

PROCEEDINGS OF THE SEVENTH MEETING OF
THE COMMITTEE ON FOREST TREE BREEDING
IN CANADA

Held at the Forest Experiment Station of the British
Columbia Forest Service, Lake Cowichan, Vancouver Island,
B.C., on August 21st to 23rd, 1960.

PART I

MINUTES AND DISCUSSIONS

Prepared and Distributed by the
Forest Research Branch
Canada Department of Forestry
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PART I

MINUTES AND DISCUSSIONS

A. ATTENDANCE

A. E. Alonzo	Estacion Experimental Agropecuaria del Delta, Cassilla de Correo No. 14, Campana, F.C.B.M., Argentina.
A. H. Bamford	British Columbia Forest Service, Reforestation Division, Victoria, B.C.
I. K. Barber	MacMillan, Bloedel and Powell River Ltd., Nanaimo, B.C.
W. G. Burch	British Columbia Forest Products Ltd., Vancouver, B.C.
A. J. Carmichael*	Ontario Dept. of Lands and Forests, Timber Branch, Toronto, Ont.
K. K. Ching	Oregon Forest Research Center, Corvallis, Ore., U.S.A.
W. H. Cram*	Canada Dept. of Agriculture, Research Branch, Indian Head, Sask.
E. C. Crossin	MacMillan, Bloedel and Powell River Ltd., Nanaimo, B.C.
W. J. B. Devitt	British Columbia Forest Service, Reforestation Division, Duncan, B.C.
E. D. A. Dyer	Canada Dept. of Forestry, Forest Entomology and Pathology Branch, Victoria, B.C.

L. F. Ebell*	Canada Dept. of Forestry, Forest Research Branch, Victoria, B.C.
J. M. Fielding	Forestry and Timber Bureau, Canberra, A.C.T., Australia.
R. E. Foster	Canada Dept. of Forestry, Forest Entomology and Pathology Branch, Victoria, B.C.
W. V. Hancock	Canada Dept. of Forestry, Forest Products Research Branch, Vancouver, B.C.
D. L. Handley	MacMillan, Bloedel and Powell River Ltd., Alberni, B.C.
C. Heimbürger*	Ontario Dept. of Lands and Forests, Research Branch, Maple, Ontario.
J. Holm	MacMillan, Bloedel and Powell River Ltd., Nanaimo, B.C.
M. J. Holst*	Canada Dept. of Forestry, Forest Research Branch, Chalk River, Ontario.
A. H. Hutchinson*	University of British Columbia, Dept. of Biology and Botany, Vancouver, B.C.
H. Irgens-Møller	School of Forestry, Oregon State College, Corvallis, Ore., U.S.A.
P. N. Jøransen	Institute of Paper Chemistry, Appleton, Wis., U.S.A.
J. M. Kinghorn	Canada Dept. of Forestry, Forest Entomology and Pathology Branch, Victoria, B.C.
L. L. Kennedy	Alberta Dept. of Lands and Forests, Edmonton, Alta.
D. Kosick	Tahsis Co., Gold River, B.C.
C. H. Lane*	Ontario Dept. of Lands and Forests, Timber Branch, Toronto, Ont.
J. Leasing	Western Forest Industries Ltd., Honeymoon Bay, B.C.
R. R. Lejeune	Canada Dept. of Forestry, Forest Entomology and Pathology Branch, Victoria, B.C.
H. G. MacGillivray*	Canada Dept. of Forestry, Forest Research Branch, Fredericton, N. B.

