

DISCUSSION OF TECHNICAL COMMITTEE REPORTS

Chairman: Scott S. Pauley

Introductory Remarks on Committee Assignments

Ernst J. Schreiner

As Chairman of the Organization Committee which established the Technical Committees outlined in the first issue of NEFTIC News, I would like to make a few introductory remarks before the discussion gets underway. From letters which I have received and from discussion with many of the members here at Mont Alto, it is apparent that there is considerable difference of opinion on the objectives and scope of Committees III to VIII.

The most effective committee assignments for forest tree improvement will undoubtedly vary from region to region and even within a single region there is ample room for difference of opinion on this subject. To present the picture more clearly, I have prepared this chart (page 40) showing our Technical committees and the important Northeastern genera and species. Technical committees on tree improvement could, of course, be set up either on a horizontal or on the vertical basis indicated in the chart. On a horizontal basis, we might have a committee assigned to improvement of pines, with subcommittees on the improvement of white pine, red pine etc., or we might set up separate committees for each of these species. Following through on such horizontal committee assignments would require analogous committees for all other genera and species. Committee assignments on such a broad horizontal basis would require a larger number of committees and might imply working plans for only long-term improvement problems.

It seems advisable, therefore, to set up our technical committees on the basis of what may be termed fields of work. i.e., on the vertical basis outlined in the chart. The tasks assigned to Technical Committees III. - VIII. were to present working plans for one or more specific jobs that might be completed within one or a

TECHNICAL COMMITTEES

		III <u>Tree Races</u>	IV <u>Tree Selection</u>	V <u>Tree Breeding</u>	VI <u>Insect Resistance</u>	VII <u>Disease Resistance</u>	VIII <u>Wood Quality</u>
PINE	White	X	X	X	X	X	
	Red	X					
	Virginia		X				X
	Exotics						
SPRUCE	White			X	X		
	Red			X	X		
	Exotics			X	X		
LARCH	Eastern			X	X		
	European	X		X	X		
	Japanese	X	X	X	X		
	Dunkeld		X	X	X		X
FIR	Balsam					X	
	Exotics						
DOUGLAS FIR		X	X				
MAPLE	Sugar		X	X			
	Red						X
	Silver						
	Exotics						
BIRCH	Paper		X		X		
	Grey						
	Exotics						

short period of years. Figuratively, to fill in one or more of the spaces in their respective vertical columns on the chart. The Conference would then be in a position to interest woodusing industries, universities, state and federal forest services, and interested individuals in cooperation to undertake the work.

Committee III., for example, might select one or more of the jobs (indicated by "X" in the vertical column) for the preparation of cooperative working plans. They might decide to sponsor racial selection studies of white pine, red pine, or an exotic such as Scotch pine, or of European or Japanese larch. These are indicated in the chart because plantations are available for study in the Northeast. Because of the increasing interest in Douglas fir for Christmas trees in some parts of the region, this Committee might even wish to sponsor the selection of Douglas fir races adapted for this purpose in the Northeast.

The Committee on Individual Tree Selection and Testing might be interested in the establishment of clonal seed orchards of selected trees of white pine, Virginia pine in the southern part of our region, and some of the larches such as Japanese and Dunkeld, or of Douglas fir for Christmas trees, sugar maple for high sugar production, or paper birch for trees resistant to dieback. Each of these squares indicated on the chart represents a single job for which an individual working plan might be developed.

Committee V. would obviously be interested in both the individual species and the genus as a whole. For example, the intraspecific breeding of white pine for resistance to disease or insects would merit a separate working plan. This would also be the case for breeding to improve sugar content in maple. On the other hand, for the general improvement of spruce, larch, and other genera both intraspecific breeding and hybridization of all crossable species would constitute a single job for a genus.

Committee VI. might consider for high priority a study of weevil resistance in white pine, budworm resistance in white or red spruce, or perhaps even resistance to bronze birch borer in the paper birch.

Committee VII. has indicated interest in formulating working plans for a job on inherent susceptibility to woodrot in balsam fir and for cooperation on inherent resistance of white pine to blister rust.

Committee VIII. might set high priority on a job to study wood quality in hybrid larch, or perhaps a study of inherent variation in the wood of some of our aggressive but at present commercially less desirable species such as Virginia pine and red maple.

I would strongly urge that the various Committee Chairmen do their best to develop a working plan for at least one specific job in their field which has sufficient justification and "customer appeal" to warrant the expectation that the Conference can bring together interested cooperators to get the job done.

These assignments are not equally easy in the various fields. We must recognize that the development of correct and profitable avenues of approach to this problem of tree improvement in the Northeast will require time. We must remember that all Committee members are handling their assignments as extra curricula jobs which cannot be allowed to interfere too seriously with their regular work. Let's also recognize that in a field as new as forest tree improvement, a diversity of opinions and ideas must be expected, encouraged, and respected. And, in conclusion, let's be patient.

Discussion - Genetical Improvement of Naturally Regenerated Stands

Pauley I will now call on Hans Nienstaedt to start the discussion on the report of his committee.

Nienstaedt I do not know what the general attitude of the Conference is to our reports. One question I would like to hear some ideas about is the desirability of fast growth. Yesterday, Dr. Anderson, in his report, mentioned the possibility of strength quality decreasing with increasing rate of growth. Does anybody want to elaborate on that question? The opinion of some is that if tree breeders could increase growth, maybe we could leave it up to the silviculturist to control that growth by spacing and still get a higher per acre yield. We were interested in Mr. Lockard's pictures last night, but I can't help feeling that if he intends to have us breed for all these different characters, we're in for a hard time. I'm sure he doesn't. He was just showing us the types of defect which are important. But, I wonder if the wood utilizing industries can't convince the consumer that a tiny little knot in a nice piece of oak really isn't a defect, and make the consumer accept some of these minor defects. The tree breeder, of course, should still try to breed for clear wood and good strength properties. I was just a little concerned about this cry about the lack of wood on the east coast in the future and the high transportation cost from the west coast. I was wondering if we could not get over that to some extent in two ways; first, by selling the consumer the idea that a tiny little knot in a big board is really not a defect, and secondly, by breeding better quality and faster growing trees.

