

The top layer of our rooting medium is sand, then a very thin layer of peat and finally the soil, which is a Shenango loam.

Softwoods are taken in our Western New York area from about May 25 to July 10 on the subjects with which we are working, depending some, of course, on the season and the material.

We do treat the exposed wooden parts of our frames with Penta so the life expectancy on those woods would be 20 years to perhaps life, depending some on the material. The saran is used only one month out of the year, so therefore that is a lifetime investment. Our own recurring expense, then, of any consequence is the replacement of the medium. We do this with power equipment and the cost is very low.

A few words about watering. We have overhead irrigation over the entire area. With this we can keep the entire area in a moist condition, and this is only done as needed. Then, of course, sometimes it is necessary to do a certain amount of syringing of the foliage. We try to avoid this as much as possible. We are more apt to direct the syringing toward the under part of the sash or the outside of the frame. Of course, in hot, dry times it might be necessary to make this application of water, daily. As you can see, our frames are practically vaporproof, and I think much more efficient than those we used, say 20 years ago.

* * * * *

MODERATOR SNYDER: Thank you very much, Mert.

Now we will go on to our last method, which is propagation under 'Outdoor Mist'. Henry Weller is really in a fortunate position coming on like this. He can probably strike a few of the comments made by the others. Of course, they will have their chance for rebuttal. The use of 'Outdoor Mist' will be discussed by Henry A. Weller of C. W. Stuart & Co., Newark, New York. Henry!

Mr. Weller presented the first section of his prepared discussion.

OUTDOOR MIST PROPAGATION

HENRY A. WELLER

Director of Perennial Production

C. W. Stuart and Company

Newark, New York

At the present time our propagation program includes three methods, ie, greenhouse propagation, seedbed propagation, and outdoor mist propagation. These three methods are utilized for their specific primacy. The selection of one of these methods, in preference to the other, is determined by the quality of rooted material, that which is more suitable for transplanting.

During the past few years outdoor misting has taken a definite step in producing quality stock and is now our main method of propagation.

The propagation of perennial stock is done primarily within the greenhouse and seedbeds as it involves divisions, stolon cuttings, hardwood and semi-hardwood cuttings, hardwood, because of lack of material during the summer months and those varieties that do well from

seed. Most of the evergreens, deciduous and broadleaves are taken care of under mist.

A schedule, dealing with a specific group of plant materials in production, is taken care of through a set pattern. For instance, the greenhouse procedure begins with *Teucrium chamaedrys* cuttings taken in October and after they are completed, *Taxus* cuttings are taken. Geranium cuttings will be continued to be taken to the middle of March, followed by *Phlox paniculata* varieties. *Lavandula vera* seed is sown in flats the first of February after receiving a pre-chilling period. Incidentally pre-chilling and a germination test of seed has given concrete assurance of production. *Lavandula* is followed by chrysanthemum cuttings and then by *Plumbago larpendae* cuttings. In the meantime, test varieties are run through on their own schedule.

Seedlings, other than *Lavandula vera*, are sown the middle of July and the latter part of September. The varieties sown in July, such as *Aquilegia*, *Asclepias tuberosa*, *Platycodon grandiflorum*, *Chrysanthemum*, *Iberis sempervirens*, *Delphinium* and *Pyrethrum*, to name a few, require no cold treatment to aid in bringing about germination. Those sown in September, which require a cold period or stratification to break dormancy are, *Sorbus aucuparia*, *Mahonia aquifolium* and *Taxus cuspidata capitata*.

Outdoor mist propagation also has a schedule all of its own and it begins the first week in June and continues on through the last week in August. Some of the early varieties propagated are transplanted the fore part of August with excellent results.

The varieties we propagate under mist in full scale production are. *Euonymus fortunei*, Winter Glory and Winter King which are two new euonymus hybrids, *Buxus sempervirens*, *Mahonia aquifolium*, *Pachysandra terminalis*, *Vinca minor*, Chrysanthemums, *Plumbago larpendae*, *Salix purpurea nana*, *Ligustrum vicaryi* and *Philadelphus virginialis*. Some varieties we have had under test which have shown good results are; *Cytisus scoparius*, *Cotoneaster adpressa* and *horizontalis*, *Viburnum carlesii*, *Taxus cuspidata*, *T. media hicksii*, *T. brevifolia*, *Juniperus hetzii*, *Rhus cotinus atropurpurea*, *Berberis atropurpurea nana*, *Pachistima canbyi* and *Philadelphus aurea*.

Misting has advanced very rapidly considering the fact that six years ago it was still in the talking stage. Our operation in this period of time has increased in area from 500 square feet to 25,000 square feet. This area involves 1000 mist nozzles spaced every 5 feet. The overall area is covered with 2 inches of 1/2 inch gravel for drainage. The beds are five feet in width and are edged with discarded railroad ties. The ties are weatherproof with creosote and are heavy enough so that they stay in place without having to be staked. We are using Florida type nozzles, the orifice of which has been drilled to 1/16 of an inch to acquire better water coverage and less clogging of the nozzles. The water pressure is maintained at 80 pounds. The beds are controlled with individual timers and solenoids. The timers have a range from two minutes through one hour, and in addition to this have a switch which can either turn the individual line off, hold it on constant or set the timers

in control. The beds are protected from the northwest with a polyethylene wind baffle to prevent drying along the edges

Of all the rooting mediums available, we have found that vermiculite works the best for our mist propagation. The vermiculite provides good aeration and good drainage, even though we are applying great quantities of water. The vermiculite also has a tendency to cling to the roots during transplanting, keeping the roots moist.

The cost of setting up a good substantial mist system is reasonable, particularly when considering the return. Approximately 33 cents per square foot will grade, provide drainage, wind baffles, pipe, nozzles, solenoids and timers. Labor in addition to this will vary as to source. The recurring cost has been negligible over a five year period. The timers, solenoids and nozzles are checked each year to insure trouble free conditions the following year. The equipment available continues to be improved and thereby adds to this already superlative advance in propagation.

I have some slides that will illustrate the area and also some of the materials we have been working on

(*Editor's note.* Mr. Weller completed his discussion by illustrating the salient features of his talk with slides. Some of the comments and questions follow.)

QUESTION: Do you have a wire mesh in the bottom of the box in which you root your cuttings?

MR. WELLER: No, these boxes have wooden bottoms. We have no problem with drainage. In fact, I have seen water standing right up in the box and it doesn't seem to bother them too much

We do feed these cuttings with the mist line with a water soluble plant food containing the three basic nutrients and the trace elements. This does help overcome some of the leaching. With *Taxus cuspidata* it is almost impossible to prevent chlorosis

MR. HOOGENDOORN: Where do you store these rooted cuttings?

