analysées dans le but de simplifier la classification des espèces de bouleau, et de fournir des moyens faciles d'identification. Cinq caractéristiques utilisables ont été definies et a partir de celles-ci, les observations de l'auteur sur la taxonomie de Betula obscura KOTULA, B. carpatzca WALDST. et KIT., B. *tortuosa* LEDEB., et B. oycoviensis BESS. ont été confirmées. L'auteur suggere egalement le choix d'un petit nombre de mesures foliaires comme base pour de nouvelles recherches taxonomiques.

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A Note on the Variation of Flamy Figure in Silver Birch

(Betula verrucosa Ehrh.)

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Studies made in Perthshire in Central Scotland have shown that the woodlands of natural birch contain individual trees characterised by well-defined flamy figured grain.

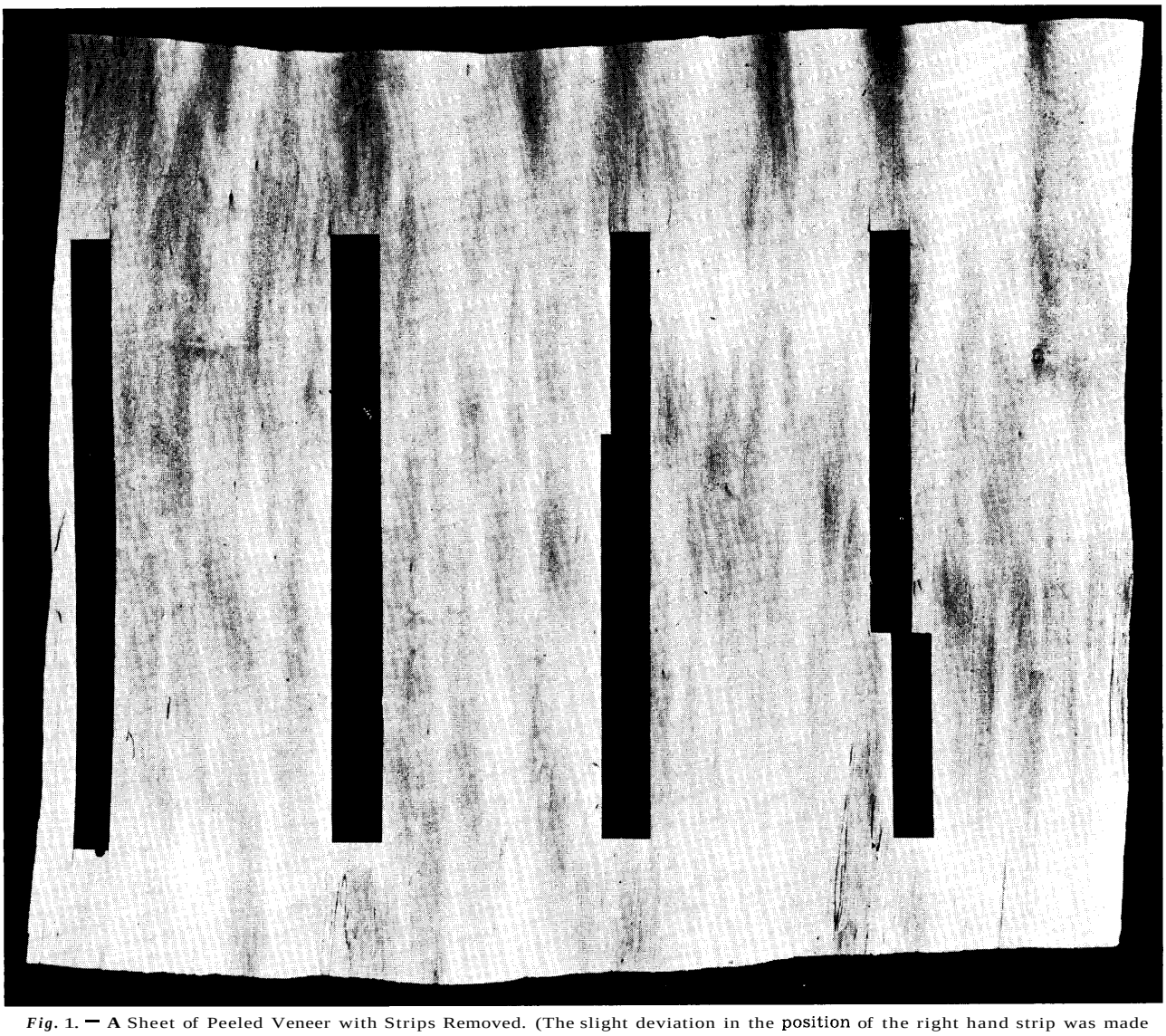

Fig. 1. — A Sheet of Peeled Veneer with Strips Removed. (The slight deviation in the position of the right hand strip was made to avoid a small knot.)

