observed was the formation of groups of vessels with a characteristic angular appearance.

These observations on *Acer rubrum* are of interest in that they give some insight into the causation of tension wood at the hormonal level. The participation of auxins in the development of tension wood has been postulated by Jaccard[6], Onaka[1] and Nečesaný[7]. Wardrop[8], however, in a discussion of tension wood formation has suggested that auxin is only related to the peripheral distribution of cell division in the cambium. Thimann[2] has deduced that tension wood would be formed in a region where there is an indolyl-3-acetic acid (IAA) deficiency. He argues that tension wood forms on the upper side of stems, the side from which auxin tends to move. The auxin level would be further decreased by the presence of active peroxidase, known to be present in tension wood. Nečesaný[9] has shown that when IAA is added to the upper side of stems which are actively forming tension wood, the formation of this tissue was retarded.

Our observations support the view that tension wood is formed under conditions of IAA deficiency. Tension wood is formed below the rings of TIBA, and it has been shown[10] that in petioles of sweet potato TIBA effectively blocks auxin transport, therefore a low auxin concentration is to be expected below the rings of TIBA. We have also observed in preliminary investigations that the induction of tension wood formation by TIBA can be prevented by IAA application.

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Gelatinous Fibres in Ash (*Fraxinus excelsior* L.)

TENSION wood in dicotyledonous trees and shrubs is recognized by the presence of gelatinous fibres. These fibres have an inner layer, composed almost entirely of cellulose (the G-layer), which may replace either the S_3 or both the S_3 and S_2 layers of the secondary wall of the fibres. In some instances the G-layer may occur in addition to the S_2 and S_3 layers of the fibre wall. In transverse sections the G-layer may commonly be seen to have pulled away from the remainder of the wall on one side.

The difficulty of recognizing gelatinous fibres in ash suspected of containing tension wood has been remarked on by a number of authors[1–4]. The difficulty appears to be due to the lack of a distinct G-layer.

Recently a piece of fast-grown ash came into our possession. Sections which were taken from this specimen in order to investigate its lignification showed gelatinous fibres with well-developed G-layers. The log had been cut at approximately 3 m above the ground from the main stem of a tree growing in Pinner (Middlesex). There were 13 growth rings (Fig. 1), the widest being the ninth (1 cm). The log was approximately 17 cm in diameter.

Application of phloroglucinol and concentrated hydrochloric acid to the smoothed end-surface of the log showed the early wood of each growth ring to be well lignified, but the extensive late wood was poorly lignified. When transverse sections 20μ thick were treated with these

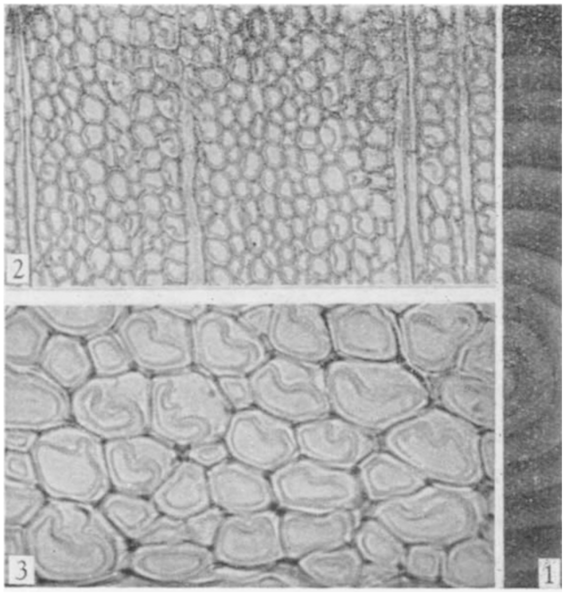

Fig. 1. Surface view of the log of fast grown ash used in this study (× 0·5)
Fig. 2. Transverse section of ash stained with safranin and light green and showing gelatinous fibres in the early wood (× 160)
Fig. 3. Gelatinous fibres in the early wood of ash (× 560)

reagents the comparatively high degree of lignification in the early wood was seen to be confined to the vessels and parenchyma in that region. The fibres throughout the growth rings were uniformly poorly lignified except for the middle lamella which was well lignified.

Fibres with apparently typical, convoluted, gelatinous layers were widely distributed in the early wood (Figs. 2 and 3). These fibres were almost completely unlignified, with the inner (G) layer showing no coloration when tested with phloroglucinol and hydrochloric acid.

When sections were treated with chlor-zinc-iodine the secondary walls of the fibres in the early wood showed a consistent pale violet coloration; this colour was more deeply developed in the convoluted inner layer when this was present. Treatment of the sections with ruthenium red also revealed a distinct inner zone to the secondary wall of the fibres, although no such layer was seen in sections of ash that had been grown at a slower rate.

By the use of differential staining with safranin and light green the gelatinous layer was stained green, with an intensity depending on the degree of lignification. Using chlorazol black E and lignin pink[5] the gelatinous layer was stained grey/black with the remainder of the secondary wall pink.

Transverse sections viewed between crossed 'Polaroids' showed the inner convoluted layer of the fibres to be non-birefringent.

The presence of such well-developed gelatinous fibres in ash is of interest, and may well be accounted for by the extremely rapid rate of growth of this particular tree. It is known that the rate of growth affects the formation of reaction wood in conifers[6] and the same may well be true of dicotyledons, although there is no published evidence on this point.

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