MR. WELLER: I think it was Leslie who mentioned that these cuttings having to be brought inside. These cuttings, however, are left in the area where they are rooted. We don't worry about overwintering. The cuttings are fed much like Jack Hill has set up his schedule. These are set up along the same method of fertilization, and to this point we have not run into any overwintering problems.

QUESTION: How many plants do the boxes contain?

MR. WELLER: These boxes contain approximately 160 to 200 cuttings.

QUESTION: What is the depth of the box?

MR. WELLER: It depends on the type of material. For *Pachysandra* we use a large box.

MODERATOR SNYDER: Are there any panel members that have questions, comments, criticisms or anything else to add about other methods?

MR. HANCOCK: I was very pleased to hear the exact figure for cost per square foot of misting, that is 33 cents. Does that include your boxes?

MR. WELLER: No, it does not.

MR. HANCOCK: Does it include the cost of mixing up your fertilizer and peat?

MR. WELLER: No, it does not. That is an additional cost. The boxes are normally used during storage so we disregard that cost. The Terralite is necessary and we don't use peat moss.

MR. HANCOCK: What do you use with this Terralite?

MR. WELLER: Nothing. Straight Terralite is a trade name for vermiculite. Leslie, you mentioned soft mud for rooting cuttings. I was wondering what the possible aeration is?

MR. HANCOCK: The soft mud is called a slurry. Now the aeration theory is not upset. Let me tell you by removing no leaves from cuttings and keeping your fingers above the mud, you can stick them fast. It makes an open hole and the cutting goes in. What we see on the sides of the cuttings, where the leaf folds around there is a bunch of roots coming out because of the aeration by leaving the leaves on.

MR. FLEMER: There is one other thing which I see I neglected to state about our greenhouse system which I would like to mention now. We have erected over our greenhouses a permanent frame made of pipe, put together with pipe joints and on this framework are laid parallel strips of one-inch pipe running out at right angles from the head house. On these parallel strips of one-inch pipe we have four-foot snow fencing permanently fixed with copper wire. It is good for a number of years and it is never taken off. It is on there both winter and summer. During the summer softwood period when the temperature is high, the men get up on this snow fence and stretch shrimp nets. As soon as we get into the firmwood cuttings in the late summer and early fall, we roll up the shrimp net and put it away. We usually get three seasons' use out of the shrimp netting, which gives us extra shade during that hot summer period. We leave the snow fencing on at all times, both as a protection against hail and also to prevent the greenhouse from shooting upward in temperature during some bright spells during the winter weather.

I think it cuts down on a certain amount of heat radiation during winter nights, too, and it is just an added protection and moderating factor for the greenhouse itself.

MR. HOOGENDOORN: What happens during heavy snowstorms?

MR. FLEMER: The snow seems to silt through. We have only once had trouble. That was a year ago when we had 12 inches of wet snow and part of the frame collapsed. That was the first time in all the years that the snow bridged over the snow fencing and built up very rapidly. The normal snow sifts through the rather wide spacing between the lath, falls on the glass, is melted and runs away.

MODERATOR SNYDER: Any other questions?

MR. HILL: Do you change the medium in the greenhouses?

MR. FLEMER: We have tried sterilizing by chemicals and by steam. We have come to the conclusion that after you have run through

four and a half crops per greenhouse you have built up your organic matter considerably. You can't sift out old roots and bits of leaves satisfactorily. Even if you do get it completely sterilized, you will get reinfection from aerial-borne spores. It doesn't pay to keep it more than one season. You will notice our protection is through the medium, beginning with very soft to medium soft cuttings, to firmwood and then to hardwood cuttings each year. As you go down this process the cuttings become successively more hard and, therefore, more resistant to basal rot. So we can get through one full season's work without having to change it. We don't dare go back again into the first cycle with extremely tender cuttings because they damp off. It is poor economy not to change the medium.

MODERATOR SNYDER: The floor is now open for questions.

MR. MARTIN VAN HOF: This is for Bill Flemer. He mentioned the overwintering of the cutting in a frostproof frame. I would like to know what kind of a frame it is, how it is constructed, and if it is a deep frame how he keeps the water out, and so forth.

MR. FLEMER: We used to have the conventional six-foot wooden cold frames which took a sash just nicely. During the long war period when wood was not available, these were pretty well dilapidated so we decided to replace them with four-inch cement block frames. We would put two frames together back to back in order to save two walls. They are dug down in the ground about 18 inches. We have a high piece of ground, Martin, so that there is drainage. The frames, although dug down into the ground, are still higher than the roadways which run alongside, so we can get drainage through the pipes at the end of the frames.

Down the center of the frame is a row of pipes with a 2 by 6 laid flat, and screwed to the pipes. On top of this is a 2 inch by 3 inch laid to form an inverted "T". This is higher than the sides of the frame and they slope off to the sides of the frame to give you a miniature greenhouse effect. It is actually a double slanted roof.

MR. VAN HOF: What is the pitch?

MR. FLEMER: The pitch is one inch from the high to the low side. We have in the bottom of the frame four inches of pea size gravel for drainage. With these pots it is important to have gravel underneath or polyethylene. If you put them on sand, they root through and you tear the pots to pieces when you remove them. They do not root badly in the gravel. During the wintertime at about this time of year, we can pick up leaves very cheaply from our town, and these are hauled in and we bank those frames with leaves. The leaves extend about 18 inches out, and they go up over the edge of the sash. We put board covers on top of the sash after the material has hardened up, and the leaves have dropped.

These frames will freeze on occasion but they do so very, very gradually and once they become frozen they stay frozen. We think one freeze is beneficial. We think what is detrimental is what Jack Hill was talking about yesterday, alternating freezing and thawing. The slow, gentle

freeze and then a long sleep seems to make them break much more vigorously in the springtime.

MR. CONGDON: Bill, I will get around to directing a question to you but momentarily I was going to say I believe from what I have learned here that Mr. Hancock and I are the only ones that are rooting down into the soil. You remember that I mentioned the stratified areas that we were rooting down through. Now I feel that the performance of this stock after you get it out into the field is of prime importance and with the method that we use we are carrying along a small amount of earth in our peat with this plant when we take it to the field. Bill, you are familiar with our operation. Do you feel you are taking to the field a plant in the line I am working, with as good a root system as the one produced by my method?

