local Section of the Society of Chemical Industry.

Four papers, already reported in this issue, were read and a long discussion took place on each.

**Dr. W. Lawrence Balls** spoke on the subject of his introductory address (see pp. 223-226). In reply to a question on the connection between the fibrils of the cotton fibre and the lustre after mercerisation, he referred to his work on fibrils generally, published in the *Empire Cotton Review* of January, 1923. The use of cotton appeared to be justified only by its great tensile strength which, in fine and coarse varieties and allowing for air spaces, worked out at 17 to 18 tons per square inch. This, however, was not translated into the tensile strength of the yarn. As regards the mechanism of swelling, he could only say that owing to its structure, the fibre was anisotropic, and the longitudinal swelling, which was easy to measure, was different from the tangential or radial. He had long been trying, but unsuccessfully, with Mr. Hancock, to measure the changes in radial dimensions, but had only succeeded in doing so with the fibre immersed in liquid, which of course altered its properties.

**Dr. J. Barratt** gave a summary of his work on the lustre produced in cotton by mercerisation and on the measurement of the transparency of a fabric (see pp. 240-250).

**Dr. Guy Barr** spoke on the action of light on fibres and textiles (see pp. 284-294). In reply to numerous questions he touched on other agencies that might be at work such as chemical action resulting in an increase in acidity, but did not think that the experiments were vitiated by the presence of micro-organisms, as these were destroyed by the short wave-lengths most destructive to the fabrics. In some recent experiments he had been following up the fall in viscosity in solution of cellulose that had been exposed to light and thought that the initial high viscosity might be due to a highly polymerised cellulose forming the outer cuticle. The Chairman supported this by reference to the presence of a small proportion of highly viscous cellulose nitrate in gun-cotton; and with reference to use of the mercury and carbon arcs for bringing about fading of colours, he preferred the latter as giving a spectrum more near to that of the sun's, while for

the same object he had some hopes of sources still more favourable from this point of view, namely, the pointolite and the daylight lamp.

**Dr. S. A. Shorter** described his views on the behaviour of woollen fabrics during manufacture with reference to general colloid theory (pp. 228-235). In reply to Dr. Balls, who pointed out the essential difference in a tructure between silk, which is extruded, and the highly cellular cotton and wool, he stated that the retraction of silk and of artificial silk was different from that of wool; and in reply to the further question as to whether there ought not to be some relation between the maximum extension of the wool fibre and the dimensions of the network on the supposition that the elastic network was rigid and had a kind of "lazy-tongs" structure, he said that the 40 per cent. extensibility was only found with cold treatment; hot water had a permanent effect. All fibres showed more or less the extension and recovery, but cotton and silk gave permanent extensions. When wetted, wool only swelled in width, but silk also in length. The time of recovery was always longer than that of extension. Theoretically, it was infinite. He did not think that the water content of the wool fibres affected this property greatly; benzene had no effect, but alcohol caused swelling. Mr. Calam suggested that the cell walls might be simply the dividing lines between large colloidal molecules, which in recovering after stretch re-established a molecular equilibrium.

**Sir Robert Robertson** on closing the discussion said he could fully realise the importance of this kind of work in the rigid control of manufacture. During the war they introduced a new propellant made from nitro-cellulose of a low nitration, dissolved in alcohol-ether instead of acetone. The new process worked well on the experimental as well as on the large experimental scale. A factory was built at Gretna and the manufacture proceeded smoothly for three months. Then in some batches the cords emerged, not continuously, but in jerks. The cotton was traced to two works, in one of which the waste cotton was boiled in open pans instead of keirs. The viscosity of this cotton was not correct, and the introduction of technical control and viscosity tests on the cotton quite removed this trouble.