

FRIDAY EVENING SESSION

September 11, 1970

QUESTION BOX

CHARLES HESS: Bob Garner, do you want to start the Question Box tonight, handling the question related to grafting?

BOB GARNER: Here is the first one directed to George Ryan. What is the concentration of glucose used to stimulate avocado grafts?

GEORGE RYAN: A 0.3 molar glucose solution was used in our experiments.

BOB GARNER: Next question. Why does Larry Carville place his grafts in the bench on an angle; why not upright? Well, I can say that it saves a lot of height in the frame, but what is the answer?

LARRY CARVILLE: It does save space and we find that the root development is at a better angle to the heat if you put them on a slant. Of course, this also means that two weeks after we put them in the bench, we have to turn the grafts. We give them a 180 degree turn.

BOB GARNER: Might I add, myself, that it is more convenient to bury the union and keep it equally warm; you have to pile up the covering when the grafts stand upright. By laying the graft on its side, you can more easily bury the union and keep it at an equal temperature so that you probably get more rapid callusing; callusing — the healing of wounds — is grafting. Grafting is the healing of wounds.

VOICE: Perhaps I will direct this to Charley. It is just a comment. If a plant is in a perpendicular position there is a different movement, translocation of rooting auxins, than when it is lying on its side; this reminds me of an article that Cathey published just recently about rooting cuttings. From the time the cuttings are taken he likes to keep them in an upright position. Never let them lie on their side. He finds a marked increase in rooting from cuttings that have never been allowed to lie on their side.

CHARLEY HESS: There are a couple of things involved. One is the auxins. As Dr. Thimann pointed out, they are the principal naturally-occurring root-promoting substance. Auxins travel in a polar direction, as he said. If you turn the cutting upside down, the auxin still moves cell by cell to the base. There is some gravitational effect, too. For example, in layering, the roots will coming at the lower side. This is believed due to auxins relayed to the lower side — so there could be some truth to it. I haven't had a chance to see the original paper to which Cathey was referring to see how critical is this uprightness. Some cuttings, as you all know from experience, form roots well if they are laid on their side.

BOB GARNER: The next question: Does the original position of the bud on the stock influence tree form after planting and subsequent

growth to maturity? Question A, Hardwoods. Question B, Evergreens.

Now, I am going to have a go at the hardwoods. Many years ago we had a student from Canada; he studied the variation of trees in the nursery — apple trees and others. He took many, many records and in some of his experiments he inserted his buds on the north side of the stock, some on the south of the stock, some on the east, the west and all sorts of other peculiar things. When he came to carefully measure the trees, the only difference he found was that when he put the bud on the north side — that is, the shady side of the tree for us, because we are in the same hemisphere as you, he got a more erect growth immediately from the bud. It was though the bud wanted to peep over the top of the stock. It came in closer — whereas with a bud on the south side, you had to tie it in a little to get it to go upright. But that was the only difference he found in that study. Does anybody have anything else on deciduous plants before we close and ask questions about the evergreens?

CASE HOOGENDORN: While my boys are lining out plants in the field you know what I tell them? — slant them all to the north because the sun will draw them straight. If you do it the other way, you get an even more crooked plant. So here is your answer.

ROBERT GARNER: Another similar question. Does the bud position on the mother tree from which you take the bud affect quality of the tree for future shape and form of the tree?

Well, may I just take the hardwoods again and refer to the same man, Dr. Cameron, who did this work? He found no difference in the size of the resulting tree. He took his buds from the inside and outside, the south side, etc. of pear and apple trees. He went to all sorts of peculiar lengths but he found no significant differences. There were differences, but they were of no practical importance.

You can't tell, sometimes, whether some of these buds are fruit buds or leaf buds; they are multiple buds very often. They blossom nearly every year right on the inserted bud; a cluster of blooms comes out. Every year I get two or three phone calls from tree raisers not very experienced and they say what do I do, all my buds are blossom buds. I say, go away for a holiday if you like, or you can cut them out with your thumb if you have the time. The vegetation will come out of the side of the apple fruit bud, and everything will be pushed aside, and it will be all right. But now could somebody answer on the evergreens?