Lockard I think that this question of the importance of growth rate depends a lot upon the use to which the wood is to be put. You may find conflicting use requirements which will change your judgment. For instance, if you're thinking of growing pulpwood, you will find that you get less fiber yield per cord from fast grown wood than from the slow grown trees. So regardless of strength characteristics, this may be an economic problem--you may grow bigger trees faster but get less fiber which may cost you more per pound. Certainly, strength is not a basic requirement in the general use of white pine. Probably the rate of growth may not be too important a consideration with this species. With others which may be used for structural purposes, a consideration of relation of certain strength characteristics to the rate of growth is an important thing. I don't think you can pass up wood quality in evaluating potentialities of increasing growth rate. We certainly know that in the Southern pines there is great difference in the utility resulting from differences in growth rate and that commercial grading rules take this into consideration. We also know there is a lot of difference of opinion on exactly the effect of fast growth on some of the strength properties. Possibly, age has some effect. So that you can't just dismiss the subject by saying we ought to have faster growing trees. The least you can do is define the general class of product you wish to grow before you come to a decision. In your statement, you separated nicely the difference between height growth and diameter growth. I think that if you can get a tree that will shoot up fast in the first 30-40 years of its life, then you really have something. You are not worried about early diameter growth in this case. The height factor is a very important element in the process of growing quality wood.

Capitalizing on natural blemishes in wood has been carried to the Nth degree in knotty pine. The furniture people are aware of the possibility in hardwood;

They have actually tried it. There are technological developments that overcome some of the objections to wood blemishes by masking or hiding them in various ways. It is possible that in the future they may not be as important as they are now in controlling quality. But, the only guide lines we have now are the established criteria, which seem to be in no danger of being rapidly changed. Also, if you can eliminate some of these defects, you are going to have wood of a general better utility than you will have if they are not eliminated. In discussing blemishes which affect the current utility of the wood, I was merely trying to raise the question as to whether these things in wood which are important now and presumably will be for a long time can be controlled or eliminated by breeding them out.

Raup I'm surprised, in talking with people who use wood, furniture-makers and the like, at the amount of lore they have. In New England, our furniture people talk about Pennsylvania cherry and Connecticut Valley cherry, and they recognize differences between them. I've heard the same thing about hickories and oaks. I'd like to ask Charlie Lockard if this lore is catalogued anywhere, or has anyone tried to put it together?

Lockard That's a good subject for discussion. We certainly know there are wide differences in wood of the same species, but whether these are regional differences, I don't know. I discussed this with Jonathan Wright with regard to ash. I talked to some bat people out in Louisville one time, and they said they liked ash from Pennsylvania--it is the best there is. Then, another of the big ash users who is most particular in his requirements--a maker of sporting goods--said they had not been able to find any regional differences. They bought ash wherever they found it, and where it met their growth rate requirements it performed satisfactorily, so that so far as they were concerned, they were not aware of any regional differences. But, there are differences in wood properties. There is "rubber" ash which has the same density and the same ring count as tough ash, but which isn't tough. The Forest Products Laboratory indicates that growth conditions may be the answer to this. We do know, however, that many of the gross physical defects that cause people to feel there are differences in the quality of wood, are related to regions. Take cherry, for instance, it is susceptible to gum spot. In Allegheny cherry, you get little, in West Virginia you get more of it; and you get a lot of it in eastern Pennsylvania. This regional effect is known, but the cause is not. It may or may not be an inherent character. That's why I raise the question as to whether some of these things are inherent--whether there are races with them, or whether it is just some factor controlled by site or history, which can hit a tree of any race.

Raup Mr. Kneeland, of Worcester, told me a story about the white pine. In the early days when they first began to sell knotty pine, they sent buyers out over New England to buy it. They soon discovered that there was an area, which could be outlined on the map, where they didn't dare buy any knotty pine, for the knots all fell out. It always seemed to me that these cases might be starting points in the search for both site wise and inherited differences.

Lockard That's it, exactly, You have stated it more clearly than I have. The question comes down to determining how far in judging timber or tree quality we want to follow the present commercial standards, which may change. We

have an instance of this right now. I pointed out last night that pin knots are serious degraders in furniture lumber. Right now, there is a movement on to liberalize the hardwood lumber grading rules and eliminate from clearness consideration any knots under a quarter of an inch in size, provided they are sound and have no checks connected with them. Well, that would in essence change the grading system. It wouldn't change values, for it wouldn't change the utility. The reason for the suggested change is that producers are dealing with timber which produces much knotty material and, therefore, having a system which gives too high a premium for clear material may be getting to be a little unrealistic. So there is a big problem, as I see it, in judging what you are shooting at.

Anderson I don't think you're on safe ground if you pass onto the consumer the effect of the knots and ask him to accept them whether he wants to or not because you don't want to breed trees in such a way as to get rid of this defect. If you're going to breed trees for better quality, it would be a mistake to say to the consumer, "We don't want to monkey with this, it's a defect, you use it anyway". I think that you have to pick out the objectives. One objective must be clear wood without any knots or other defects. All the other things are means to that end. You may need improvements in other properties--dimensional stability or strength or perhaps density for pulping purposes. But, if you pass the responsibility to the consumer, I think you're missing the objective.

Sims I think here it falls upon the wood user and wood technologist to point out or to pick out the characters of lasting value, of most nearly universal appeal, to give us as goals toward which we should breed. Looking at it from the standpoint of forest management, the forest manager will embark upon an enterprise lasting a very considerable length of time and current fads and fancies, cannot be given any weight. I can remember when birdseye maple was very much in vogue for furniture and I don't know whether you can give the stuff away now. Golden oak, with great wide pith flecks was once very much in style. Furniture styles, particularly, change so rapidly that I think it would be ridiculous for, forest manager to set about to grow wood of a particular figure or color or grain density or finishing qualities to meet a current demand in the furniture market. I think the wood technologists must give us more universal goals and objectives. Some that are going to hold good regardless of fashion changes in wood utilization.