R. G. McKee	Deputy Minister, British Columbia Dept. of Lands and Forests, Forest Service, Victoria, B.C.
R. J. Moore*	Canada Dept. of Agriculture, Plant Research Institute, Ottawa, Ont.
A. L. Orr-Ewing* (Chairman)	British Columbia Forest Service, Research Division, Victoria, B.C.
D. C. Prideaux	British Columbia Forest Service, Research Division, Duncan, B.C.
A. E. Richmond	Canadian Forest Products Ltd., Beavercove P.O., B.C.
E. A. Roberts	British Columbia Forest Service, Research Division, Mesachie Lake, B.C.
R. L. Schmidt	British Columbia Forest Service, Research Division, Victoria, B.C.
G. Silburn	British Columbia Forest Service, Reforestation Division, Victoria, B.C.
R. R. Silen	United States Forest Service, Pacific Northwest Forest and Range Experiment Station, Oregon State College, Corvallis, Ore., U.S.A.
L. A. Smithers	Canada Dept. of Forestry, Forest Research Branch, Victoria, B.C.
R. H. Spilsbury	British Columbia Forest Service, Research Division, Victoria, B.C.
H. S. D. Swan*	Pulp and Paper Research Institute of Canada, Montreal, P.Q.
C. Syrach Larsen	Arboretum, Hørsholm, Denmark.
Miss K. Syrach Larsen	Arboretum, Hørsholm, Denmark.
O. Sziklai	University of British Columbia, Faculty of Forestry, Vancouver, B.C.
G. W. Wallis	Canada Dept. of Forestry, Forest Entomology and Pathology Branch, Victoria, B.C.
C. W. Yeatman* (Secretary)	Canada Dept. of Forestry, Forest Research Branch, Chalk River, Ontario.
J. T. Yelf	Canada Dept. of Forestry, Forest Products Research Branch, Vancouver, B.C.

B. BUSINESS MEETING

Morning, 21st August

Twelve members, denoted by * in the preceding list, attended the business meeting.

84 Welcome

Dr. Orr-Ewing called the meeting to order at 9.30 a.m. and welcomed the members to the Seventh Meeting of the Committee. Mr. Kennedy and Dr. Ebell were introduced to the members present.

85 Minutes of the Last Meeting

The minutes of the last meeting had been prepared and distributed to members by the Forest Research Branch. Omissions or corrections were called for. The minutes were adopted on a motion by Swan, seconded by Cram.

86 Membership

(a) Resignations: A letter of resignation from Dr. Chouinard was read. Dr. C. J. Bishop had notified the Secretary by letter that he had replaced Dr. H. Hill as sponsoring member, representing the Department of Agriculture, Ottawa.

(b) New Members: The Chairman called for proposals for membership of the Committee. He reminded members of the three classes of membership (Ref. Minute 38, 1954), viz:

- (i) Active members - those actually conducting work in tree breeding or closely allied fields. (Note: active members prepare reports of progress for presentation at the biennial meetings and these reports are included in the published Proceedings).
- (ii) Sponsoring members - official representatives of organizations engaged in tree breeding work.
- (iii) Corresponding members - occasional visitors or those with a general interest in tree breeding who wish to keep informed of the Committee's work.

The following men were elected members of the Committee:

Mr. A. H. Bamford	Corresponding	Reforestation Division, B.C. Forest Service, Victoria, B.C.
Mr. W. G. Burch	Corresponding	B.C. Forest Products Ltd., Vancouver, B.C.
Mr. G. C. Cunningham	Corresponding	Forest Research Branch, Canada Dept. of Forestry, Fredericton, N. B.
Mr. W. V. Hancock	Active	Forest Products Research Branch, Canada Dept. of Forestry, Vancouver, B.C.
Mr. L. L. Kennedy	Corresponding	Alberta Dept. of Lands and Forests, Edmonton, Alta.
Mr. J. E. Liersch	Corresponding	Canadian Forest Products Ltd., Vancouver, B.C.
Mr. O. Sziklai	Active	Faculty of Forestry, University of British Columbia, Vancouver, B.C.

Mr. Swan commented that he is no longer engaged in work directly related to tree breeding and requested his membership be changed from 'active' to 'corresponding'. It was agreed that this would be done.

87 Chairman's Report.

(a) Publications

Dr. Orr-Ewing noted that the Proceedings of the previous meeting had been issued and that a résumé of the meeting had been published in the Forestry Chronicle, Volume 34: 431-435. 1958. He regretted that no newsletter was put out in 1959 as had been suggested at the last meeting.