MR. FLEMER: I think that your method is less expensive, but the key to the success of your method is that you are a better nurseryman than we are. You dig all your shrubs at one time of the year. You are handling bare root shrubs which are all brought in for storage. You have a distinct harvest time. When it opens up in the spring you have no harvest, no plants to dig and trees to get out of the ground, and the first thing in the spring you go right to work with those bare-root cuttings with a little earth adhering, and they go right to the field and you get wonderful stands.

We, unfortunately, or foolishly perhaps, growing a general line of evergreens, broadleaves and shrubs, are so darn busy in the spring that we just can't take the time, at the proper time, to put out bare root shrubs. So our solution on this thing is to pot them up.

MR. CONGDON: I would like to point out that these are not bareroot cuttings that are going to the field; they can stand in the frame for whatever length of time is necessary. Sometimes as late in our areas as the first of June. I feel we can hold them there as long as you can in the pots.

MR. FLEMER: If you can make the soil stick to them, there is no question it is just as good, and obviously, I have seen your stands many times and they are as close to this mythical 100 per cent we all bandy around as it is possible to get. Our operation, I should say, is geared to precision. We are in a high labor area. We grow a great number of plants. Our cost compared to our Tennessee brothers are fabulous. The only way we can keep going is precision — precision in production. We plan ahead year after year, sometimes many years in advance what we are going to produce. We grow many of these shrubs in rather small quantities, surprisingly small, some only 250 of a kind, some only 500 of a kind, some only 1,500. We grow a lot of odd shrubs other nurserymen don't grow. In these oddities we can guess fairly well what we are going to sell. If we have scheduled 500, we don't want 1,500 and we don't want 100, because then we would be listing in our catalog something that was unobtainable somewhere else.

We can justify this higher cost of potting these plants and then going to the field and chalking it up to precision. After all, what really costs you money is not in the few cents you save on your liner; it is that

stand in the field. If you have a good steady, even stand across the field, it enormously reduces your fertilizing cost, cultivation cost per plant and most especially your weeding cost. Any other questions?

MR. RALPH SYNNESTVEDT (Glenview, Ill.): Bill, back on this cost again — in the days before you potted off into Jifty pots coming out with your first crop of softwoods, what additional charge do you now feel that this potting operation is costing you over that? I assume in the days before the potting you went to the frame outside with the rooted cuttings from the house. Is that correct?

MR. FLEMER. No, that is not correct. We used to do it in clay pots and that really got to be expensive. We were so relieved when the peat pot came along. Just to give you some figures of what we grow, we run through this range of evergreen houses just short of a million plants a year and taking all our costs, including overhead which most nurserymen and especially most propagators don't figure when they are figuring production cost, we figure it costs us six and three-quarters cents per pot plant, that is a two and a quarter inch pot plant, before it goes to the field. That is high, but it is worth it.

MODERATOR SNYDER: We will throw it open to all members of the panel.

MR. MILTON SPANGLER (Boston Park, N.J.): I would like to ask Mr. Flemer about the yew cuttings he takes out of the greenhouse and pots up in peat pots.

MR. FLEMER: Our yew cuttings are rooted usually by early March. They are potted in two and a quarter inch peat pots and either set up in sash houses or in the greenhouses, depending where we have the room. They root very rapidly through the walls of the peat pot. They are planted out in May, in the open field in narrow rows, three, 18-inch rows are opened simultaneously by a three row opener. We plant them out in the open rows and cultivate with a cultivator rigged with these little, tiny vegetable cultivators.

MR. SPANGLER: The reason I asked this is that I put out 40,000 yews last spring. I had the Puerto Ricans do the planting. It costs \$1.00 an hour. I planted them in beds about six inches on the square. When they got through weeding them, and in about three weeks I had a beautiful hay field. I am afraid somebody is going to come along with a match. I don't know what to do.

I have planned for this coming year that whatever I take out of the greenhouse I am going to pot up in peat pots and put in a frame. I wondered whether you waited for fall.

MR. FLEMER: As early as they are hardened off sufficiently to stand outside temperatures they are planted in the field. The earlier you get them in the field the better.

We find bedding and weeding costs extremely high. That is the reason we have gone to the three-row modification, much like Hugh Steavenson has described.

MR. SPANGLER. While I am here I would like to ask Mr. Weller if he takes his yew cuttings in the spring and puts them out under mist?

MR. WELLER: The yew cuttings under mist are taken in July. For the greenhouse procedure the cuttings are taken in November. We do bed our cuttings out in beds in early spring, but we have no weed problem to speak of.

MR. MARTIN VAN HOF. I saw some beautiful stands in the pictures of all your shrubs. I have had a miserable failure with *Philadelphus coronarius aureus* under mist. They start to root and then their leaves drop. What am I doing wrong?

MR. WELLER: I have run into the dropping of foliage to some extent, but not to the extent of decreasing the amount of rooting. I don't consider that a problem. The root structure is the thing I am after. If they drop a few bottom leaves, I don't feel that actually enters into the picture.

MR. VAN HOF: I wasn't worried about a few bottom leaves but rather any leaves.

MR. WELLER: I think, Martin, possibly the timing might have a little to do with that.

MR. CONGDON: I showed you a block of 30,000 *Philadelphus coronarius aureus* that were grown under sash. I could have also shown you an equal block grown under mist. The secret of *Philadelphus c. aureus* under mist is to put them on an extremely dry cycle. On dry, hot days, they flag terribly. We would much rather see them flag than have them too wet, since they will come up during the evening and night. As long as you keep them on a dry cycle you will have no trouble with *Philadelphus c. aureus*.

MR. HANCOCK: I can confirm Mert Congdon's statement absolutely. The leaves would drop off, I would think, because it does not stand wet conditions. That is one item we can grow perfectly under our method and if we get a very wet period that is exactly what happens to them. When we see that coming, first of all we have to avoid watering. We don't have nearly the same amount of water going on the *Philadelphus c. aureus* that they do in misting. We merely have humid air. The *Philadelphus* species cannot stand a lot of water. As soon as we see that rot is starting, we dust them with a fungicide to stop it.

MR. HOOGENDOORN: How can you stop it if you are going to put water on it again right after?

MR. HANCOCK: We don't actually. I just make sure that it gets very little water. That is one thing I have against this mass misting. For some things it might be beautiful; for other things it might be a flop. When people say you shouldn't do all this hand work, we can actually avoid putting water on the *Philadelphus c. aureus* with the use of burlap, just enough to keep them from wilting.