Anderson I think it's fair enough that the wood technologist and wood user should do this, but I think it should also be recognized that they don't have control of demand. I can give you an example. Port Orford cedar has certain properties that make it very excellent for use as battery separators. But, I don't know whether they'll use battery separators fifty or a hundred years from now, or that they'll even use batteries--that's what were up against. I do think that in a general sort of a way you can make predictions. You can say that clear wood is always going to be desirable. I don't know whether knotty pine is going to be desirable fifty years from now or whether everybody will shudder when they look at it. I think that certain colors are important--walnut, cherry, light maple, etc. Dimensional stability is important. The ability to grow wood that is strong or wood from the same species that might have better working properties is important.

Wright I'd like to echo Nienstaedt on one point--the fact that the tree breeder can work on only a limited number of characters at once, Our Station has started work on weevil resistance in eastern white pine. It looks as though it might take fifty or a hundred years to achieve really worthwhile improvements in this one character. Greater amounts of effort will probably be needed for the improvement of certain wood properties. Rather than scatter our efforts too much, it seems most necessary now to decide which two or three characters are most important and most amenable to genetic selection and to concentrate on these few characters.

Anderson If weevil resistance is going to be the key to growing white pine at all, then I would say that weevil resistance is bound to come first. Once you've got the weevil resistant strain worked out, then you'd have to start working on the wood quality aspect. But, then if you can't grow good wood quality, a weevil resistant strain isn't going to be nearly so valuable.

Carlaw I wonder if we're ready to put organization in the field looking for elite trees. Conceivably, on a large scale you would give regular cruising parties the job selecting elite trees. Are we in a position to give that job to the field men? They should be aware of the possibilities of selecting elite trees. However, these men probably will not know an elite tree when they see one. They'll merely know the "best" tree. Are you going to collect their suggestions and then run them down to see that they actually measure up to elite standards?

Nienstaedt In setting up these rules for elite trees, as I mentioned yesterday in my short comment, we decided that rather than set up specific rules for selection of better trees in a naturally regenerated stand for marking for regeneration cuts, we set up standards for elite trees. The silviculturists can use them as a guide, bringing out factors which would be of importance in deciding between one tree or another. Another point which I think would be of interest would be to determine what improvement can be brought about by different intensities of selection in a naturally regenerated stand.

Pauley I feel that at this point, I must exert my authority as chairman. Surely, we've been wandering far afield. The objective of these discussions is to discuss the various reports that were given yesterday. The report that was given by Hans as Chairman of the Committee on Improvement of Naturally Regenerated Stands is not primarily concerned with breeding problems, the subject which has been discussed almost exclusively up to this point, nor to the selection and testing of individual trees handled in another subcommittee. I would like to suggest that if there are any of you here who would like to make specific recommendations for the Committee on Improvement of Naturally Regenerated Stands, please do so at this time, and defer other questions or other suggestions to the committee which is particularly concerned. I calculate there are about four more minutes to do this.

Bond My main concern for being here is to learn what a State Forestry Department can do in the tree improvement program. We are concerned with small woodland ownerships and state forests and have foresters in the woods every day. Someone suggested that cruisers and others in the woods could locate some of these

"high brow" type trees. I doubt if most crews know enough or are interested enough at this time to select such trees. It seems to me that the tree improvers should set up standards which clearly define an elite tree of a given species, then let the woods foresters report them as they come across them. Then the tree improvers could double check the trees and carry the ball from there.

Nienstaedt Well, maybe they can't at the present time, but I think that with a minimum of instruction, they could pick them out, and I think a really outstanding tree is something that most people working in the woods will pick out by themselves. We're not looking for a large number of trees, we don't expect to find a large number of trees, but I would think that a man who is really in close contact with his woods could and does pick out the best trees as he passes through.

Pauley We exceeded the time limit, but I thought that was proper since we wanted a little bit to begin with. I personally think that the problem of improving naturally regenerated stands is a matter of tremendous importance because there are so many forest areas in this country that now, and for a long time in the future, will doubtless be managed under self-reproduction systems. But, it is also true that we know very little now about the proper recommendations to make to the silviculturist in the field. Of course, that is one of the reasons why this conference was started.

Discussion - Forest Tree Seed Certification

Pauley The next committee is concerned with forest tree seed certification.

The committee Chairman, Mr. Farnsworth, gave you a resume of the report yesterday. If anyone has questions, suggestions, or criticisms to make with reference to this report, please do so now and Mr. Farnsworth and other members of his committee will answer you.

Farnsworth From the instructions of the Chairman, I understand that the purpose of this discussion is primarily to receive suggestions from the floor regarding the work of the committee or to answer questions regarding its work.

Gabriel It seems to me that the problem as it is defined is to get a uniform law which would force seed certification throughout the Northeast. I understand that Herbst Brothers don't seem to be in agreement with the New York State law since dealers selling seed outside of New York have no law which forces them to certify their seed. Therefore, they say, why should we be in favor of local or state law when other states have none. How do you propose to solve this problem; through federal legislation, as you suggested in your outline?

Farnsworth It probably would not be desirable or practical to require certification of all seeds any more than all agricultural seeds are certified. One approach would be to provide legislation, that would control labeling of the seed sold so that the use of the term "certified" could not be used except under formal certification. Seed not labeled "certified" could be sold in any way according to agreement between buyer and seller. In order to accomplish this, as I suggested in the outline, we would prefer that it be established by federal legislation controlling labeling. Failing that, there seems to be much in my opinion to be gained by proceeding with available state legislation.

The New York seed law which Mr. Herbst expresses himself as opposed to, is not a certification law. It is a labeling law that requires seed sold by dealers within the state to be labeled regarding species, germination, purity, and origin. Admittedly, certain additional responsibilities are required by the labeling law for dealers within the state. I think we're faced with the choice of either deciding to omit any control, or use what is at hand. My own feeling is that the New York State law is better than nothing. In the end, any legislation, to be accepted by dealers in a legitimate and reasonable way, has also to be accepted by the consumer who in the end pays the bill.

