This will indicate that lignin must be viscoelastic by its nature. While the primary, secondary and tertiary walls were not differentiated, minute capillar openings were seen in the secondary cell wall. The smallest diameter of the openings were estimated at nearly 10 mμ. This agrees with the result of the previous observations made with thin sections. (K. Kobayashi and T. Kondo, Collected Papers of Nihon Kagaku-seni Kenkyusho, 8, 1, 1943).

Observations of the radial sections displayed the thin layer of primary wall which consists of striations arranged almost perpendicular to the fiber axis, in agreement with the conclusions inferred from optical microscopic examinations. The laminated structure of secondary wall was exhibited in detail by the layer-by-layer slicing of the wall. The fibrils in each layer are bound together somewhat tightly. But the cohesion between layers are so loose that they could easily be stripped off from each other. The inclination of fibrilles in each layer varies stepwise, but does not reverse in direction, as were suggested by many investigators. (K. Freudenberg; Tannin, Cellulose, Lignin, Julius Springer, Berlin, 1933). The fibriles in the innermost layer of secondary wall have a very large angle against fiber axis. The tertiary wall which is the inner surface of the tracheid, has a granular construction instead of a fibrillar structure. In the cell wall of ray cells the fibrils run in parallel to the cell axis and accordingly perpendicularly to the tracheid axis.

Observations were extended also to the surface of the wood fibers of unbleached and bleached rayon pulp (almost free from lignin), and some interesting facts were revealed with regard to the structure of bordered pits. The primary wall around the pit opening forms a disc with a circular arrangement of fibrils. On the other hand, the fibrils of the secondary wall run in a stream-line shape along the pit aperture. Furthermore, the existence of a thin membrane other than a valve was recognized, which intercepts the pit opening. Reference has not yet been made to this in the field of plant anatomy.

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22. The Relation between the Mechanical Properties of Polymethylmethacrylate Films and their Degree of Polymerization and Molecular Orientation

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Mechanical properties of streched films of fractionated polymethyl methacrylate (degree of polymerization P=240–16000) were measured. Tensile strength increased with P, but reached to a constant value at higher value of P (Table 1). Unfractionated polymer of $\bar{P}=800$ showed lower value than fractionated one, although this was uncertain at higher value of $\bar{P}$.

Table 1. Relation between the degree of polymerization and tensile strength (Kg/mm^2)

Degree of drawing (%) \ P	370	590	1040	1970	11600	16000	Unfractionated	
							800	8900
0	6.4	7.2	7.4	6.7	6.9	7.0	4 8	7.0
100	8.5	10.0	9.8	9.8	10.3	10.0	7.7	11.1
200	9.9	12.3	12.2	12.3	14.2	13.2	8.7	17.0
400	12.9	17.2	18.8	18.8	21.0	18.5	12.6	29.0

The degree of polymerization has more remarkable influence on the flex-life (folding strength) than on tensile strength (Table 2). The flex-life of unfractionated polymer was inferior to fractionated one.

Table 2. Relation between the degree of polymerization and flex-life (cycles).

Degree of drawing (%) \ P	370	590	1970	3880	Unfractionated	
					840	13000
0	28	24	27	22	20	22
100	89	426	680	712	115	97
200	238	1496	3105	2683	188	189
400	735	4010	18160	21780	669	2630

23. The Elasto-viscous Behaviour of Plasticized Polyvinyl Chloride at the Elevated Temperature. (III)

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The variation of the elongation of plasticized polyvinyl chloride films with time under constant load was estimated at various temperatures. Appling the four element mechanical model which consists of springs and dash-pots (W.M. Gearhart and W.D. Kennedy, Ind. Eng. Chem., **41**, 695 (1949)), the spring constants and viscosity of dash-pots were calculated. As plasticizers, di-n-octyl phthalate (DOP) and tricresyl phosphate (TCP) were used.

The relation between the concentration of DOP and the logarithm of the principal viscosity η_3 (the viscosity of the series connected dash-pot) was linear at every temperature except 150°C. Linear relation between ln η_3 and 1/T (T;