DR. PRIDHAM: I was interested in having Mr. Weller tell us again how he handles the cutting down of the frequency of the mist. I think you said, Hank, each bed was run individually and you had pretty complete control over the material in one bed. You said something about cutting down on the original number of misting applica-

tions to, I think, about one-tenth of what you started with, but I am not sure. Would you tell us again?

MR. WELLER: We are using a timer that has a particular cycle of two minutes to one hour, and a solenoid that has a period of approximately 25 seconds. When we first take the cuttings the period is 25 seconds out of every five minutes. Generally, within a week or possibly two weeks, the cycle is dropped to ten minutes. Then as rooting is taking place, the cycle is dropped off as fast as possible and cut down completely to 25 seconds every hour, and it is absolutely foolproof. Each bed is controlled individually and each bed contains one variety. We do have control over that particular material.

MODERATOR SNYDER: You see, when you begin to ask questions you get a lot more information coming up from these people.

MR. MARTIN VAN HOF: I saw some lilac propagation over at Roger's with the plastic inside the greenhouse. Now I would like to know from Henry and Roger how they are doing it, under mist, especially with the white variety cuttings?

MR. WELLER: Lilacs under mist is still in the testing stage and it will probably continue to be there for some time.

MR. COGGESHALL: I think Gerald Pfundstein could answer that question concerning lilacs under mist.

MR. GERALD PFUNDSTEIN (Dundee, Ill.): We have not done so many after the first couple of experiences under outdoor mist. We are doing it in the greenhouse. The first season we tried them in the house with the mist we did not have very good luck. The second year we tried many more in the house and with a comparable lot got not nearly as many as in a frame outside. We had very poor luck with it. We did it in a plastic-lined house this past year and had very good luck, mostly with hand misting and without automatic units.

MR. AART VUYK (Indiana, Pa.): I would like to come back to the question of the deep tray. We built a couple of deep trays and we made them approximately three and a half feet deep. We have drain tile underneath on account of our terrible clay conditions, and we run our drain tile towards the dam we have there. But we also have heat pipes in there and the thermostat set at 40 degrees, and I think it is quite an advantage to have heat in the tray.

We put cuttings in there like American holly, Japanese holly, and all that kind of material and we feel that we get a rather heavy plant by June to line out. We believe this happens because we get the first flush of growth right in the deep tray, and I think it is quite an advantage.

MR. WELLER: I would like to ask Bill Flemer about this Jiffy pot, because our experience with them has been somewhat disastrous, and I gather other people have had trouble with them, too. The difficulty seems to be in, first, the material that you put into the pot. A very fine-rooted plant such as azalea or rhododendron seems to have no ability to drive through the peat pot and really submerge when it is planted. And the second thing is that the Jiffy pot itself acts as an eva-

porative surface, so unless you are very careful as, of course, you should be, the material will dry out in storage or through the winter.

We ran comparable tests on two plants, ie, *Prunus* 'Hally Jolivette' and *Clematis montana rubens*, putting half of each lot of plants in Jiffy pots and the other half in soil. The straight soil was greatly superior.

I would like Bill to comment on that in relation to his material.

MR. FLEMER: Jim, you have had the same experience that we have had on *Prunus*. We have tried *Prunus* in Jiffy pots and for some reason which I can't explain they don't do as well as in the clay pots. They are one of the few plants that we still go to the added trouble and expense of potting in clay pots.

About this drying business, we do not have trouble with that because we are used to peat pots. It is difficult if you are using several different kinds of pots to get the greenhouse crew accustomed to watering them properly. If you have some plastic pots, some clay pots and some peat pots you will find the clay has to be watered frequently, the peat pots less frequently, and the plastic pots still less frequently. Once you shift over entirely to one kind, be it clay or peat, you can soon work out a watering schedule that gives you good success.

We have not had trouble with azalea and rhododendron in peat pots. They are one of the few that we water in the flat before we set them up. The others, after potting we set them up in the cold frame dry so the pot is rigid and water them in the cold frame where they are going to stand for the rest of the winter. This gives us air spaces between the pots. In the case of the azaleas and rhododendrons, we water them and then set them up. That means the walls become soft and rather spongy since the pots are set closer together. We have no trouble getting roots to come out all over the surface of the pot as it fills up with roots. If you are not familiar with using it, you do have to pay more attention to watering, definitely, and just make sure that you don't allow them to dry out.

MR. WELLS: About the planting of this material in the field after it is established in the pot will the edge of the pot serve as a wick? If you run into a dry period it seems that you can rapidly deplete the water reserves just in the small pot ball, and as these pots are fertilized also you run into a layer of highly soluble salts which can be lethal for touchy plants, particularly the ericaceous material.

MR. FLEMER: You have to be careful in fertilizing, because there is fertilizer in the wall of the pot itself, and you can over-fertilize rather easily. Now our pots go to the field out in nursery rows, Jim. That means the trench is opened mechanically and we set the pot deeper than you would probably in bedding a shallow-rooted subject like a rhododendron. The pot is down a couple of inches below the soil surface by the time we follow up our planting with cultivation, and we do cultivate almost immediately. As soon as the planting crew is out of a row, the cultivators are following and throwing up loose soil over the pots. Furthermore, these pots are flat enough and go on a truck to the field, and the driver goes around to the hydrant and soaks them. The pots are literally mushy wet and they usually have enough reserve

supply of water to reestablish themselves before they get into the wick-like drying which you mentioned.

MR. HANCOCK. Again, I can collaborate that Jim, this might answer your question, too. We brought up some one thousand *Pachystima canbyi* cuttings and potted them in Jiffy pots. I wasn't there when they did some of the planting and some of the pots went into the ground two inches and some of you could see the rim on the surface. I might say those in the ground two inches, the plants grew magnificently and the others, where you could see the edge of the Jiffy pot on the surface, not as good. I quite agree that you must get that Jiffy pot at least an inch and a half below the surface.

MODERATOR SNYDER: Thank you, Leslie. I think we had better take a break so you gentleman can catch your breath and then come right back. (The group recessed briefly)

Take your seats, please. The panel will come back to the platform and we will get underway. We are going to give the members of the panel now an opportunity to brag, I hope, about some of the plant materials that we have been particularly successful with and also an opportunity to possibly express reasons why they prefer their method to other methods. We will follow in the same sequence in which they appeared originally, which I believe started with you, Bill.