Would pressure from the consumers of the seeds help solve the problem, Gabriele and wouldn't that be more desirable than legislation? Usually when you speak legislation, it has the same effect on some people as waving a red flag in front of a bull, their cooperation is lost entirely.

Farnsworth Actually, legislation is an expression of that pressure, is it not?

We should have machinery based on legal authority which can limit the use of the word "certified" by some kind of a labeling restriction. We must also have something that's worth certifying, so that the consumer can confidently expect that in some way or other the seed is better, and we must have an informed consumer who can judge with reasonable certainty that the seed that has been certified authoritatively has some particular value for him. When all three conditions are met, we will progress rather quickly toward certification.

Schreiner I would like to point out a possibility of certification without legal enforcement. The German Poplar Society has a system of certifying the clonal purity and quality of poplar nursery stock under which the individual nurseryman voluntarily pays for the inspection. The German Poplar Society, through its publicity, has attained sufficient prestige so that most buyers of poplar planting stock in Germany look for the Society's certification label. There's no legal compulsion. There are many nurseries that sell without the Society's certification, but the most progressive (and most profitable) nurseries were using this voluntary certification method.

Don't we have in NEFTIC the means for just such publicity, inspection, and certification? Why can't we set up the machinery necessary to determine what can be certified, and then stir up the publicity which is essential to make such certification effective? We might get better results than with legislation.

Farnsworth What Ernie has said emphasizes that first of all, an educated consumer is necessary and second, there must be something worth certifying. If legislation precedes those two, you run into opposition.

Discussion - Selection of Tree Races for the Northeast

The next committee report is concerned with the selection of tree races Pauley for the Northeast. In the absence of the Chairman, Mr. Littlefield, the subcommittee's report was given yesterday by Mr. Eliason. I would like to ask him to come up here and answer, with the support of other members of the subcommittee, any questions or criticisms you may have.

Are there any suggestions that might be passed on to the members of this Eliason committee? The report mentioned plans to evaluate the plantations in

existence in the Northeast of known seed origin. I understand the committee has started work on this matter. There are a great number in New York State, and no doubt in other states.

Has anyone an idea where some funds are available to do the work, following up this tabulation? How about graduate students who might be obtained if field expenses were paid?

Pauley Unfortunately, most graduate students are no longer satisfied with eating and sleeping, they want some money, too. That just complicates the problem a little bit more.

Marquis I cannot offer to finance all the studies that should be made, but I do want to point out that the Forest Experiment Stations now have authority to make grants of appropriated funds in the nature of cooperative aid to help finance studies that fit into the Station's program. The purpose of the aid is not to purchase equipment or to pay the salaries of research men, but to provide for field assistants and travel when the lack of funds for such purposes is holding back a worthwhile study. The justification for the use of such funds and cooperative aid is in facilitating studies involving the contributed time of qualified workers at a cost of only \$300.00 or \$500.00 to the Station. Cooperative arrangements for publishing results can also be made. So if there are projects in checking on plantations, etc., that would fit into the station program, we may be able to use our funds or appeal to Washington for money to help finance them. If you find that the lack of a few hundred dollars is a bottleneck that is holding up a worthwhile study, I invite you to submit a proposal for a cooperative arrangement to the Experiment Station.

Schreiner The Organization Committee had a definite purpose in assigning Technical Committees tasks that included a working plan for at least one specific job. With a plan which outlines the objective, the procedure, and personnel, and money needed, we will be in a position to request cooperation from industry, schools, experiment stations, state organizations, foundations, etc.

I want to emphasize this particularly. We can't go to anyone with a nebulous plan and say, "We'd like to improve something, we think it might be with spruce, but maybe we could do it with fir, are you interested?"

Let's fill a few of the squares in the chart I showed you this morning with jobs that can be "sold" to prospective cooperators.

Eliason I cannot speak for the committee, but I am quite sure that the committee does plan, if it is continued, to come up with some specific jobs with cost estimates. Any other comments on funds?

Shaw I'm Johnny-come-lately to this Conference but in none of the discussions have I heard the reference to one source of funds. It may have been made in the other Conference that I haven't attended. I've just returned from the near East where I've noticed the work of certain foundations which seem to have money. I'm thinking of such institutions as the Ford Foundation, and as I've been sitting have listening, I've been wondering if they can carry those funds into the Arab world, they might also be interested in something at home. Now I know that what Mr. Schreiner just said is correct, that you cannot get to first base with such an

organization unless you have something specific and detailed. But, I have heard that some of these foundations are well supplied with money, so I'd just like to throw into the pot that some of these very wealthy foundations might be interested in something of this sort.

Meyer, W. H. My comments apply to plantation examinations rather than to the matter of funds. Experience leads me to believe that graduate students, even though trained in forestry, are generally not prepared to do the job that needs to be done in this case. Most plantation records lack an adequate description of the stock, the way it was handled, planted, and so forth. Recently, I made trial plantings of fifteen species useful to wildlife. One species of shrub arrived with moldy roots and several others included many individuals that were too small or lacking in vigor. If these facts had not been recorded, we could expect misleading conclusions and comparisons. I expect that 90 percent of all plantation records lack sufficient basic data to justify comparative analysis. A fellow has to be a good ecologist to evaluate plantations on a comparative basis, and he must have some knowledge of the factors that have affected survival and growth. We should select plantations for which sufficient basic data are available and we should have them examined by men who really understand that work.

Eliason I can't speak for those plantations outside of New York, but the New York plantations which we have in mind do have the history going back to the seed or even the cone collections and, from there, through the nursery to the planting, with many detail records. Littlefield, the Chairman of this committee, and myself, were personally involved in the supervision of these steps. The story needs only the field examinations to be completed. I'll agree that in those plantations with little or no history, the results leave considerable doubt. However, in these New York plantations, even with some faults in design, etc., they do have valuable information which ought to be extracted.