(b) Membership

The Chairman suggested that the list of active members should be revised since a number of those presently listed are no longer actively engaged in tree breeding and have not submitted reports to the Committee for some time. He suggested that these men be asked to accept the change from 'active' to 'corresponding' membership if they are still interested in the work of the Committee, or alternatively to resign. The Secretary was instructed to write to the following members requesting their wishes: Mr. A. Beckwith, Dr. A.W.S. Hunter, Dr. R. Pomerleau, Dr. A. Lafond, Dr. C.R. Sullivan, and Dr. E.C. Smith.

(c) Mailing List

The Chairman next raised the question of the mailing list for the distribution of the Proceedings of the Committee. He suggested that the forest industrial companies should receive Part II of the Proceedings as at the present time only one company received them. Dr. Heimbürger said that the Proceedings should be sent to the heads of companies with invitations to

become corresponding members. Mr. Swan added that the head of a company may wish to designate another officer of the company as a more appropriate recipient. Mr. Holst pointed out that the reports submitted by members are primarily for the information and co-ordination of fellow tree breeders and only secondarily for general publicity. He suggested the companies may be better served by a special review type of report. Dr. Orr-Ewing felt a second report would be impractical and that a standard report would suffice. Mr. Swan suggested that the companies considered should be asked to indicate whether (1) they were interested in the Proceedings, (2) they wished to continue to receive them, or (3) they wished to suggest an alternative addressee. Mr. Swan undertook to provide the Secretary with a list of up to fifty companies who might wish to receive the Proceedings.

Dr. Orr-Ewing expressed the opinion that the distribution of the Proceedings within Canada should receive priority over distribution abroad.

The following motion was proposed by Swan, seconded by Holst:

Copies of Part II of the Proceedings should be sent to chief foresters in the pulp and paper industry in Canada, with priority to be given to companies known to be actively interested in forest management and research. A covering letter is to be sent with a reply section included.

Carried.

It was further moved by Cram, seconded by Swan:

That Dr. Heimbürger and Dr. Orr-Ewing prepare a list of forest industrial companies to whom the Proceedings should be sent.

Carried.

(d) Future Publicity

Dr. Orr-Ewing suggested that an issue of the Forestry Chronicle might be devoted to tree breeding following the example set by the Journal of Forestry. Doubt was expressed whether the Forestry Chronicle could spare the space, but the matter should be raised again at the next meeting. Dr. Orr-Ewing said that in the meantime he would approach the editor of the Forestry Chronicle to discuss the possibility of such an issue.

Dr. Heimbürger undertook to prepare an up-to-date summary of tree breeding in Canada for publication in the Forestry Chronicle.

The Chairman and Secretary were asked to prepare a report on this meeting for submission to the Forestry Chronicle.

88 New Business

(a) Terms of Reference

Dr. Heimbürger requested that the terms of reference for the Committee be brought up to date and that a small sub-committee be appointed for this purpose. The following motion was proposed by Swan, seconded by Gram:

That the new chairman, secretary, and Dr. Heimbürger shall revise the terms of reference of the Committee and shall distribute same before the next meeting, at which time the terms of reference will be presented for approval.

Carried.

(b) Acknowledgements

On behalf of the Committee, Dr. Hutchinson thanked the British Columbia Forest Service for providing the facilities for the meeting and

also thanked the Forest Research Branch for their support.

The Secretary was instructed to write to these organizations expressing the gratitude of the Committee.

(c) Location and Date of Next Meeting

It was agreed that meetings should be held successively in different parts of Canada and a number of suggestions were put forward for the next meeting. It was agreed that the place of the next meeting should be decided by the newly elected chairman and secretary after suitable enquiries had been made. It was also agreed that it would be held in August, 1962.

89 Election of Officers

Nominations for the positions of chairman and secretary were called for and ballots were held.

Dr. Heimbürger was elected chairman, and Mr. Yeatman re-elected secretary.

It was moved by Cram, seconded by Holst:

that Mr. Swan be a member of the 'terms of reference' sub-committee.

Carried.

C. TECHNICAL MEETING

Afternoon, 21st August

Nineteen members and twenty-seven guests from Canada and abroad attended the technical meeting which included discussions of the biennial reports submitted by members and reviews of programmes by some of the guests.