MR. FLEMER. It is pretty hard for me to say what special plants we can propagate that other people can't because I can't just offhand think of a thing that we are rooting successfully in quantity that someone of you fellows isn't doing at the same time. I will say that in our trials, we have a misting unit, too, which we have found more successful for rooting magnolias than our conventional mist house. This is one of those sash houses with a raised bench which I described earlier, with bottom heat. It has Florida nozzles, three feet apart down the bench from the overhead pipe and in it we find we can take magnolias softer than we could under our conventional greenhouse method and root *Magnolia soulangeana* and *M. s. alexandrina* very successfully. We have not been successful with *M. speciosa* or *lennei*, which are other varieties we grow.

I would like to bring up this matter of peat pots again, because we have tried many different kinds. The one that is sold under the commercial name of the Jiffy pot, has proven to be far away and above the best of the lot. The Bird pot is made with a great deal of paper in it. If that is the one you are using, Jim, that would be the cause of your trouble. I see you are shaking your head. You are probably using the Ball pot. The Ball pot is made only of peat and spruce fiber, and it is both tough and porous. You get good aeration through the sides of the pot and good root penetration. The roots just shoot right through the pot and slow down and grow now more. Additional roots come out from within the root mass, so by the time the plant is ready to go to the field you have just the pot entirely filled with roots, and the plant is ready to go right on out. None of the other brands which we have tried have been as successful.

I want to emphasize once again the terrific importance of putting all your peat pots in one area if you are using different types to begin with and of getting your hose man accustomed to watering this particular type of container. Its requirements are different from the other two classes which are commonly used in the nursery business today.

I might also say that we syringe our cuttings during hot weather if they are flagging a little, as much as four times a day. People have asked, why don't you just substitute a mist line for all that labor. To me, any technique, even though it increases the cost of operations that makes the propagator and his staff get down in those greenhouses, go through and have a look at the material is a device which increases your overall success. The trouble with these automatic things and failures with them are almost always traced to just turning it on and letting the clock do it or the electronic leaf do it, and think no more about it. In our opinion, the secret of successful propagation is no more nor less than every day attention. Hand-watering does enforce this at least it makes the men get in there and see what is going on, even though they might not do so otherwise.

Well, that is all I have to say at the present time. Thank you.

MODERATOR SNYDER: Now we will go to Roger again for a few comments on the polyethylene system. Roger, can you really propagate plants under polyethylene?

MR. COGGESHALL: Thank you very much, Bill. I will try to answer your question. I believe we can propagate plants under polyethylene, at least I have been told so for a good many years.

We start off, as far as our propagation schedule is concerned, with the spring and go right on through the summer, fall and winter.

We start off first with the propagation of lilacs. Then comes the *Prunus*, 'Hally Jolivette.' It is a bush type of cherry, very easy to root. I believe in getting it to live is in reality getting it to overwinter. Jim Wells mentioned that he had trouble with it in Jiffy pots, is that not right?

MR. WELLS: Eighty per cent of them died in Jiffy pots but 100 per cent came through in flats of soil.

MR. COGGESHALL: We propagate this kind of cherry in exactly the same manner as we do the lilacs, the magnolias, and the shrub *Kolkwitzia*. All these types of plants are made when the top growth is just about long enough to make a cutting. In respect to the cherry, when we make the cuttings we root them, pot in Jiffy pots, and then they are immediately put out. Next spring they will be 15 inches high. We have no trouble overwintering the plants with Jiffy pots in that manner.

(*Editor's note:* Mr. Coggeshall continued his discussion from slides.)

We collect the lilac and cherries when the growth is long enough to make a cutting. By that I mean with the lilacs we have two sets of leaves with a three double-lobed cutting. The cuttings are treated with Hormodin No. 2 and Hormodin No. 3. We have had considerable difficulty propagating the white varieties. Mme. Antoine Buchner and

Vestale and Ellen Willmott, these three in particular were practically nonexistent percentagewise. This past year for the sake of comment we held off until the growth was a little harder and we decreased the hormone. Instead of Hormodin No. 3, we used the No. 2 product. The idea was that the cuttings would take a little longer to root but the results were quite a bit better. Maybe that sounds a little odd that with the decreased hormone concentration you get better rooting. That was certainly the case in these particular varieties.

With the dark-colored varieties such as Lucie Baltet and Katherine Havemeyer, rooting was very good. Once they are rooted, we pot them in two and a quarter inch Jiffy pots. They are carried in a tenthouse until the roots come through the sides, which will take place in a week to ten days. Following that, we bed them out seven inches apart, across in a bed 42 inches wide.

The advantage, in bedding them out, at this time of year, which I mentioned was around the first of August is that most of the varieties will go on to make from an inch to six inches of growth, depending on the variety.

The propagation of lilacs under polyethylene plastic is very successful. I ran an experiment in connection with rooting the cuttings directly in the ground. The results there were far superior to growing them in the greenhouse benches and the greenhouse space being at a premium, next winter we will throw most of the lilac propagation into the ground with a polyethylene cover, the idea being there is no necessity to pot them the following year.

This picture is an illustration, at least in part, of the difficulty we have had with the Jiffy pots in a way that has not yet been mentioned. Now we had tremendous heaving through this past winter. These plants, which I did not mention are mulched with sawdust following the bedding-out operation, and I can certainly back up Mr. Hancock's comment that if you plant them too shallow you are going to have problems. They are planted at least two inches deep. We had a tremendous heaving loss. We reset the plants as early as we noticed it in the spring.

Once the lilacs have been made, we switch on the azaleas and select the color in the Ghent and Flame azaleas. As I have already mentioned, we cannot grow many of the things that you can grow here in Pennsylvania and New Jersey. These azaleas for the most part have proven quite hardy, although last year we changed our minds in respect to certain varieties which were killed right to the ground.

These cuttings are also made before Memorial Day. As I mentioned previously, we have a lot going on during this, the busiest part of the season. However, I certainly believe that if you are going to bother with this type of plant material you have to do it now or forget it. If you make these cuttings in June or July, you won't get one-tenth of the material you should have. These are treated with Hormodin No. 3 without wounding. They were then put into a medium of sand, peat and styrofoam. The styrofoam is ground, and the medium mixed in equal parts by volume. These cuttings we leave in the medium for

approximately three months. Then there is the matter of potting them off again into Jiffy pots. In many instances the varieties we root are: "Josephine Klinger," and "Daviesi" which we grow very little of; the "Coccinea Speciosa," "Pallas," and "Raphael de Smet," which are much slower to root. These cuttings also go into Jiffy pots and this winter we are handling them a little differently

Along the lines of Charlie Hess' comments in connection with the dogwoods, we have them in a storage condition where the temperature will fluctuate very little. In that way, we hope to overwinter them. We ran them under light about the second of November. That is a continuation of the normal daylight plus artificial to supplement the continuous daylight. The varieties grew anywhere from two to 15 inches, depending on the variety. The difficulty came into play when we attempted to overwinter them. The temperature dropped the second of January and the house froze up solid and I can say that we won't try that again

We do not place these azaleas too close together. The terminal buds were removed. We believe they have an inhibiting effect on the regrowth of the cutting in the spring, but next year we will know more about it.