CASE HOOGENDORN: You asked about evergreens. When we are lining out evergreens, whether it is a 2-year graft or 2-year bud-dings, we all know that the growth of any graft, certainly after two years, will be full on the south side and down on the north side. Anyhow, I walk up and down the rows that these boys are planting and say, "Fellows, you put the weak side on the south." Now by doing this,

putting the strong side on the north and the weak side facing south, we finally produce a uniform block of trees.

ROBERT GARNER: I think we all agree on this; if the plant is in a truly juvenile condition, the fact that you transfer the buds from one tree to another makes absolutely no difference as long as they are in the same environment. Charley is looking very serious here, but I have taken seedlings and waited until they flowered, being a very patient young man years ago. I also took buds from the seedling and dropped it into a glass or vase so that I wouldn't lose it and I nipped out into the orchard and I budded it on the tips of fruiting trees; then I grew these trees and I grew them in other ways, that I won't bother to describe, and they all flowered the same year eventually. I have gotten no different results in that way. I have seen it recorded otherwise in other places and it may be different, but in my experience when that seedling is determined to flower, then it flowers, and it flowers wherever you put the bud. I put it on dwarf stocks and I put it on strong stocks, I remember; trees grew up and they all flowered at the same time.

JAMES WELLS: The thought occurred to me as you were talking that if you take a cutting from a rhododendron, in particular from a mature plant, this is obviously flowering wood. If it was left on the plant it would flower, in all probability. You may even take it as a piece of flowering wood with a flower out on it and remove the flower. You root it and it loses this characteristic. Why? It takes two or three years for it to flower again. Now what happens?

ROBERT GARNER: I haven't got all these answers, but may I guess? The nutrition immediately is entirely different. If you bud it onto an established stock, a stock with a lot of stored food in it, then it can continue to flower to fulfillment probably, but if you separate it, as a cutting, the plant becomes enfeebled; it hasn't got that background of nutrition to carry it forward. It probably drops its buds or they fail to develop; is that right? Yes, because grafting is only an incident in the life of a tree. If it is properly grafted you haven't done anything to weaken the tree in any way. It is just as though you have pruned it; it is what I like to call an incident in the life of a tree. Just merely an incident. The other things — as cuttings — are catastrophes.

Shall we rush on. We have a lot of good questions here. Does the height of insertion of the variety bud on a dwarfing rootstock influence the size of the resulting tree? I mean if you put your bud in high — or low — does this influence the size of the resulting tree?

If it is a very dwarfing rootstock — say Malling IX, or something more dwarfing, then it does. It depends, apparently, on the proportion of the dwarf in the composite tree. Say you put a vigorous variety, as you generally do, onto a dwarf; well, if you have got all the root system and a considerable amount of the stem left as the dwarf, then the resulting tree, the composite tree, will be smaller, at least for a long

time. It will have a bigger influence. If you bud it very low down — but I don't mean scion rooting — then you will have a more vigorous maiden tree. We used to think this was due to other things; for instance, if you put a pear on a quince — one of our members who is now dead, Amos — he said, "I don't like the sun to shine on the quince trunk". It incapacitates the tree a little bit. It doesn't like it, but I think it is true to say that if you put a vigorous apple on a dwarfing apple, they will compromise and they will compromise somewhat according to the quantity of each which is in the composite tree. If you work your dwarf very high, then you have a smaller proportion of the vigorous part in the tree, then the composite would be less big as a whole than it would if you had only a little piece of dwarf at the bottom and the rest of the tree vigorous. Do you see what I mean?

RALPH SHUGERT: If I could pursue this a little further. You are saying, in effect, if I understand you properly, that it is possible, depending on the techniques to dwarf apples, to influence dwarfing, to utilize the dwarfing effect of this rootstock by the height of the bud. This is very interesting, because what I have read is contrary to what you said. It was my understanding, from the little reading that I have done on this, that the dwarfing influence of the rootstock was in that stock, whether it was MM 972, 111, etc. You saying that, to a degree, the placement of the bud on the plant stock will have some effect on dwarfing of the tree. Am I right?