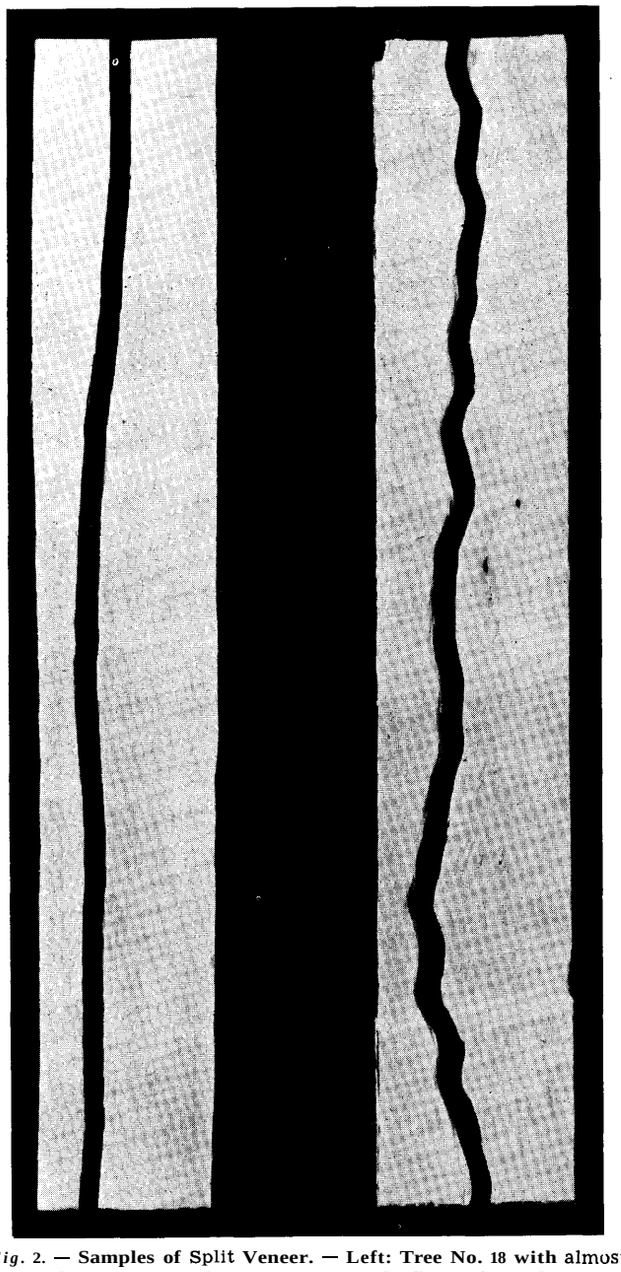

Fig. 2. — **Samples of Split Veneer. — Left: Tree No. 18 with almost straight grain; —** ***right:*** **Tree No. 17 with 'flamy' figured grain.**

The veneer quality of thirty sample trees of Silver birch, ***Betula verrucosa*** EHRH. from Perthshire have been examined by Mr. R. J. NEWALL at the Forest Products Research Laboratory, Princes Risborough, England. Logs ten feet long were cut from the bottom length of the sample tree stems and divided into billets three, two and three feet long (**0.9, 0.6** and **0.9** metres) respectively, for peeling and slicing tests. It was found that fifteen of the trees showed varying degrees of flamy figure. It was possible to describe this variation in figured grain using the terms 'intense', 'moderate', 'slight', 'very slight' and 'trace' and this suggests that the range of variation is continuous. This note describes an analysis used at the Forest Research Station, Alice Holt Lodge, Farnham, England which confirms that flarny figured grain in birch does show a continuous range of variation.