Wright With the object of filling in one square on the diagram on the board, I'd suggest starting work on Scotch pine. It is a moderately important species for both timber and Christmas tree production and might be most important if we knew the correct races to plant. New York has an excellent set of racial tests of Scotch pine. These need evaluating. They also have a good set of racial tests of red pine and some larches, but have already made a good start on the evaluation of these plantings. For most other species, including eastern white pine and Norway spruce, there are so few racial tests already established that we shall have to start from scratch.

Schreiner I'd like to urge that Wright's suggestion be given very serious consideration. He has recently spent three weeks checking some of the New York plantations.

Eliason Yes, our Scotch pine seed source studies go back for thirty years. We have some good red pine set-ups and some on the larches. I don't believe John Wright has seen these. We are making some progress with the larch study in these plantations but only very superficially with the red pine. Outside of these special plantations, we do have pretty good seed source records on all state plantations made in the past twenty years.

There is one additional point to consider, and that is on a standardization for measuring these plantations. Are there any comments on this? There appears to be a need for uniformity in this matter, so that we can all be talking the same language. At a conference like this, we should consider the criteria to be used in examining plantations.

Nienstaedt In 1943, there was a paper published by Werner Schmidt in Unisylva with suggestions for rules for the measurements of Scotch pine racial studies. He wanted these rules adapted for international use. I don't know if they ever were, but I have been through them and think they have a lot of good ideas which might be worthwhile.

Kriebel Presumably, some of these plantations were established at an early date and are not as well randomized and replicated as some of the others. There is going to be a varying amount of information that you'll be able to extract from these different plantations, so there can't be absolute uniformity in method of evaluation. The method will depend on the precision with which they were laid out.

Farnsworth There is great need for uniformity of mensurational measurements in evaluating plantations. Even such things as calculating basal area, determining mean diameter, or measuring heights, as well as the less well mathematically expressed relationships need standardization. If they're not standardized, comparisons between plantings are difficult or impossible to make.

Sims I think in addition to what Gene Farnsworth has just said, your committee that makes suggestions on this subject would do well to help the field man with sampling design and the interpretation of his results. I think Jonathan Wright might be able to enlighten you on difficulties encountered in getting valid samples and valid interpretation of sampling information. When you go out to these operationally installed plantations, they're not well designed experiments that we're talking about, with randomization and replication, Dr. Kriebel, but neither plantations that were put out to cover up ground for the most part, or with rather rudimentary experimental designs. Back when some of these plantations were put in, a treated plot and a checked plot were considered a pretty crackin' good design. So I think there's need here for considerable attention to the sampling design along with the measurements.

Kriebel Would it also be a responsibility of this committee to assist people who are setting up new plantations, to achieve some broad standardization of statistical design in order to make comparisons possible?

Eliason I would judge so. The committee might well point out some past mistakes which should be avoided.

Discussion - Individual Tree Selection and Testing

Pauley Dr. Bramble, Chairman of Committee IV., could not be with us today. Who wishes to start discussion on the report Dr. Bramble gave yesterday?

Schreiner There seems to be no comment--perhaps because this subject has been sufficiently covered in discussion of the previous reports. In that case,

I'd like to bring up the question of committee assignments. I have the impression that there may be considerable opinion among the members that selection of tree races and individual tree selection should be handled by one committee. Does anyone have any comment on this point? Should we combine Committees III. and IV?

Pauley If nobody else wishes to make a comment, I will do so. It seems to me that this committee might very well be combined with the Committee on Tree Breeding, just as well as it might be combined with the Committee on Racial Selection. After all, the breeders should have a vital interest in the individual trees they plan to use in a breeding program. I don't know if there's any particular advantage in combining these committees or maintaining them as separate entities. If the argument is advanced that there is over-lap in these two committees, I think it might just as well be argued that all of the committees overlap one another as they normally must. Is it your opinion, Ernie, that there are too many committees and that it would be better to reduce the number?

Schreiner No, quite the contrary. I don't think we have too many committees. If we broaden the scope of technical committees, I am quite certain we'll eventually be plagued with a confusion of subcommittees and possibly even sub-subcommittees.

Bowen I'd like to ask the representatives from the Southeastern and Lake States, who is going to do the work in surveying and locating these select trees.

Dorman We have a project in that field under the Selection and Breeding Subcommittee. The actual field work is done by tree improvement workers themselves, the state forestry people, foresters for pulp and paper companies, and anyone who is interested in that field of work. We don't put out specific instructions as to exactly what we want. We've distributed material on the type of selection work that is required and the principles involved. But, so far, we've stimulated interest in the selection without trying to pin point it down. We don't exactly know what we have and selections can be made for several objectives. It's very difficult to define the optimum tree, the one best tree that we would like to have, and expect everyone to look until they found it. We'd rather have a lot of people looking for odd material, or unusually good trees to establish a base--then later selections will have to beat that standard. Gradually, we'll increase our standards to the point where we'll have the best types or the best combinations.

One thing we want to do, and it wasn't brought up in our discussion a little while ago, is to reduce the variation within plantations of trees. We can get superior types of wood for certain purposes or we can get inferior types. But, just to have uniformly good material would be of an advantage. I feel our objective should be to isolate the various phenotypes. A forester in charge of land management or in charge of silvicultural work for a pulp company should know what is the best tree for pulp. That's his job, it's not job , it's not the job of geneticists. The forester is growing the stuff, he should know best what he's going to grow. But, the geneticists can say, here's this type, here's this type, and here's another type. They have certain characteristics, and you can pick out from that what you want. We have a wide variety of uses, so that our selection must be very broad. We want all types, we want material that can be used for

selection of open pollinated seeds, we want material that can be used for control breeding with other good types for combination of desirable traits. We want some odd material that may have some marker genes or something that could be used in cytological studies or studies in inheritance of good traits or defects or deformities. We need trees having rapid growth, disease resistance, insect resistance, small branches, and other valuable traits or combination of traits.

Rudolf I'd like to speak mostly of intentions. We're just getting under way also, and until we get the guide for selecting superior stands and trees, we don't intend to push any regular campaign. When the guide is available, we hope to distribute it rather widely and to hold a number of training meetings in the field in which members of the Tree Improvement Committee will explain to the "dirt foresters", if you want to use that term, what we're looking for and show them some examples on the ground. In the meantime, members of the Tree Improvement Committee themselves already have made a number of selections. They think they know what they're looking for, and they have made some real progress.

