length of the life-cycle of *Xestobium* depends upon : (*a*) condition of the timber with reference to fungal decay ; (*b*) moisture content of the timber ; (*c*) temperature conditions.

For example, the insect has been reared in the remarkably short period of 11 months in willow in an advanced stage of decay at moisture content of 18–20 per cent (based on dry weight of wood) and at a temperature of 20°–25° C. On the other hand, under similar conditions of temperature and humidity, but with wood in a very much less advanced stage of decay, the beetle has not yet completed its development after a period of 22 months. Furthermore, at temperatures of 20°–25° C., the duration of the life-cycle of the insect reared in oak sapwood, in varying stages of decay, and at moisture contents less than 18 per cent, occupied 28–30 months and longer. Under out-of-door conditions in decayed oak and willow, it has been prolonged still further and has not yet been completed.

Now that it is possible to breed *Xestobium* in the laboratory, further work is in progress on the relationship between the type and extent of fungal decay in timber and its susceptibility to attack. The results so far obtained, however, lend support to the view that the development of *Xestobium* in buildings is extremely slow unless conditions unusually favourable for rapid decay of the timber are present.

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Dec. 18.

[1] *J. Roy. Soc. Arts*, **72**, (3720) ; 1924.

Transformations of Isomeric Sugars

DEFINITE evidence is now available of the correctness of the views expressed in our former letter on this subject[1], as, in a smooth series of reactions, we have succeeded in converting *d*-glucose into *d*-galactose and *l*-gulose. The two transformation sugars have been isolated separately and identified.

Starting from α-methylglucoside, an anhydro ring was formed between positions 3 and 4 of the glucose chain as a result of consecutive reactions which gave as the end product an amorphous 2-acetyl 3 : 4-anhydro 6-trityl α-methylhexoside. After opening the anhydro ring, two distinct acetone derivatives were obtained, namely :

(*a*) A monacetyl monacetone methylhexoside, m.p. 101°–102°, $[\alpha]_D$ + 127·3° in chloroform.

(*b*) A monacetyl monacetone methylhexoside, m.p. 176°–178°, $[\alpha]_D$ + 76·8° in chloroform.

On deacetylation, the compound (*a*) gave a theoretical yield of a monacetone methylhexoside, m.p. 109°–110°, $[\alpha]_D$ + 147·2°, from which, on partial hydrolysis, α-methylgalactoside was obtained which showed correct melting point and mixed melting point and a specific rotation of + 175·5° in water. From this, in turn, *d*-galactose was isolated and identified by determination of the optical activity and by conversion into the phenylosazone.

In a parallel series of reactions, the isomeride (*b*) gave a monacetone methylhexoside, m.p. 132°–133°, $[\alpha]_D$ + 88·5° in chloroform. On complete hydrolysis to the parent sugar, the rotation became lævo, $[\alpha]_D$ − 17·9°, and as the phenylosazone melted at 156°, the product was evidently *l*-gulose. The scission of the 3 : 4-anhydro ring in glucose may give four possible products : *d*-glucose, *d*-allose, *d*-galactose and *l*-gulose, and doubtless all are present. Of these only *l*-gulose is lævorotatory, and its isolation together with *d*-galactose is of special interest in view of the relationship of these hexoses with ascorbic acid and lactose respectively. We are accordingly extending our work with the object, *inter alia*, of converting maltose into lactose.

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[1] NATURE **133**, 871 ; 1934.

Luminous Night Clouds over Norway in 1933 and 1934

As reported in a letter to NATURE[1] large masses of noctilucent clouds were seen over southern Norway in the night of June 30–July 1, 1934. From three of my aurora stations I got a series of simultaneous photographs of these clouds. The plates have now been measured, and the results will soon appear in *Astrophysica norvegica*. The following points from this paper may be of interest :

Seven pairs of plates gave the following 41 heights in kilometres : 82, 83, 82·5, 84, 84, 82·5, 82·5, 82, 83·5, 82, 82, 85, 82·5, 81, 82, 84, 81, 80·5, 81, 82, 81·5, 81, 81·5, 82·5, 82·5, 82, 82, 82·5, 83, 82, 78, 82, 82, 83·5, 82, 82, 81, 83·5, 82·5, 83, 81. The mean, 82·2 km., agrees very well with the mean value 82·08 km. found by Jesse from observations in the years 1889–91. It also agrees with my own measurements from 1932, which gave 81·4 km.

The velocity of the clouds was 80–83 metres a second from east to west. A series of waves with their crests orientated north and south appeared, the distance between successive crests being 6–9 km.

As observed in 1932, sun rays passing nearer to the earth's surface than about 30 km. do not make the clouds shine. This may suggest that the clouds are chiefly illuminated by ultra-violet rays.

From different people I have received observations and photographs of luminous clouds on the following nights : 1933 : July 4–5, 7–8, 9–10, 19–20, and August 9–10, 23–24. 1934 : June 30–July 1, July 5–6, 6–7, 16–17, 17–18, 18–19, 30–31, July 31–August 1, August 7–8.

A very interesting case is the occurrence of such clouds over central Norway on July 19–20, 1933, because similar clouds were observed 33 hours later over Canada[2], coming from the east-north-east, which corresponds to a drift of 48–57 metres a second, if the clouds had drifted from Norway to Canada. For further details I must refer to the complete paper which is in print.

In conformity to the opinion expressed by Vestine in his paper mentioned above, it seems to me that the luminous night clouds are likely to consist of cosmic dust coming from interplanetary space into the upper atmosphere in the same way as shooting stars and meteors. The arguments in favour of this opinion are the following :

(1) The occurrence of luminous night clouds after the great Siberian meteor (1908), also adduced by Vestine as an argument in favour of a cosmic origin of the clouds.

(2) The occurrence of the clouds in the months of June and July, with a maximum near the end of June, which is comparable with the fact that shooting stars appear at certain fixed dates of the year. The reported occurrences of such luminous clouds in the