'Flamy' figured grain is caused by directional changes in the grain pattern. On the underbark surface of the wood these appear as longitudinal waves or ripples and as less obvious horizontal ridges around the stem. Both these features are closely associated and have their own characteristic decorative effects. On both peeled and sliced veneers comparisons of the degree of figured grain can be made both between and within trees by splitting pieces of peeled veneer and observing the number of waves along a given length. The number of waves increases as the degree of 'flaminess' intensifies.

Sampling and Assessment Method

Sheets of peeled veneer were obtained from the lower billets of fifteen sample trees, one (tree 18) with relatively straight grain and fourteen with flamy figured grain; in seven of these trees veneers were also available from the upper billets. The north point had been marked on the trees before felling so that it was possible to divide the sheets of peeled veneer into north, south, east and west facing sectors. Four strips of veneer each **60** cm. in length and 2 to 4 cm. in width ***(Figure 1)*** were cut from each sheet to correspond with the four cardinal points of the compass. Slight deviations in the position of the sample strips of veneer were sometimes necessary to avoid areas in which the grain pattern was affected by knots. The strips were then divided into three equal lengths to provide three 20 centimetre long samples for each compass point, giving a total of twelve sample strips for each billet.

A slight incision was made at one end of each sample strip so that they could be broken into two pieces ***(Figure*** 2) The numbers and heights of the waves were measured on one of the split pieces. **A** wave was defined as "any rise more than **0.49** mm. above the horizontal line between two points irrespective of the distance apart of the points".

Table 1. — **Ranked means for numbers and heights of waves and visual rankings by two independent observers.**

Mean Number of Waves per 20 cm		Mean Height of waves		Visual Ranking Observer A	Visual Ranking Observer B
No of Waves	Tree No.	Height of Wav.(min.)	Tree No.		
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
2.00	**18**	0.81	7	18	18
3.08	**20**	0.86	8	8	8
3.25	**8**	0.90	11	7	7
3.58	**29**	0.93	30	30	30
4.75	**30**	1.01	9	9	11
4.83	10	1.05	12	20	20
5.14	**11**	1.06	18	29	27
5.17	**27**	1.16	10	11	9
5.18	**9**	1.19	1	27	1
5.33	**7**	1.35	13	10	29
5.42	14	1.36	17	13	13
5.92	1	1.51	27	14	14
6.50	**13**	1.63	29	1	10
8.08	17*)	1.68	20	17	17
9.00	**12**	1.93	14	12	12

Rank Correlation Coefficients:— Col. **1** X Col. **3** = **0.13**
Col. **1** X Col. **5** = **0.79*****
Col. **1** X Col. **6** = **0.69****
Col. **3** X Col. **6** = **0.51**"

* Significant at 5% level
** Significant at 1% level
*** Significant at **0.1%** level
S. E. for mean no. of waves = ± **0.517**

*) **Trees underlined are those which could be classified commercially as 'flamy' birches.**

The data on the number and heights of the waves were subjected to an analysis of variance to examine the variation within and between trees and the effects due to orientation of the veneer sheet. The conclusions from this analysis are:

1) Both the number and heights of the waves vary greatly; most of the variation is accounted for by differences between trees.

2) The effects of orientation are not significant; that is, the measurements may be made on samples taken from any point around the circumference of the log.

3) The data from the upper and lower billets of seven trees show that significant differences occur within trees in the numbers but not in the heights of the waves.