90. Opening

Dr. Orr-Ewing called the meeting to order at 1.00 P.M. and asked that each man present should introduce himself to the meeting.

91. Welcoming Address

Dr. Orr-Ewing then introduced Mr. McKee, Deputy Minister, British Columbia Department of Lands and Forests, who welcomed members and guests to British Columbia and to Cowichan Lake.

92. Discussion arising from Members' Progress Reports and Visitors' Programme Reviews.

The reports and reviews were tabled as listed below and these were later published as Part II of the Proceedings. In addition, four other speakers took part in this session by speaking informally about their work.

(a) Members' Progress Reports:

A - M.G. Boyer	I - C. Gagnon
B - A.J. Carmichael	J - C. Heimburger
C - L.P. Chiasson	K - M.J. Holst
D - W.H. Cram	M - A.H. Hutchinson
E - B.W. Dance	N - H.G. MacGillivray
F - L.F. Ebell	O - R.J. Moore
G - J.L. Farrar	P - A.L. Orr-Ewing
H - D.A. Fraser	R - W.A. Porter
	S - J. Salm

(b) Visitors' Programme Reviews:

A. E. Alonzo	Estación Experimental Agropecuaria del Delta, Argentina.
K. K. Ching	Oregon Forest Research Center, U.S.A.
J. M. Fielding	Forestry and Timber Bureau, Australia.
W. V. Hancock	Vancouver Forest Products Laboratory, Canada.

(c) Other Speakers:

H. Irgens-Moller	Oregon State College.
R. R. Silen	Pac. N.W. For. & Ra. Exp. Station.
A. H. Bamford	British Columbia Forest Service.
W. G. Burch	B.C. Forest Products Ltd.

(a) Members' Progress Reports

A - M. G. Boyer

The author was not present. Dr. Heimburger commented that the work reported here is valuable but that the poplars under observation were insufficiently identified. The pathologist should be aware that some of the poplars are in clones and that others occur in seedling populations. For example, the breeder must specify whether he is talking about a clone or about a population when discussing P. balsamifera.

B - A. J. Carmichael

Mr. Carmichael commented that cold storage of red pine seedlings in plastic bags over winter had not been successful; losses amounted to 80% of the stock after planting (Ref. page B-4, bottom). The plastic bags were satisfactory for transporting stock lifted in the spring.

One item not included in the report was the successful use of a rifle for scion collection. A 30.06-calibre rifle fitted with a K4 Weaver telescopic sight was used, firing pneumatic-tipped bullets with 39,000-feet-per-minute

muzzle velocity. As an example, red pine branches up to 5 inches in diameter and 90 feet above the ground were shot off when the air temperature was 10°F below zero. The rifle was also suitable for collecting white and black spruce scions. It was necessary to use a large-calibre rifle with ammunition of high muzzle velocity.

In answer to a question whether black spruce tree No. 294 (ref. page B-5) was a plus tree, Mr. Carmichael said that the wood density determinations were not yet complete. However, the work of Mr. Hall at the University of Toronto indicates that in black spruce wood density is closely related to growth rate. Mr. Holst commented that in Mr. Jones's work on white spruce, wood density was to some extent independent of rate of growth.

A discussion developed concerning the pruning of trees in seed orchards for flower production. (Ref. page B-4, paragraph 4). In 1960 an attempt was made to find the date of pruning for maximum bud formation in pine. It is now known that the number of branches can be increased and the height of the tree reduced by pruning in red pine. Mr. Fielding commented on the reaction of P. radiata to pruning. Because of the inherently rapid growth, only small branches result from top pruning since a new leader rapidly takes over. The small branches are not suitable for cone bearing. Mr. Holst suggested that seed orchards might be planted on dry sites to induce early flowering. Mr. Carmichael quoted from experience at the Lynn tract in southern Ontario where planted red pine first flowered on the ridge. This had now ceased and heavy flowering was taking place on the lower, moister site.

In reply to a question, Mr. Carmichael said that he would like to

prune red pine clones or ramets in the nursery before the clones or ramets were planted out in order to develop trees of bushy form from the start. It was suggested that open grown trees of normal form may be more efficient cone and seed producers in the long run.