Dengler When you find these so-called elite trees, how do you determine that their eliteness is inherent and not just due to site?

Schreiner Where vegetative propagation is possible, inheritance can be most easily determined by clonal tests. Where vegetative propagation is not possible, progeny tests must be used..

Discussion - Tree Breeding

Pauley I'll now ask John Wright to present a brief summary of the points covered in his abstract of the Tree Breeding Committee's report.

Wright Yesterday's report contained a set of suggestions for prospective tree breeders and a plea for recommendations from the Conference membership as to what type of committee activity would be most valuable to the membership as a whole. Dr. Graves, a member of this committee, would like to speak a few words on the importance of controlled pollination work.

Graves I want to say something just for the record, on cross-pollination.

I sent out a circular letter to a lot of you people, and I was astonished to find that only two or three institutions are cross-pollinating trees. Now, to my mind, that's a very important feature of tree-breeding. Of course, it's sexual; it's a different process from selection. But, selection and cross-pollination are both fundamental parts of breeding. But, a lot of you people here have been talking about selection of trees; you're depending on chance, chance pollination by nature. Why depend on chance pollinations by nature when we've got the methods of doing the thing ourselves?

I've talked to foresters about this and they say, "Oh, it takes too long; there's too much technique in it." Now, we've been cross-pollinating chestnuts for the past twenty-five years, and I find that nearly every species of chestnut, I think every species, is crossable. And, there's no difficulty about it at all--very simple. Think of the possibilities; think of the wonderful walk we had with Dr. Augonbaugh where we saw the magnificent *Populus maximowiczii*, about sixty feet high, about twenty inches in diameter, in fourteen years. Think what you might have there if you crossed with, for example, *Populus deltoides*.

Of course, there's another side to this matter. When you select your elite trees, you're depending upon the struggle for existence. These trees that you select have been going through the struggle for existence, of course depending upon chance pollination by nature, for thousands of years. And, one objection to cross pollinations is that our off-spring from cross pollinations have not been subjected to the struggle for existence and survival of the fittest. This same thing happens in the breeding of race horses, fancy canines, and so forth. The offspring of these artificial pollinations may not be as reliable as these trees you get in the wild.

Just one other point: you don't know whether you have a phenotype or a genotype, when you're selecting the elite trees. But, in cross-pollinations, you could find that out by your genetic work.

We can sum it all up as follows: tree breeding consists fundamentally of two processes, (1) cross pollination and (2) selection. If we omit the first part and use selection only, then we are relying on chance pollinations made by nature. How much more sensible to make the cross pollinations ourselves, choosing what appear to be the best parents.

I admit that those who rely on selection only have a strong point. For elite trees (if they are genotypes) are the result of generations of struggle for existence and survival of the fittest in their natural environment. In controlled pollinations, we cannot say this of the off-spring. They are often prone to weakness or disease of some sort, e.g., highly bred race horses, fancy dogs, etc. They have not been "through the mill" so to speak.

The ideal way to breed trees is first to select the parents, namely, the elite trees, and then to cross pollinate them, again selecting the best off-spring.

We have a wealth of material for tree breeding, mostly still untouched. Let us not be deterred by thoughts of the amount of time necessary. The time scale for trees is very long. We must get started. Succeeding generations can continue the work.

Schreiner I think John Augenbaugh showed you the large trunk canker on the rapid growing Populus maximowiczii that Dr. Graves just mentioned in his discussion. This Chinese poplar is very susceptible to disease. For the record, we used P. maximowiczii in our hybridization work twenty-nine years ago. Many of the hybrids surpass the parent species in growth vigor and at least one clone has so far been less susceptible to disease.

Dorman Speaking for the record, I'd like to put it on the plate that the Southern Forest Tree Improvement people are doing controlled pollination work. We're working with open pollinated seed first because we have it available right now and we still don't know the opportunities from use of seed of that type. But, we are carrying on the cross-pollinating work. If there had been time for Ernie Schreiner to show his slides last night, you would have seen some hybrid trees that were control bred in 1942 and 1943 and a lot of those trees are now producing seed so that we'll have second generation on some of those high-yielding slash and longleaf pine before very long.

Rudolf My remarks on tree improvement in the Lake States were brief, so I omitted the fact that we are not overlooking the method of controlled pollination in the Lake States.

Discussion - Inheritance of Insect Resistance

Pauley Ray Brown, would you give us a very brief summary of your committee's report?

Brown Our committee feels that the states will be able to make major contributions in the search for this mythical pine which may be resistant or immune to white pine weevil attack. So I'd like to ask the members of our committee, Don Collins, State Entomologist of New York; Ben Hadley, Pennsylvania Department of Forests and Waters; and Al Nutting who is pinch-hitting for Henry Peirson, Maine Forest Service, to express the states' views on what they may consider necessary in this research.

Collins I think most of you are aware from other remarks, particularly those made by Mr. Eliason here and at other meetings, of the plantings of white pine and other trees that have been made by the Conservation Department in various parts of New York State. You are also aware that for almost all of these planting --in fact, I would say all of them--there is a history of the seed source, and that some sort of data has been taken at more or less regular intervals on the progress of the stands.

The subject of surveys is one that is often brought up and argued, especially in such matters as forest insect control, where the problem is likely to be on a very large scale. Those of us who have to justify surveys frequently find ourselves questioned by those who control the purse-strings because so often surveys produce only data which are then shelved and forgotten until some much later date. I think the present situation may be an example of where survey data can be made to pay off, because as has been brought out in the report that Ray Brown gave, one approach to the problem of determining whether there is a factor of resistance to weevil attack in white pine is to try to select from the plantings specimens that might be called "elite" trees. In this instance, we mean trees which in the midst of weeviling have appeared to be somewhat resistant, or at least have escaped the attack of the weevils.