The ranked means for numbers of waves per 20 cm. length and heights of the waves are shown in *Table* 1. Also shown are the rankings made by two independent observers who ranked the corresponding sheets of veneer visually by the degreee of flamy figured grain. It can be seen from the simple rank correlations that the number of the waves is the more important factor in determining the intensity of flamy figure grain.

Differences between any pair of ranked means for numbers of waves are not significant with the exception of that between tree 13 and 17 which is only slightly greoter than three times the standard error and is therefore of doubtful significance when the size of sample is considered. The indications are that we can expect to find a continuous range of variation between straight grain and well-defined flamy figure in Betula verrucosa.

Note on Cliromosome Morphology in Picea rubens Sarg. and Picea mariana (Mill.) B. S. P.

By E. K. MORGENSTERN[1])

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Cytogenetic studies in the genus Picea LINK have progressed little beyond the stage of chromosome counts. Examination of sixteen species indicated that the haploid chromosome number is twelve (3, 7, 8), and little doubt remains that this number prevails in normally developed individual throughout the genus. Chromosome morphology, thus being of greater interest than chromosome number, nas been dealt with in only a small number of species. The studies of all species investigated agree that nine chromosomes have median and three submedian centromeres. Secondary constrictions were noted in two species, namely three constrictions in P. smithiana (WALLICH) Boiss. (3) and two in P. *jezoensis* var. hondoensis (MAYR) REHDER (7). Detailed species comparisons, based on carefully drawn idiograms, are still lacking for this genus. As a result existence and nature of interspeciiic differences in chromosome morphology still require comprehensive investigations.

For a study of chromosome morpnology in P. rubens and P. *mariana,* seed from two sources of each species was supplied by the Glendon Hall Laboratory of the University of Toronto. P. mariana came from the Longlac and the North Bay area of Ontario, and P. rubens from the Valcartier Forest Experiment Station, Quebec, and the Haliburton area of Ontario. Seedling root tips were pretreaied in 0.1% colchicine for 20 nours, fixed in 3 : 1 alcohol-acetic acid for 30 minutes, stained according to the FEULGEN procedure, and squashed in acetic acid. Slides were made permanent according to the dry ice method (1).

Analysis began with the preparation of camera lucida drawings of three metaphase plates of each spccies at a magnification of 5000. Length of chromosome arms was measured and summed within each plate to obtain "total diploid complement length" (TDCL). The contribution of each individual chromosome to the plate total could then be expiessed as TDCL %. This term, being a measure of chromosome length in relative terms, permits the comparison of chromosomes from plates with different degrees of contraction (6). Next, arm ratios were obtained by dividing the length of the short arm by that of the long arm. On the basis of relative length and arm ratios, chromosomes were then paired to obtain the haploid set which was arranged in order of increasing length.

The sesulting chromosome series showed few distinguishing characteristics. In both species the twelve chromosome pairs differed merely quantitatively from one another, i. e. in length and arm ratio, showing a lack of easily recognizable qualitative features such as secondary constrictions and satellites. Although observed, secondary constrictions could not be consistently identified. Especially difficult was their separation from other achromatic regions. Similar conditions have recently been described from a study of Pinus (9).

The exclusive presence of quantitative differences demanded a cautious interpretation of the data (5). Attention was focussed on distinguishable chromosome groups rather than on individual chromosomes because of opticai limitations and random variation within the populations.

No clear-cut differences between species could be determined and for both species the chromosomes of each plate could be separated into three groups based on length and arm ratio. These groups, based on one plate of each species, are shown in Figure 1. Group I ccnsists of one short pair with submedian centromere. Group 2 comprises three medium-sized pairs with one median and two submedian centromeres. Group 3 includes eight long pairs with more or less median centromeres.

The single pair in group 1 can always be easily identified but several individual pairs within groups 2 and 3 cannot. In group 2 the pair with median centromere (pair 2) can be distinguished from chromosomes in group 3, which also have median centromeres, by its much smailer size. But the pairs wiih submedian centrorneres (pairs 3 and 4) are so close in length and arm ratio that their separation is rather difficult and probably not always reliable. In group 3 conditions are similar and only the

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