This polyethylene plastic unit roots the cuttings in extreme heat and extreme humidity. I honestly believe the results we have propagating these hard-to-root materials is due to the fact that the temperature under the polyethylene is certainly much higher than under your mist system or conventional hand-syringing operation.

We begin our rhododendron propagation approximately in the middle of July with cutting material such as *Rhododendron fortunei* or Dexter hybrids and *R. catawbiense*. These are rooted by, say the middle of November at the latest. We try to turn over the benches as fast as we can but can get only three crops in one single year.

With these *Rhododendron fortunei* hybrids we have quite a few seedlings which have been collected locally. These plants have proven to be hardy over a great many years and the stock plants are up to 12 to 15 feet in height. As far as hardiness is concerned, we had very good success in overwintering them last winter

There were varieties such as Caractacus, Dr. Dresselhuys, E. S. Rand, and Mrs. Peter den Ouden which were killed.

We do not get the rhododendron in the State of Massachusetts that you get in New Jersey. We usually get two flushes of growth in a year. We had a third one this year and we pruned it all off. By that, I mean it wasn't longer than an inch and a half to two inches. It has all been killed by the frost now, the plants grew so late. These plants are what we would consider one year old.

Now we pinch the two-year old rhododendrons heavily so as to shape them up prior to the lining out operation. When the cutting is potted it is benched. Then when it is at the end of the first flush, the first year in the bed, it is pinched and pinched again at the end of the second year. If it stays in the bed two years the pinching operation is continued and the spring of the third year they are lined out.

As far as the *Taxus* are concerned a question came up a while ago as to what we do with them once they are rooted. We pot all ours. This operation is done in the way Bill Flemer described. We eventually hope to have all our cuttings potted by the time spring rolls around. They are placed in a concrete frame in Jiffy pots with a light layer of sawdust over them.

In the Jiffy pots that you see, they are bedded out the next spring. In other words, we pot up material you saw in the frame in the spring and it remains in that frame all that summer and all the next winter, and the bedding out operation takes place the next summer. This material here is again planted out on the same spacing I have already mentioned, and the mulch is soft. A good many of you I know do not like sawdust. We pay pretty close attention to fertility and in my short experience of time in a nursery, I have not seen any damage due to the use of sawdust.

I might comment that once these plants are dug, the lining out operation begins. The space they come from is cover cropped for two years before it is put back into plants again.

This is a field of six year old plants which range in kind and age. However, one application of Simazin was applied in the month of May, the first year, and again in the month of May the second year. There was no necessity to hoe that piece following application.

The only further thing I have to comment is that with the propagation of the evergreens we do not use any polyethylene plastic at all. They are bedded out in open benches under standard greenhouse operation procedures.

MODERATOR SNYDER: Thank you, Roger. I know you can propagate plants and I know the polyethylene frame is a very effective method for doing this.

We will call on Leslie Hancock to comment on some plants that he has been especially successful with.

MR. HANCOCK: I will say that there are very few plants in my honest opinion that we can produce any better. After all these wonderful pictures it really makes you wonder whether you have ever learned anything.

We find that because we take the plant up with just a little ball of roots it is as good as if we had it in a Jiffy pot. We take them right over to the bed and pull them apart and put that chunk of earth into the soil, and it goes right on growing.

As far as two other items, Silver dogwood and *Viburnum tomentosum plicatum*, I know that these are not expensive plants. This method gave us 100 per cent rooting of Silver dogwood. As you know, the Holland propagators had to rely on layering as a method for propagating this plant. Of course, I might also say that we have always been able to grow *Philadelphus coronarius aureus* particularly well.

The only other item which I would comment on are the cotoneasters. I don't know that Harvey Templeton asked me what experience we had with propagating cotoneasters. I think this is one thing

that we will be able to do better than anyone else. I have two plants in the back of the room of *Cotoneaster adpressa praecox*, which I bet you never saw. Also, I brought a *Cotoneaster dammeri* which is 18 months old, and which you can inspect.

MODERATOR SNYDER. We will go to Mert Congdon for any rebuttal or comments he would like to make.

MR. CONGDON. Bill, when I first went over the list of material that we are working on in these outdoor frames I explained to you that it was all fairly easy material to propagate. I am not really familiar with some of the difficult subjects that might possibly be done in this way, since I am solely interested in producing a volume of the easier to propagate deciduous subjects.

As was brought out earlier, we do particularly well with the *Philadelphus coronarius aurea*, *Potentilla*, *Philadelphus virginialis*, the viburnums, and hydrangeas, *Deutzia*, *Kolkwitzia*, and *Ligustrum ibota vicari*, which do better under mist, at least for us.

Now the reason that I prefer the cold frame and mist method is because we feel that the frames and the mist are the methods of lowest cost for the subjects in which we are interested. If we are to produce a two-year, two to three foot, field grown weigela, for example, at 35 or 40 cents, and believe me, the trade expects us to produce them for that price, we must watch these costs all the way.

Henry Weller gave a good talk on this subject last year in Cleveland. The nurseryman that is producing liners had better not go over about five cents on this class of plant material. We feel that we are doing it for less than half of this cost. If we are to watch costs, then we certainly cannot transplant but once directly from that propagation to the field, and this generally eliminates the greenhouse. We must root directly in the soil or have a satisfactory growing medium.

Secondly, we stick to this method in order to balance our propagation. As previously mentioned, I don't like to go over 25 or 30 per cent on any method. Rarely a year goes by that we don't have trouble with one of these procedures. By attacking it in five ways, as I pointed out, we spread the risk. In cold frames with us, our controlled conditions produces uniform results. Of course, we stick to the method because of the successful results in the past. We have had no experience with conifers and ericaceous materials.

Another advantage of this technique is the little need for attention. Outside of the 7:00 a. m. inspection each day, the frames can be left to themselves and the attendant can devote his time to other matters. I must admit this is not true on hot, windy days when drying conditions are severe. I must also admit that we are in a very favorable location up in Western New York on the shores of Lake Erie. We have a comparatively cool, humid climate all through the summer and some of the problems that people would have, say, in the Midwest, with frames, are not a problem with us.