As to whether this escape is due to site, or more broadly speaking, to geographical location, is something which, of course, we cannot say. The third alternative, the genetics of the tree, or trees, involved, is one that we will have to determine after we have eliminated, if we can, the other two factors. We may be able to do that by referring to data already obtained on white pine weevil in the general surveys, and also by a more purposeful series of surveys in which this is a principal objective. In fact, in some cases, the only objective will be to find trees which we can study in greater detail and possibly from which we can obtain progeny one way or another, to study this factor of resistance to white pine weevil attack. In other words, we will have to try to answer several questions that were implied in the outline that Mr. Brown prepared.

For instance, referring to the Tug Hill area, we should try to determine why these trees have escaped weeviling to such an extent. With reference to the three hundred quarter-acre survey plot which are to be examined annually for incidence of weeviling: when the results of those examinations are in, or as we go along, we will have to answer as best we can then and there, by direct observations, the question of why we think certain trees may have escaped weeviling--trees such as those in a spray check plot where trees show no weeviling. Ordinarily, we would be disgusted at that situation but from the point of view of studies on

resistance, we should be encouraged and try to find out more specifically why those trees escaped weeviling. Then, we might attempt to isolate trees that we think have escaped weeviling because of some genetic factor. I think we can have a definite program on this.

The thought I want to leave with you is that although in many of these projects we may seem to be rather nebulous, we have to start somewhere, and I think in New York State, we already have a start in these plantings. Possibly Pennsylvania and Maine also have that same start, but perhaps in a little different way and with a different set-up.

Hedley I can say that we feel the same about this problem as do Don Collins and his New York workers. Our effort will develop along the same line of reasoning that he has expressed. At some future date, I feel that we on the insect committee should get together and decide what facet of investigation our individual organizations will explore.

In Pennsylvania, we have white pine plantings originating as far back as 1904 on which records have been kept. We have many white pine plantations exhibiting weeviling of varying degree that can be examined and studied and in which data may be taken along any line of research the committee feels is indicated.

We are cooperating with the Northeastern Station in the examination each year of permanent plots in white pine to determine weevil incidence and the possible occurrence of weevil-resistant trees. This study, I believe, is the best basis we have to go on at this time. Within the next five or ten years, the yearly data taken from these permanent lots may show us promising white pines on which logical tests may be started.

Examination of old, well established plantations that are badly weeviled presents a rather discouraging picture from the point of view of selecting weevil-resistant individuals. In very badly weeviled plantations, a few good stems can be found. Is the answer resistance--or is it chance? However, we will keep looking over these plantations, possibly an "elite" pine will appear. As I said before, I think our best bet is in the yearly examination of sample plots in plantations and the application of biological tests to apparently weevil-resistant white pines.

Nutting I think it is a very important subject, and we do have a number of plots which we are examining yearly in Maine, and most of our work will be with natural stands because we have comparatively few plantations. I am sure our interest is very intense, and we will put in as much work as possible and certainly are very pleased that the other states are working on the problem and we will coordinate with them. I think our ideas are very similar to those of New York and Pennsylvania.

Brown Time is short for discussion here, so we will welcome any suggestions or comments that you may send the committee after this meeting. I urge that you send us your ideas.

Gabriel Is there anything in your examinations which might give you a clue as to how this resistance may be inherited. Have you seen anything which might lead you to believe that it could be a multiple factor inheritance or just a simple Mendelian inheritance? I believe that an idea of how this resistance might be inherited could possibly serve as a key in solving this problem.

Collins We have no information on that at present because we have barely touched the subject, but I agree with you, that is something we do have to keep in mind. In that connection, I think I'm correct in saying that the pathologists have gone farther than the entomologists in the study of inherited resistance among plants to their particular brand of plant pests, and I think we can gain a great deal by profiting from each other's observations and suggestions between those two fields.

Kriebel In connection with this, I would like to point out that in crop plant breeding, there has been practically no knowledge at all of the causes of this resistance, yet they have been able to develop insect-resistant varieties of wheat, corn, and other plants. We don't necessarily need to find the causes of resistance in order to do something about it. If we can find resistant trees and propagate them, that is what we're really after.

Discussion - Inheritance of Disease Resistance

Pauley The next committee report to be discussed is Inheritance of Disease Resistance. Ray Hansbrough presented the formal report yesterday, and I'll ask him now to introduce the salient points again for your consideration and comments.

Hansbrough All of the observations and formal research on the subject of the inheritance of disease resistance in plants, including trees, strongly indicate that for every pathogen, there probably is resistance. If this resistance is not in the particular species with which we are concerned, it almost certainly is in the genus. Ordinarily, therefore, we know that resistance is probably present before we begin to look for it. The question that we on the committee would like to have your guidance and comments on is what subjects are we going to select for detailed study. In our report yesterday, we attempted to outline our background thinking on this matter and presented two forest disease problems for your consideration: the inheritance of resistance to heartwood decay and the inheritance of resistance to oak wilt. We would welcome opinions from the floor now or sent in later to the chairman for inclusion in the final report.

Snow I'd just like to say briefly that the six evaluation criteria of Carl Hartley apply equally as well to the subject material of all the committees that have reported at this meeting, and I think they should give them careful consideration.

Discussion - Inheritance of Wood Quality

Pauley The final Technical Committee report is on the Inheritance of Wood Quality. Dr. Anderson will summarize the Committee report.

Anderson Since there isn't as yet a formal membership on this committee, I don't like to set up objectives. I think this should be done by the thinking of several people. There is one point in connection with wood quality, and that is that it runs through and underlies pretty much all of the work you're doing. Eventually, the product reaches the market place and when it does, it must be marketable.

I'm not speaking purely in terms of dollars there, I'm speaking in terms of properties. One case in point at the present time, for example, is beech. Beech is intrinsically a good wood, but it's somewhat hard to dry without drying defects. Consequently, that's one factor involved in less use for the species than it would otherwise have. Now, if someone finds a strain that has better drying properties, he'll have an improvement insofar as beech is concerned.

I would like to say that I would appreciate receiving any suggestions for membership on the committee. I'd appreciate receiving any suggestions for points in relation to wood quality where the committee could be of service to the entire group either now or by mail later.