ROBERT GARNER: You are right, but I must emphasize that I meant only a trace of difference. Only a very small difference. Nothing like the effect of the genotype, as you call it, nothing like that. We are talking only in small degree in reference to the placement of the bud.

ROBERT GARNER: In cherries, the mazzard cherry stock, with the sweet cherry on it, are practically brothers. They are *Prunus avium*, both of them, and I can't see this dwarfing technique that we were discussing just now having much play. But what does have an effect is the actual form of the tree and the way it sets off. For instance, we often put sweet cherry on a *Prunus avium* stock such as 'F / 12-1', which is a clonal stock. I have a fairly large experiment at East Malling of trees that are now 15 or 16 years old, some of which I bushed off at 3 feet and some I headed off at 6 feet; we measured the heights, the sizes of the head of the tree, produced on the 3 feet trees and produced on the 6 feet trees, and the one on 3 feet trees were significantly larger in volume, and have always maintained that size — more than the other one. As we know, when we come to sell, say standard crab apples up on tall stems, you get a miserable head compared to what you get at the lower level. What causes all this, I don't know, but it is an actual fact.

BILL CURTIS: When we grew flowering cherries budded or grafted on mazzard seedlings, I found that those budded or grafted at

3½ to 4 feet developed a heavier head at digging time than those budded or grafted at 6 feet, the exception being the weeping *Prunus subhirtella* and the weeping form of *P. serrulata*, which were always budded or grafted at 6 to 6½ feet, developing good heads.

ROBERT GARNER: Thank you very much. Does anyone use *Magnolia grandiflora* as a stock for deciduous magnolia?

HANS HESS: We have used *Magnolia grandiflora* for deciduous magnolia and we have also used *Magnolia kobus* as understock for *Magnolia grandiflora*. Both will work. I would say that there are some varieties of *Magnolia grandiflora* which do not take well for some reason. There are others which are reasonably compatible. This is apparently due to the individual character of the plant, just like people. But they will work in both directions; *Magnolia grandiflora* for deciduous and *Magnolia koba* for *Magnolia grandiflora*.

ROBERT GARNER: When lining out grafts, should the ball be intact or broken or disturbed to any extent? What about the the soil root ball in larger containers?

BRUCE USREY: When you are planting something coming out of a container the root ball has to be broken up if it is bound; otherwise you get future twisting of the roots, even though you don't notice it.

JIM WELLS: This was mentioned the other day and I want to make the comment now that in moving plants from one size pot to the next you really have to break up the ball and tease the roots out. It isn't just a matter of scratching the surface of the roots. You really have to disturb the root ball — mash, mangle it; if you have this problem with containers my answer is just to work up the root ball vigorously.

ROBERT GARNER: Thank you very much. The last question on grafting. Why should *Pyrus calleryana* 'Bradford' not be grafted on any pear seedlings, but only on *Pyrus calleryana* seedlings? I am sure we have somebody to say something about this, but I can imagine it is connected with virus. May I give my thoughts on this. You would have the same situation if you had *P. calleryana*, tolerant to the virus, which is carried in the 'Bradford'. If this was always tolerant, whereas *P. communis* was more tender, then delayed incompatibility is due to the systemic spread of the virus through the plant to kill it.

CHARLEY HESS: The topic we will now take up is on rooting cuttings and we have some questions on specific plants. First, has anyone rooted *Taxodium distichum* — bald cypress?

VOICE: I have rooted a few but with a low percentage. It can be done.

RALPH MOORE: I have worked with this tree too. One spring I cut the tops off probably 100 or 150 different two- or three-year-old seedlings and I rooted them in sand or sand / peat, using cuttings from 4 or 6 inches long, with almost 100% success. But if I tried them with cuttings from a mature tree, I had almost 100% failure.

CHARLEY HESS: What is the best way to propagate crepe myrtle?

VOICE: We propagate crepe myrtle by hardwood cuttings.

VOICE: We root softwood cuttings of this under mist with no problem.

