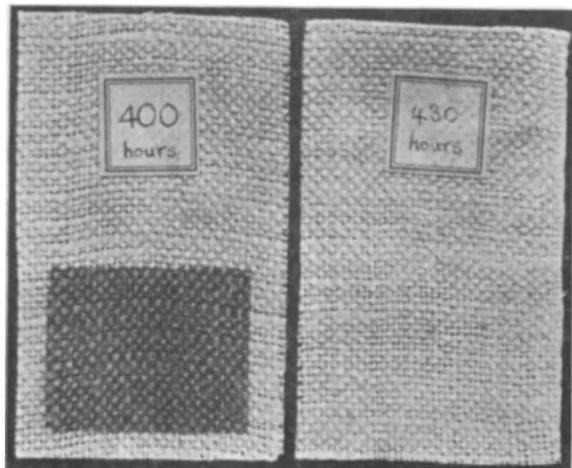


Permanent Bleaching of Ligno-Cellulosic Materials

At the present time the bleaching of ligno-cellulosic materials such as sisal, jute and manila is, as normally carried out, of only temporary efficacy, for the bleached materials gradually discolour again on exposure to sunlight.

It has now been shown that this discoloration can be prevented and bleaching thereby rendered permanent by subjecting the materials to certain esterification and etherification treatments, particularly acetylation, benzoylation and methylation.

Acetylation has been carried out in a number of ways by means of acetic anhydride in the presence of various acidic and basic catalysts. Benzoylation has been accomplished by treatment with benzoyl chloride in the presence of pyridine at about 100° C. Both these processes have been employed to give complete protection against light discoloration. A marked, though only partial, effect has been obtained on methylation by successive treatments with ethereal diazomethane. Methylation with dimethyl sulphate in the presence of strong alkali has also been found to be partially effective, but in this case the effect is accompanied by considerable damage to the fibre.



In the photograph, untreated jute, of which a limited area was exposed to the light of a carbon arc lamp for 400 hours, is shown on the left. The degree of discoloration is considerable. On the right is a sample of acetylated fabric in which the equivalent area was exposed for an even longer period. In this case no discoloration at all is perceptible.

It is tentatively suggested that the cause of the discoloration is to be found in the reactivity of the phenolic groups of the lignin present in these fibres, which, under the influence of light, tend to polymerize to coloured quinones. By causing the reactive phenolic groups to combine with alkylating or acylating agents, therefore, the discoloration is prevented.

I am indebted to the Sisal Growers' Association for permission to publish this note.

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Effect of Hydrogen Peroxide in the Presence of Copper Sulphate on the Shrinkage of Wool

NILSEN¹ has reported that chlorine dioxide imparts an unshrinkable finish to wool when applied in a solution from carbon tetrachloride. Experiments have been conducted to examine the effect of oxidation by hydrogen peroxide in the presence of a copper salt on the shrinkage of wool.

The knitted fabric used was made from 60's quality, count of yarn 1/15, circular knit, and the degree of shrinkage through felting was determined by reduction in area during hand milling at about 50° C. in an aqueous solution containing 5 per cent soap and 0.2 per cent sodium carbonate. All measurements were made after the samples had been relaxed by soaking in water for about ten minutes. Samples measuring in each instance about 30 sq. in. in area were immersed in 600 ml. of 0.4 per cent hydrogen peroxide to which 25 ml. of 5 per cent copper sulphate solution had been added and which had been brought to pH 4.2 with 5 per cent sodium bicarbonate solution. Lipson² has shown that pH 4.2 is the value for maximum attack.

The solution was brought to the boil in ten minutes and maintained at the boil for ten minutes. After washing in running water for one hour, the samples were measured and then milled for about fifteen minutes with measured control samples. The percentage reduction in area during milling was 40 per cent and 15 per cent for the control samples and treated samples respectively.

It was found that by soaking the samples before milling, for five minutes, at room temperature (17° C.) in 5 per cent sulphuric acid solution, the shrinkage during milling in the treated samples was reduced further. The reduction in area was 37 per cent and 3.5 per cent for the control samples and treated samples respectively.

Using the apparatus devised by Lipson³, frictional measurements were undertaken to discover if the treatment affected the directional frictional effect. The values before and after treatment were found to be the same.