Mr. Swan questioned whether the nitrogen levels set out in the last paragraph of page B-6 can be maintained. Mr. Carmichael replied that indications from nursery studies by Prof. Arnson are that set levels of nitrogen can be maintained by regular foliar analyses followed by appropriate nitrogen applications.

C - L. P. Chiasson

This report was open for comment but in the absence of the author discussion was limited. Dr. Cram wondered how self-pollination could occur if the ovulate cones of balsam fir had been isolated (Ref. page C-1.).

D - W. H. Cram

Dr. Cram drew attention to the following corrections to be made in his report: (1) Page D-2, Table 1, Vigour of Progenies; "A-16" should read "V-16". (2) Page D-3, paragraph 2, line 5; "than" should read "then". (3) Page D-5, top line; sixth word is "heterozygous".

Referring to page D-3, last paragraph, Dr. Heimbürger commented that it is known from work with spruce and pine that the effect of seed size on vigour bears no relationship to sexual maturity. Dr. Cram said the point to be made was that the effect of seed size on the subsequent growth of Caragana was still evident after five years, and not only to three years as previously thought.

In reply to a question regarding the importance of Colorado blue spruce in shelter belts on the Prairies, Dr. Cram said that this species was preferred to white spruce which is very susceptible to pine needle scale and spider mite. Hence this spruce is preferred for silvicultural as well as for horticultural reasons.

E - B. W. Dance

The author was not present and discussion was limited.

Dr. Heimburger suggested that Petawawa was not a good place to test the disease susceptibility of poplar species since these are important for reforestation only in certain localities in Southern Ontario. He also raised the question of artificial inoculation and the interpretation of results from the use of these methods. In conclusion it was agreed that trials performed at only one location limit the applicability of the results to other areas with different environments.

F - L. F. Ebell

Mr. Holst said that the report suggests that good growth occurred in years in which many flower primordia were formed while poor growth occurred in the following year. The reason for this might be: (1) the loss of roots in a dry year (when the greatest number of flower primordia is laid down) may result in a lowering of growth in the succeeding year; and/or (2) the production of cones and seed uses quantities of metabolites which are not then available for wood production. Dr. Ebell said he hoped that the analyses for carbohydrates will help elucidate the second point. Dr. Fielding commented, that in an Australian study, pollen production had

accounted for four to five times as much dry matter as had the cones of Monterey pine. Dr. Ebell added that pollen accounted for large amounts of sugar which certainly constituted a drain on food reserves.

In reply to a question regarding the application of fertilizers to encourage cone production, Dr. Ebell said that fertilizers made little difference in years in which cone bearing was generally good, but that in a year with few flowers, for example in 1960, the fertilized trees definitely bore heavier crops than the control trees.

G - J. L. Farrar

The author was absent and no discussion took place.

H - D. A. Fraser

The author was not present.

With reference to paragraph 1, Dr. Heimburger said that the induction of flowering in young trees must not be confused with increasing the flowering of sexually mature trees. These must be recognized as distinct problems. In further discussion, it was felt that the causes of sexual maturity were not yet known. Little success has been had in making juvenile trees flower, apart from those genetically precocious. It was pointed out that such precocious genotypes were not generally desirable for reforestation.

I - C. Cagnon

In the author's absence discussion was limited.

The difficulties of breeding for resistance to Dutch elm disease were pointed out, since the disease attacks older trees and not necessarily

the seedlings. It was understood that a systemic chemical had been produced which could be injected into the tree to make it toxic to the insect vector, but that the treatment was expensive.

J - C. Heimbürger

Dr. Heimbürger commented that northern white pine provenances were statistically less liable to weevil damage than southern provenances. In reference to page J-6, he said that the new poplar disease (Gladiostoma) is very important to the poplar breeder.

His associate, Mr. Fowler, is working on the breeding systems in red pine (Ref. page J-3) and has found selfed progenies to be as good as or better than crossed progenies. How this may apply to the species as a whole is not yet known.