CHARLEY HESS: Do rooting hormones help on hardwood cuttings?

BILL FLEMER: We have never had any effect on our hardwood cuttings from root-promoting substances.

HUDSON HARTMANN: We have had just the opposite results from rooting hormones with hardwood cuttings of pears, peaches, peach-almond hybrids, olives, walnuts, and so forth. With many of these we do not get any rooting at all without the hormone treatments. We use IBA — quick-dip at 4,000 ppm or about 50 ppm with a 24-hour soak. We have used some of the techniques Bob Garner has been describing; the methods vary with different species. With some, such as Bartlett pear, apple, and walnut it was necessary to chill the top buds, while the base is kept warm. Other species, as peaches, the hardwood cuttings have to be set directly into the nursery without disturbing the roots. The same seems to be true for walnut; the cuttings have to be placed for rooting right where they are going to grow without disturbing the roots, or they don't make it. Different techniques vary with different species, but we do get a very strong response from the rooting hormones with many species.

CHARLEY HESS: What is wounding? Does wounding help rooting, a light wound, heavy wound, chemical wounding?

JAMES WELLS: I didn't put this question in. My answer is prejudiced because I am, of course, for wounding, but I would like to explore this subject. I still can't quite understand this chemical wounding. It seems strange to me and yet Brian Humphrey swears that it saves a lot of time. He can eliminate wounding techniques in making his cuttings; all he does is to put on a strong enough formula on the base of the cuttings that he destroys the basal tissue. He expects to do this and then, finally, he gets moderately higher rooting. This seems to me to be a very strange way to do wounding, and I would just like to know if anyone here supports this.

LESLIE HANCOCK: Don't you think that it is a fact that every plant is a law unto itself, and you can't say that because it works with a certain apple it must work, too, with a rhododendron. You know there is not one method that will give perfect results for a very large number of plants. Mr. Garner has done it with a given plant and has been very successful. I am not sure whether other people will find that they can do it with every plant or not. I would question whether they have gone far with it; this method may work well with some things and not with others.

BRUCE BRIGGS: Is it possible that wounding is only an injury to tissues and this is what we are talking about?

CHARLEY HESS: I think there is some truth to that; it is an injury effect you are getting. You stimulate cell division which is one of the first things that you have to get accomplished in starting root initiation.

We have talked about this before, the so-called traumatic acid which is synthesized in some plants in response to wounding; we have tried traumatic acid in stimulating rooting of cuttings, but it is not effective nor has it helped in grafting, which is another thought we had. There is evidence that, if you wound the inside of a pea pod, you get callus formation stimulated; traumatic acid can be isolated from this tissue, but apparently this is not a universal substance.

BILL CURTIS: I think all of us at some time or another have used hormones too strong and have burned the base of the particular cuttings, then they rooted well.

JAMES WELLS: In 1946, before I came to this country, I paid a good visit to Boskoop which is where I first heard of wounding, and immediately afterwards I came over here to Koster Nursery; I ran a series of tests with the *Juniperus* species and many other plants using hormones on cuttings made with a heel, without a heel, and with and without a wound. I have records on these treatments at home. These tests were also carried out with a control — with no hormone treatment. Therefore, we have non-heel cuttings, and heel cuttings with a wound and without a wound, and all of these with hormones. Now when you have the results laid out on a table, there is an absolute gradient of increased rooting in favor of the no heel plus wound treatment. The next best was a heel with a wound, and the next best was a heel without a wound; no heel and no wound gave the lowest rooting. But you notice a distinct increase of about 25% in rooting from wounding alone without any hormone added. Add hormone and you get higher rooting. Take away the heel and you get higher rooting still.

PETER VERMUELEN: What was the condition of the wood, the age of the plants, that you took the cuttings from in this experiment?