We are without any question propagating these plants under frame and mist procedures equally at about, I would say 1.5 cents per plant.

Divisions cost us that much since there is the labor in making divisions. When we get into hardwood cuttings and layering then we are going to get up to about 2.5 cents per plant. I might point out at this point that the plants produced from hardwood cuttings and layers are larger plants when they go to the field. As a result they perform a little better than this other material and therefore, are worth more to us.

But what I want to leave you with is the fact that we are getting that cost down pretty low, and these other fellows are going to have to scratch and cut cost if they are going to meet these figures.

MODERATOR SNYDER: Thank you, Mr. Congdon. Since we are pushing for time, we will go right on to Henry Weller for rebuttal or additional comments on mist.

MR. WELLER: I must say I am quite fortunate in following rather than preceding some of these fellows.

The essence of outdoor mist propagation is outstanding in many ways. In analyzing any feature of misting with those of some of the more basic methods of propagation, there is no point of comparison. Mention the factors involved and mist will show a definite advantage; whether in the selection of materials, flexibility of timing (the period of time when a cutting can be taken, and also the period of time after rooting), the type of cut made and location as to either above or below a node, control during and after the rooting period brought about by automation, the absence of having to use root stimulants, root structure, percentage of rooting, percentage in transplanting, the use of containers in conjunction with the operation, insect and fungus free conditions, foliar and root feeding, the methods of hardening-off various materials and the over-wintering problems indicate one factor, or all factors, if taken into consideration will definitely point towards outdoor mist propagation as approaching the ideal method.

Outdoor mist propagation, of course, is only practical when dealing with softwood materials and therefore should be utilized during the months of greater light and heat intensities.

The main objective in propagation, is to produce the very best rooted material possible. The secondary objective is cost. The two objectives, quality and cost, can be checked through cost analysis and by taking into full consideration all the factors involved, quality very definitely should prevail if the material is checked not only in the propagation stage, but through the process of becoming a salable plant.

Outdoor mist propagation has been most influential in reducing our cost, simply because all factors from the beginning of propagation through the eventual salability have resulted in quality as the primary asset and cost as the secondary result.

The main factors that make outdoor mist propagation ideal are; (1) the flexibility of timing. In our experience cuttings can be taken over a longer period of time with excellent results. We can take cuttings earlier in the year; also the after rooting period is lengthened because the cuttings are fertilized through the mist line to insure active growth which continues until transplanting. The cuttings can also re-

main an indefinite length of time within the rooting medium. (2) Using flats and storage boxes that are normally put away for the summer, again is an advantage in that the cuttings can be moved directly to the field in their growing boxes. This means the cuttings do not have to be pulled until the last minute before they are to be planted into the ground. (3) The rooted cuttings are fed through the mist line, saving us the time and labor of hand feeding. We use a water soluble fertilizer containing the three basic nutrients and trace elements and by doing this, we increase the growth and vitality of the cuttings so that they can be transplanted the same season that they are taken rather than waiting until the following spring. This allows us to plant at a time when we are not as busy as during the spring rush. It gives us a better and larger plant at the end of the normal two or three year period of growth. In many cases we are able to grow a salable plant in one year less growing time. Some of the other advantages, although not as significant, include the cut used. With the plants we have tried, we have found that in most cases it doesn't make any difference whether the cut is made above or below the node. This enables us to cut a handful at one time with a pair of pruning shears. No hormones need be used. In our testing we have not found any advantage in using hormones under mist. Less attention required. There is no need for constant vigilance necessary with any other method of propagation. Watering is taken care of automatically and the distribution of moisture is equal in a given area. I'm sure you have all experienced the misfortune of poor water distribution, the lack of moisture in one area and excessive moisture in another.

The cost of propagating by misting, as I mentioned previously, is greatly reduced because of the quality of the rooted material. The quality is brought about by the combination of two or more factors associated with propagation. Cost of materials originally propagated within a greenhouse has been reduced as much as 40 per cent, while those propagated in cold frames were reduced by approximately 25 per cent. However, there are varieties that will not fit into your outdoor mist program because of the time element and availability of cutting wood. There are those varieties which require certain particular care, such as grafting, layering or air-rooting and which therefore have to be given special attention. This generally involves the use of either cold-frame or greenhouse facilities. The greenhouse will always have a place in propagation to be sure, but if it can be avoided the profits will generally show a substantial increase. Again I mention quality as the prime essential. The material involved should be checked through cost analysis. Whichever method of propagation shows the better quality, that method should be used. Decreased cost will be the eventual end.

Try misting and run a comparison with your basic routine. Set up a cost analysis program, it's comparatively simple, there are only four steps to be considered, namely; (1) The planting stock. (We at Stuart's set .003 per cutting as the credit to the stock block. It provides care and maintenance for the area.) (2) Materials. Items such

as the mediums in use, and any other material used must be allocated. (3) Labor — men and women. The hours spent in propagation and those in the field, during and after transplanting, are necessary to acquire a true and accurate picture of the complete operation, step by step. (4) Overhead. This includes benefits, indirect labor, supervision, rent, water, heat and light, equipment and repairs. It can be allocated as a percentage of the labor dollar, or while in the process of propagation it can be broken down on a square foot basis and while in the field it can be absorbed by blocks or by the square foot within the area containing the particular material under analysis.

A percentage figure on rooting, transplanting and salability losses, will give you a complete and accurate picture and will guide you to the ideal method of not only propagation, but growing within the field.

Propagation brings about reduced or increased loss. The condition and type of root structure at the time of transplanting brings about the eventual profit or loss. The root structure is the anchor, the foundation, and certainly the top growth depends on its initial start brought about by a good healthy vigorous root system.

Concern over percentage of rooting becomes a thing of the past when dealing with mist. With the varieties with which we have worked, consistent percentage figures of 90 per cent or higher rooting, eliminate this age old problem.

The potential of mist can only be fully realized if we all develop this vast field of true opportunity.

MODERATOR SNYDER: Thank you, Henry.

I would like for the panel to come back up on the platform. I am going to ask the panel to make their answers short so we can cover more in the time allotted.

MR. VERKADE: I notice that a lot of nurseries are planting *Taxus* cuttings in Jiffy pots or in other containers. I would like to know if someone could give me an idea what that costs compared to planting in beds. Is it possible?

MR. FLEMER: Those figures are extremely difficult to arrive at because of the difficulty in getting a cost for keeping those beds clean. It depends on the year. If it is a wet year you have to weed a lot. If it is a dry year you don't have to do so much and the men are in and out. Unless you have somebody right there watching all the time and clocking them in weeding that particular bed it is a very difficult thing to change.