Mr. Holst noted that plant forcing (Ref. page J-1) is of general interest and he wished to know more about the reported nine-fold increase in the growth of white pine. Dr. Heimbürger said that this might be taken with a grain of salt since the controls were poorer than is normally observed. A three-fold increase would be a more realistic figure. On the question of light intensity, daylight supplemented by artificial light at night was found to be the best condition.

M - A. H. Hutchinson

Dr. Hutchinson issued an invitation to members and guests who might be visiting Vancouver to visit the Douglas fir provenance test growing at U.B.C.

In reply to Dr. Heimbürger's question, Dr. Hutchinson said that

all the mother trees used in the single tree progeny tests were growing on the east coast of Vancouver Island. Single progenies exhibited great variation, often covering the whole range of all progenies.

N - H. G. MacGillivray

In reply to a comment, Mr. MacGillivray said that the term "fast growing" which was applied to the red spruce of southern Appalachian origin, refers to growth in the South and not to growth in Canada, where this species has yet to be tested.

O - R. J. Moore

A discussion arose about the irradiation of pollen and seed, a topic of interest to many of the participants. In reply to a question, Dr. Cram said that Caragana is used in the Prairies for shelter belts and erosion control.

P - A. L. Orr-Ewing

Dr. Orr-Ewing noted in reply to a question that the criteria for selection of plus trees were outlined in his 1958 report. Selections are generally confined to site class 130 (height at 100 yrs.) and the plus trees are compared with the surrounding dominants. Forty years is the lower age limit but generally older trees are preferred.

With reference to 3., page P-2, two increment cores are taken at breast height for wood quality tests.

P - W. A. Porter

In absence of the author, the meeting was told that a full report of Mr. Porter's work would be distributed to members shortly.

Dr. Heimbürger questioned the criterion of rust resistance which had been set for individual white pine. A tree of "above average" resistance meant that only 60% of the ramets from the tree were infected. He suggested that if one ramet was infected then the tree was rust susceptible. Dr. Foster agreed that this was the case.

S - J. Salm

No discussion was held in absence of the author.

(b) Visitors' Programme Reviews

Pages T-1 to T-7, Part II, Proceedings

A. E. Alonzo

In reply to questions concerning the cultivation of poplar and willow, Mr. Alonzo said that pulpwood is taken down to an 8-centimeter diameter. The drainage ditches in the Delta are generally spaced about 66 feet apart.

K. K. Ching

Dr. Ching was asked whether the method of pollen freeze-drying has been successfully established and has been supported by field tests. He replied that favourable reports have been made in connection with both tomato and pine pollen. The equipment required for the process includes a vacuum pump. The pollen is dried under vacuum and stored in a nitrogen

2 - Mr. [Name]

In absence of the subject, the meeting was held at 7:00 p.m.

of Mr. [Name] would be distributed to members shortly.

Mr. [Name] mentioned the collection of [Name] which

had been [Name] and [Name] white [Name]. A [Name] of [Name] [Name] [Name]

about [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

that [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

Wester [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

(b) Virginia [Name] [Name]

Page T-1 to T-4, Part II, [Name]

A. E. [Name]

[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

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[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

R. E. [Name]

Dr. [Name] was asked [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

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atmosphere at a temperature below freezing.

J. M. Fielding

In reply to a question, Mr. Fielding agreed that he selects against flowering on the terminal shoot. Selection against coarse branching is also effective by selection against flowering on the branches. There is also evidence that the intensity of flowering is inversely related to vigour and hence selection for vigour is a third way of selecting against flowering.

In further comment, Mr. Fielding said the only work being done in the eucalypts is the study of natural variation. The introduction of softwood species and the production of softwood timber are the primary concerns of forest management based on artificial regeneration.

With reference to spiral grain, he said that its inheritance has not been studied in progeny tests, but that clones certainly reflect this trait of the plant.

The P. radiata × attenuata hybrids were reported to be vigorous, as indicated by a few natural hybrids from the northern end of the range of P. radiata. It is hoped to introduce hardiness to cold and drought into P. radiata by breeding with P. attenuata.

