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Translucent Wood

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Summary

Wet cross-sections up to several centimetres thick of young trees show marked translucency. Various research applications are suggested by the observation of this phenomenon.

Under certain conditions, wood in thick sections can exhibit marked translucency. This phenomenon does not appear to be generally recognized although it can scarcely have escaped previous observation, and the transmission of radiation through thin sections is of course a common research procedure.

Freshly-cut cross-sectional disks, 2 cm thick, and 5 to 10 cm in diameter, of young trees of *Eucalyptus sieberi*, in the green state, when held up to direct sunlight, or even to sunlight reflected from a white surface, were found to transmit a considerable portion of the incident light, the transmitted light appearing as a rich rosy colour on the side of the disk remote from the source. The effect appeared to be enhanced by evacuating air from samples submerged in water under vacuum. The passage of opaque objects on the side of the disk receiving the incident light can be clearly discerned from the other side. Other eucalypts were found to behave in a similar way. For example green sections 4 cm thick of a 12 year old tree of *E. regnans* held up to a bright lamp showed the effect very clearly in the sapwood but not the heartwood; this allowed the limits of the heartwood to be discerned very much more clearly than in reflected light. Boards 2 cm thick cut from the sapwood but with their face in a tangential plane were quite opaque. If the wood is exposed to the air the translucency disappears on partial drying, but it can be restored immediately on rewetting.

It was thought at first that the water-filled vessels were acting as "optical fibres", the light being transmitted by internal reflection from the walls. Synthetic systems of this sort, notably fused quartz tubes filled with tetrachlorethylene, are now showing great promise for telecommunications (Anon. 1962). Actually the idea of piping light along a tube was first thought of by Baird, the inventor of television. The vessel diameter in young eucalypts is of the order of 100 μm, which is similar to that of the wider tubes used in the telecommunications work. However, 2 cm sections of a softwood *(Pinus radiata)* from a young tree were also translucent, and light can apparently be transmitted by mechanisms other than internal reflection.

A number of applications are suggested by the recognition of wood translucency. Spectral analysis of the transmitted light may yield information on the chemical nature of the transmitting membranes or internally reflecting surfaces,

e.g. vessel walls *in situ*. In hardwoods vessel length and diameter would be expected to influence the intensity and frequency distribution of the transmitted radiation, and the use of logs of different length, perhaps with laser sources, might provide data relevant to vessel length distribution. Incipient tylosis formation in different species may be amenable to study by light transmission. The effects of changing the moisture content and of replacing the water with other liquids also require investigation. It is even conceivable that a translucent wooden window might achieve architectural popularity.

References

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