Our potting costs, producing potted *Taxus* ready to go to the field average about six and three-quarters to seven cents apiece. I can't give you bedding costs because we have never been able to keep up with it accurately enough to find out just exactly what it did cost us.

MODERATOR SNYDER: I saw Mr. Congdon shake his head. Have you a comment?

MR. CONGDON: I was shaking my head on the weeding of these beds. It is so minor with us it is practically nonexistent.

MODERATOR SNYDER: Do you mulch?

MR. CONGDON: No, but with your two inches of sand or whatever sterile medium you might be putting over the peat and the Shenango loam up we just don't have any weeding costs at all.

MR. FLEMER: Mert you are not spacing out *Taxus* in soil to stand for two years, you are talking about leaving the cuttings where they are. When you space them six by six or six by eight and have to keep the beds free of weeds for two years, that is quite another matter.

MODERATOR SNYDER: Any other questions?

DR. FRED NESBIT: I would like to ask Roger Coggeshall if he thinks I would have any luck with *Magnolia ashei* under the poly tent, and if so, how hard should I take the cuttings? I take things pretty soft for my mist bed. With *Magnolia ashei* I haven't been able to hit the exact time.

MR. COGGESHALL: I am sorry I can't answer your question. We attempted to propagate *Magnolia ashei* on material sent in to the Arnold Arboretum. This was attempted under polyethylene and was a complete failure. It is very difficult. I don't believe, frankly, it would root any better under plastic than under open mist.

DR. NESBIT: Would you think if I took a fairly hard rather than soft?

MR. COGGESHALL: I would stick to the softest possible material you could keep from flagging.

DR. NESBIT: There is one other thing that nobody here seems to be able to grow, ie, *Elliottia racemosa*. I don't know whether I should try that under open mist in the summer or under mist in the greenhouse in the fall or under polyethylene?

MODERATOR SNYDER: What is the plant?

DR. NESBIT: *Elliottia racemosa*. Mr. Beetle found it down in Georgia and we are one of the few sources, and Kew wants it now, and I can't send them.

MR. FRED GALLE: Try taking root cuttings.

MR. WALTER PEFFER (Trafford, Pa.): My question is directed to Roger Coggeshall. Do I understand that on your *Taxus* this spring that you used Simazin after they were planted?

MR. COGGESHALL: No, I misrepresented that. The only time we have Simazin for weed control is on established plants in the field after they have grown at least a year prior to the application. We have not attempted it at all on the young beds of *Taxus* cuttings.

MR. PEFFER: What is the rate of application and the length of control?

MR. COGGESHALL: The rate of application I believe was two pounds to the acre and the length of control, as I mentioned, one application in May was sufficient for that summer.

MR. MARTIN VAN HOF: I would like to ask Roger, if he is going to change from inside propagation of lilacs to outside?

MR. COGGESHALL: That is right.

MR. VAN HOF: Is that going to be in the soil?

MR. COGGESHALL: In the soil, that is correct. In addition to the soil we will add sand to make it lighter.

MR. JIM WELLS: I would like to ask Roger Coggeshall if he has used sawdust as a mulch for rhododendrons, and if so, with what results.

MR. COGGESHALL: Yes, Jim, we have. On the newly bedded out ones that sawdust had not been applied. On the one or two year old plants, as soon as they are bedded out we apply the sawdust. That stays on for the life of the plant in the bed, a period of two years.

MR. WELLS: Do you find any greater incidence of *Phytophthora* in the beds with it?

MR. COGGESHALL: No, we don't, or at least not to my knowledge.

MR. WELLS: What kind of sawdust do you use?

MR. COGGESHALL: We use any kind we can get.

MR. WELLS: How thick?

MR. COGGESHALL: Perhaps an inch or inch and a half; two inches at the very most.

MR. WELLS: I just want to make a comment before I leave the microphone about this cost accounting. I think there is a confusion between cost accounting and time study. If you set up a cost accounting system it is usually very simple to extract from that a time and motion study of how much direct labor you are expending to produce a given number of cuttings or to do any clearcut operation. Over a five-year period at Koster Nursery we proved very clearly that the direct labor cost which you could allocate any day to any given operation could be multiplied by four in order to weigh it with all other costs, ie, indirect labor, overhead, and anything else that keeps the doors of the nursery open. That formula worked consistently, and the cost was so clearcut that is what we used

We then dropped back to a time study and multiplied by four to achieve a known cost. It is very simple.

The second thing that came out of those cost accounting figures was that by far the most serious question in any nursery is the plants we try to grow and do not. Every time that we took inventory and there was a loss, we showed this loss in dollars, in red. When you see how much money you have spent for plants that aren't there you really sit up and take notice.

MODERATOR SNYDER: That is a point Jack Hill emphasized a couple of years ago.

We will have time for one quick question and answer.

MR. HOOGENDOORN: I would like to address my question to Henry Weller. Do I understand you to say you don't use any hormones of any kind under your mist?

MR. WELLER: Under the mist we do not use any hormones.

MR. HOOGENDOORN: You said it didn't make any difference whether you used hormones or not. We have a mist system and we use hormones. Why do I get a difference in certain items. Sometimes

using a No. 3 will give better rooting and sometimes a No. 2 will be the best.

MR. WELLER. As I mentioned previously, we do not use any hormones under mist, and I attribute this mostly to the problem of excessive leaching. The amount of water that passes through evidently subdues any beneficial aid from rooting powders. I have not seen any significant difference.

MODERATOR SNYDER. Case, it may be the condition of the cutting in the bottom two inches. The hormones may be effective with the harder cuttings and not the softer.

I would like to take this opportunity to thank the panel members for their participation. I think that if you were confused when you came into the room you are probably equally confused now.

We could say there are many ways to propagate plants and probably one thing which is very elementary but we sometimes lose sight of is that if we change one procedure or part of one procedure we are going to have to watch all other operations. We can't go from the greenhouse to the mist to the cold frame and expect to water the same, to take the same type of wood and carry on all other procedures as we have formerly done.

I will now turn the meeting back to President Roy Nordine.

PRESIDENT NORDINE. Just a couple of brief announcements, and one is that both the Executive Committee and Membership Committee will meet for lunch during the lunch hour.

All those who will be speakers or who will be appearing on the program this afternoon are to meet immediately in this corner.

The meeting is dismissed until this afternoon, which will begin promptly at 1:30.

The session recessed at 12:00 noon.