W. V. Hancock

The following notes include replies to questions and matters raised in discussion. Although small wood cores lead to the compression of the wood sample, compression does not occur with the larger cores being taken. The trees sampled to date include both plus and other trees. The

main criterion of wood quality in Douglas fir is the degree of spiral grain, where trees with more than 5 degrees spiral are rejected. Spiral grain appears to be a normal characteristic of Douglas fir. It usually turns to the left when young, centres at about 50 years, and then turns to the right. Fibre length and specific gravity were also measured. Specific gravity is generally high at the core (.5); it then declines for about 10 years (.35) and finally increases steadily at a rate independent of the specific gravity in the initial ten years.

No work has been done with variation in specific gravity in relation to changes in the environment. No differences were found in tracheid length between spring and summer wood. The relationship between branch and stem wood is being studied in three trees on the U.B.C. campus.

(c) Other Speakers

H. Irgens-Moller

As many provenances as possible of Douglas fir are being gathered for a breeding arboretum.

Differences between provenances have shown up as differences in photoperiodicity. Differences in phenology as in date of bud bursting may also be useful. The rate of change of phenology or photoperiodism is greater from east to west, with altitude, than from north to south, with latitude. The variation between provenances in thermoperiodism and its interaction with photoperiodism is being investigated. Differences in chilling requirements are also being studied.

In germination experiments with provenances growing on south and north slopes, it was found that seed collected on the southern slopes germinated more quickly. This difference disappeared after stratification.

The differences could either be of genetic origin, or the cones on the southern slope could be more mature on a given collection date than those on the northern slope. Collection dates were to be staggered in an attempt to equalize the time for maturation.

In work in the growth chamber, it was found that a two-hour light interruption, from 11 p.m. to 1 a.m., was as effective as exposure to continuous light in promoting growth of seedlings.

R. R. Silen

Mr. Silen reported on the history of provenance studies in the northwestern United States which began 1912 in Douglas fir and 1926 in ponderosa pine. More recently, many provenances of local species and exotics had been put on trial. Reports are to be published shortly on this work.

In general, exotics have not done as well as native species. Some that have grown well for a number of years have failed following periods of extreme weather conditions.

Dr. Heimburger asked: if clones of Douglas fir from high elevations are planted at low elevation, will they flower sufficiently late to avoid pollination from local trees? Mr. Silen reported that in one instance and in one year in Washington a seed orchard of clones from high-elevation trees planted at low elevation flowered one week later than the local source.

A. H. Bamford

Mr. Bamford briefly outlined the history of the tree breeding programme of the British Columbia Forest Service. The details of this

programme were left for Dr. Orr-Ewing to describe during the field trip.

W. G. Burch

Mr. Burch is chairman of the Plus Tree Board of the Vancouver Tree Farm Forestry Committee, a co-operative organization of government and industry set up to locate potential plus trees of Douglas fir. A number of candidate plus trees have been found as a result of this co-operation. In reply to a question, Mr. Burch agreed that the value of seed from seed orchards will not be known until the progeny tests are assessed, but that seed from seed orchards should be at least as good as that collected at the present time. Dr. Orr-Ewing was not in favour of open pollinated progeny tests because of the possibility of inbreeding.

Mr. Holst suggested that more trees might be selected from the best stands rather than single trees from a number of different stands of varying quality. In any case, a greater number of plus trees might be required so that a reasonable number of elite trees would be discovered from the progeny tests. Dr. Heimbürger agreed that he would prefer to select a number of prime trees from the best homogeneous stands, rather than one or a few trees from each of a number of stands.

93. Meeting of the Western Forestry Genetics Association.

Mr. Silen extended an invitation to attend the meeting of the Western Forest Genetics Association to be held on the 24th of August in Seattle.

94. Acknowledgement

Members and guests expressed their thanks for the liberal hospitality extended to all by the British Columbia Forest Service.

95. Adjournment

The Chairman adjourned the meeting at 9.00 P.M.

D. FIELD TRIPS

22nd and 23rd August

A two days' programme of field study was organized by Dr. Orr-Ewing in co-operation with other staff members of the B.C. Forest Service, the Forest Research Branch, the Forest Products Research Branch, and the Department of Agriculture.