Experiments were carried out to determine the effect of the treatment on the extensibility of the fibres. After treatment, fibres were found to be more easily extensible, yet the ability to recover from deformation was not impaired. Thus it appears that the unshrinkable finish is produced by means which differ from those suggested for the majority of other anti-shrink reagents, namely, reduction of directional frictional effect or reduction of extensibility of the fibre.

It is intended to publish a detailed account of this work in the *Journal of the Royal Society of New South Wales*. The interest shown and constructive criticism provided by Mr. M. R. Freney, officer in charge, Australian Wool Realization Commission Testing House, is gratefully acknowledged. Thanks are also due to Mrs. F. Harris for valuable assistance with the frictional measurements and to Dr. F. P. Dwyer for help in preparation of this communication.

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¹ Nilssen, Ph.D. Thesis, Leeds University (1937).

² Lipson, M., *Proc. Roy. Soc. N.S.W.*, 76, 225 (1943).

³ Lipson, M., *Nature*, 156, 268 (1945).

Man's Reaction to Mosquito Bites

It is widely known that different individuals give very different reactions to the bites of insects, and also that repeated exposure may alter the reactions of one individual (Boycott¹, Hecht²), but surprisingly little work has been done on this subject. The availability of a group of human volunteer subjects for medical research made it possible to investigate the effect of the bites of various species on individuals who could be kept under observation for long periods.

In the first series of experiments, the yellow fever mosquito *Aedes aegypti* was used, and only subjects who had never travelled outside Britain, and who were, therefore, unlikely to have been previously bitten by this species, were exposed. Twenty-five volunteers all give a similar reaction. When bitten by *A. aegypti* for the first time there was no immediate cutaneous response, other than a tiny red spot about 1 mm. in diameter at the site of the bite, and no itching was observed. After a variable period, however, usually between twenty and twenty-four hours, a marked delayed reaction occurred. A red patch about 3 cm. in diameter surrounded the bite, and the central 1 cm. was seen to form a definite weal. This condition was observed over several days, the itching and other symptoms waxing and waning several times.

The volunteers were bitten by *A. aegypti* on several occasions for about a month, and at the end of that period the reaction was markedly different. An immediate reaction had developed—as soon as the mosquito had fed, a weal developed at the site of the bite, an area of erythema appeared surrounding the weal, and the skin itched. Within two hours all these symptoms disappeared completely, but after twenty to twenty-four hours the same delayed reaction noticed on the occasion of the earlier exposures appeared.

After a further period of exposure there was another modification. The immediate reaction persisted unchanged, but the delayed reaction got gradually less severe and eventually disappeared. This meant that the bites were less troublesome to the victim.

The volunteers never got beyond this stage, but in other individuals who have been repeatedly exposed to thousands of bites from *A. aegypti* I have observed that the immediate reaction also disappears.

Man's reaction to the bites of this species may then be tabulated as follows: each stage is reached after further exposure.

Stage	Immediate reaction	Delayed reaction
I	—	+
II	+	+
III	+	—
IV	—	—

I suggest that these two reactions are quite distinct and are probably caused by different antigens in the saliva of the mosquito.

Other experiments have been carried out with *Anopheles maculipennis atroparvus*. Most men when first bitten gave the stage I reaction, and it seems likely that the minority who gave stage II (three out of twenty-five volunteers) had had previous exposure to the mosquito. After exposure, the immediate reaction was developed, and in some cases stage III was reached. I have not yet produced stage IV experimentally, but have observed it in individuals known to have been exposed to this mosquito for several years.

The sensitization and immunity in these delayed and immediate reactions seems to be specific. Thus one man may simultaneously give a stage I reaction to *Anopheles* and a stage II reaction to *Aedes*.

Other species of biting insects appear to give results which fit into the same scheme, with minor modifications. Most human beings appear to give very similar results when subjected to the same degree of exposure, though special cases of hypersensitivity and severe allergy also occur.

The whole problem is under further investigation.

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¹ Boycott, A. E., *Univ. Coll. Hosp. Mag., Lond.*, 13, 200 (1928).

² Hecht, O., *Rev. Sanid. Asistencia Social Caracas, Venezuela*, 8, 391 (1943).