Schreiner Would you consider receiving suggestions as to where samples of wood that might be inherently different could be tested?

Anderson I think suggestions on that point would be very much in order. Such analyses of properties are pretty time consuming and one big problem has been, and I think will continue to be, the difficulty of getting someone to make the analyses. I know that the Forest Products Laboratory at Madison has done a lot of that in the past--not necessarily on genetical aspects, but on all aspects of wood. I presume that is one possible agency. There is a certain amount that can be done at Syracuse, but we're limited both as to personnel and budgets. We are primarily a teaching institution with heavy teaching loads. The amount of time that faculty members have left over for research becomes limited. We have in our school (and the same is true of other schools) the possibility of work by graduate students.

Certain of the wood properties can be evaluated after the wood is dry. So, that even though an institution may not have graduate students or the time or budget to do a certain project at a given time, the situation may change as time passes and the stored specimens may be analyzed later.

Nienstaedt I think also we'd like to know how to test the wood at an early age. We can't wait until the trees reach sawlog size before we get some information on what we have. In fact, this is probably one of the places where studies of the correlation between juvenile and mature characteristics would be very important. I think it's the wood tester's job to decide on those techniques, if they can be made.

Anderson I think that's an excellent suggestion, and I think it's a fair one.

I don't think we've got the whole answer to it. Charlie Lockard tells me that at Madison, they have the thought that the evaluation of wood within reason can be done at a very early age. If Charlie has some remarks on that, I'd appreciate it.

Lockard I was the author of the remark that the Laboratory had indicated that in the case of hardwoods, they felt they could evaluate wood properties from stem wood if they had a stem of possibly a couple of inches in diameter.

I might also state, on a little different subject, that the Laboratory itself is working into its program a project along the lines which I have discussed here; that is, the inheritability (if that's the right word) of some of these factors which affect the wood properties or the commercial utilities of wood.

Schreiner For further light on whether technical committees should be set up on a vertical basis as indicated in my chart, I'd like to ask Andy to comment on the need for a Committee on Wood Quality.

Anderson I'm inclined to think that there should be a Committee on Wood Quality . My personal opinion is that it should serve more as a watchdog committee, When you select elite trees, for example, what are your criteria for an elite tree? For forest trees, it seems to me what you're thinking of is the wood in the tree. I think that a committee on wood quality could certainly give information along that line. I had not thought of this committee as actually going out and doing the tree breeding. Tree breeding and all the genetical considerations involved there are specialists' techniques and, personally--I'm not a geneticist.

Gabriel I would like to ask if you think it would be feasible, from the point of view of the wood-using industries, to investigate the specimens which are chosen for elite trees for desirable as well as undesirable properties. For example, if the pulp manufacturers were interested in knowing whether or not there are differences in the lengths of wood fibers in a tree which is rapidly growing as compared to a tree which is slower growing, could we answer such a question? The question in my mind is, how can we deal with the inheritance of wood properties on an intelligent basis when we know so little of what constitutes these properties.

Anderson I think that the users, whether it's the pulp and paper industry or furniture or whatever, should keep an eye on these rapidly growing trees. For example, in a rapidly growing cypress, it's my understanding that you have a high percentage of sapwood and a low percentage cross sectional area of heartwood. One of the very desirable qualities of cypress wood, of course, is its resistance to decay and insects. The sapwood is not resistant, so what is your product? Certainly, the users are interested in this. I think that if you're growing eastern red cedar for fence posts, and growing it rapidly, you have a higher percentage of sapwood. You may get fence post size rather quickly, but if you do, you may also have a small proportion of heartwood. In a fence post, if you're going to avoid treating it, you want the highly resistant heartwood. So, naturally, the man who is interested in eastern red cedar as fence posts should be observing that particular point. I think that the pulp and paper industry should be interested. I can't give you an answer on the relation of fiber length to rapid growth, but it is true that as you go further from the pith in a coniferous tree, the longer the fiber length. That isn't quite so true in some of the hardwoods. I have seen data for some hardwoods that showed an increase in fiber length for the first several years and after that, no increase. Such things should be watched by the people who are interested.

Brown, C.L. I would like to ask one specific question concerning your previous report. It relates to the statement that the wood of old-growth yellow poplar is quite often easier to work than that of the more rapid growing younger trees. I was wondering if this was due primarily to differences in the thickness of the cell walls, the size of the individual elements, or certain other factors?

Anderson I haven't seen any measurements on that particular point. There may be some. Does anybody have any knowledge of such measurements having been

made? Speaking from observation only, not measurements, the slow growth material has a higher proportion of vessels which are the thin-walled elements, and a smaller proportion of fibers which are the thick-walled elements. The opposite seems to be true of the more rapidly growing material. These are generalizations and observations and as such, as you well know, are subject to error.

Shaw I would like to throw something in on this factor of quality, and that is in the face veneer industry which we have in the Midwest. Though it is centered in the Central states, it buys its logs all the way from Pennsylvania and New York on the east, to Iowa and other points in the West. Now that industry has very specific requirements in which growth rate is quite a factor. It's also interested in such things as the occurrence of gum and mineral streaks which make face veneer of little value. So, I would just like to throw that in because of the fact that though much of the industry is not located here, the industry does draw its products from this area.

Pauley I have a comment on some of the remarks made by people from the floor.

I think that whenever the subject of forest tree improvement is brought up, the idea immediately occurs to many people that one of the things with which we are most concerned is increased growth rate. I'd like to make two points in that regard. In the first place, forest tree improvement need not necessarily mean that increased growth rates are desirable in all cases. If for specific purposes, increased density and other characteristics of the wood associated with slow growth are desired, then I can assure you that genetically it would be possible to develop such slow growing strains. Secondly, I don't think that we yet know enough about the reaction range in wood characteristics of our many timber-producing coniferous species to say definitely that increased growth rate is necessarily associated with low density. I very much doubt that density and rate of growth are necessarily incompatible in these species. No effort as yet seems to have been made to select for both increased growth rate and wood density. Such efforts might very well yield positive results.