1. Objects of Interest near Cowichan Lake Experiment Station

On August 22nd, those in attendance saw the following items which were centred near or at the Experiment Station.

(a) Power borer for large diameter cores.

Mr. Hancock and Mr. Yelf demonstrated the power borer developed at the Forest Products Laboratory, Vancouver, for use on trees up to 85 inches in diameter. A large core was quickly extracted from a Douglas fir 36 inches in diameter. The total weight of the machine is 90 pounds. It can be broken down into three 30-pound pieces for packing.

(b) Plus tree selection.

The group was shown a candidate Douglas fir, 95 years old, 177 ft. high, 30.4" d.b.h. inside bark and 19.0" diam. inside bark at mid-height.

Comparable measurements of three adjacent dominant trees were:

Dominant 1: 98 yrs., 168 ft., 26.3" d.b.h., and 17.1" diam. at mid-height;

" 2: 98 yrs., 175 ft., 34" d.b.h., and 23.0" diam. at mid-height;

" 3: 95 yrs., 161 ft., 26.6" d.b.h., and 15.8" diam. at mid-height.

The second of the comparison trees was larger in diameter but rejected because of multiple sweep. Scions from all selected trees are collected and grafted into clone banks at the Experiment Station and Duncan Nursery.

(c) Old growth Douglas Fir.

A few scattered trees approximately 650 years old were seen in the same location as the plus tree.

It was pointed out that it is unusual to find such disparity in ages of Douglas fir within the same area.

(d) Heritability studies in Douglas fir.

Dr. Orr-Ewing pointed out a number of different phenotypes of young Douglas fir growing in the Robertson Valley. Clones and seedling progenies from open pollination of these trees were seen at an outplanting area within the Experiment Station. A number of trees with both good and poor crown types and of variable form had been selected as being typical of the types used for general cone collection. The progeny and clones at five and three years, respectively, showed many of the characters of the parents. For example, the twisting stem form of clone No. 19 was a reflection of the wavy, drooping branches and twisted stem of the minus mother tree. The progeny of this tree were among the most vigorous but still showed the twisting stem form. Many other examples demonstrated the heritability of form characteristics in Douglas fir.

(e) *Pseudotsuga* breeding arboretum.

There are six species in the genus *Pseudotsuga*, two in North America and four in Asia. Seed of all six has been obtained. Five species are growing at the Experiment Station. Other outplanting areas have been planned on the milder west coast of Vancouver Island as three of the species are very susceptible to frost.

(f) Controlled pollinations and inbreeding in Douglas fir.

An interesting series was seen of inbred and reciprocal cross progeny from two mother trees. A number of apomictic plants were seen, all derived from one tree.

(g) Cone induction in Douglas fir.

Dr. Ebell reported on a series of trials aimed at controlling the flowering of Douglas fir. Treatments included foliage sprays and fertilizer applications. Best results were obtained with applications of nitrogenous fertilizers made at the time of flushing.

2. Trip to Mt. Prevost and Duncan Nursery

On August 23rd the group left the Experiment Station and saw the following:

(a) Improved cone production area.

An area on Mt. Prevost was visited where young natural stands of Douglas fir have been treated by thinning, brush cleaning, and the application of fertilizers to encourage seed production. Fertilization has increased cone and seed production for at least one year. The project is in

the early stages of development and more definite results can be expected in the future.

(b) Duncan Nursery.

Greenhouse and nursery facilities for the grafting of Douglas fir were seen. Root stocks are potted in September, grafted in March and the ramets hardened off in May. Flushing of Douglas fir is more rapid if the rootstocks are chilled prior to being brought into the greenhouse under a long day.

Mr. Porter's clonal selections of partially resistant white pine were seen growing in a disease garden with Ribes that had been selected for good leaf-holding capacity to prolong the infection period.

Seedlings of exotic species of Pseudotsuga were seen in the nursery beds together with specimens from other genera. After lunch at the nursery, the group toured the main nursery until 3.00 p.m.