JAMES WELLS: This wood was all quite young, Pete. I mean the Pfitzers were strong, vigorous shoots — current season's growth. Of course, this was done in October and November. Yes, dormant plants. The Pfitzers were not particularly young plants, as I recall. The Thujas were three to four foot plants when we took the cuttings. Not really young, but not old. The wound that I gave at that time was a light wound. That is, drawing the tip of a knife blade down the stem. Later on we got to soldering together four Gem razor blades. These are the single-edge type blades. You can put four side by side, solder them together and with this you can make a very neat cut, drawing them down the stem making three or four parallel cuts at once. Now some plants don't respond to wounding at all — *Taxus* is one of them.

CHARLEY HESS: The next question: Does anyone have trouble over-wintering one and two-year *Acer palmatum* grafts in containers?

VOICE: We have had one-gallon can plants in beds in a lath house. No protection other than a grass material half way up the gallon cans; no other protection over the bed or over the lath house. No problem in Ohio.

PETE VERMUELEN: We haven't had any trouble with our one-year grafts in gallons generally; they are put in plastic covered houses. In the spring we use Saran or polypropylene cover so we do have some shade. After the first frost, first or second frost, they are covered with white poly. The plants are watered in very heavily; the houses are closed quite tight. We haven't had any problem with any *Acers* over-wintering.

CHARLEY HESS: The last question on cuttings. Is there a relationship between moisture content of the cuttings at the time they are taken and rooting? I would say this is getting back to the question of when should you take the cuttings — early in the morning, or late in the afternoon — and presumably it is in favor of the morning or a cloudy day.

At this point we will take a two-minute break, then Bruce Briggs will lead the discussion on "Seed Propagation".

BRUCE BRIGGS: Here is a question on weed killers. How much Dacthal should you use — in lbs. per acre?

RALPH SHUGERT: I will answer quickly. On the testing that I did in Nebraska and Ohio on germinating seedlings — those that have true leaves — on all the stock I worked with, we used it at 12 lbs. per acre. We have been very happy with it. Three years ago I tested it from 4 to 20 lbs. — 12 lbs. per acre was the most suitable rate.

BRUCE BRIGGS: Has anyone had any experience with injury from use of Casoron on *Taxus* or deciduous shrubs from repeated applications over a period of two or three years or more?

VOICE: We have used repeated applications on a number of things with Casoron; we have run into some trouble with Casoron. With *Taxus* we had some tip injury. We don't use it anymore.

BRUCE BRIGGS: Harold Clarke, you have used it at Long Beach, Washington; do you want to comment from the West Coast?

HAROLD CLARKE: We have used it on rhododendrons without any apparent damage. The cranberry people there have used Casoron regularly for several years now. They are very conscious of residues after the amino triazol incident. They find absolutely no trace of Casoron the second season. Of course there is 100 inches of rain and they flood the cranberry bogs with a foot of water, and so on. I suppose this might have something to do with it.

VOICE: I just want to say that we used Casoron in the southwestern region. We put it on a lot of lining out stock. I began to get a

little bit nervous when some of our Johnson Grass stools died out. As the summer progressed and the weather got hotter our plants slowly began to turn brown and died, I sent back about 50 bags of Casoron.

BRUCE BRIGGS: I am not surprised at your results in that hot weather; it should be used when the weather is cool because fumes do come out in the warm weather and then you are going to have problems.

DOUGLAS WEGUELIN: In England we put some of it on some spruce, *Abies*, and in a few days they looked like they were covered with gold dust. They all went yellow. The only thing we use it for is spot treatment on heavy weeds; if it is anywhere near poplars it is lethal.

VOICE: We have been using Casoron for the last couple of years on all our lining out stock 3 or 4 weeks after planting with no damage whatsoever at about 100 lbs. / acre.

BRUCE BRIGGS: It depends upon the area, the location; one area is moist and cool, another area is hot with a different soil. You are going to have to try it out and see how it responds under your conditions.

BILL CURTIS: I have used Casoron since it first came out and I have used it on everything that goes in the nursery. We grow rhododendrons, *Taxus* and many other plants. We don't use it during the summer. I never put Casoron on until December, January or February.

BRUCE BRIGGS: Do we have a nematologist in the room? Will nematodes survive in northern winters? Does cold weather kill nematodes?

ANDY LEISER: It depends on the species of the nematode and then how far north is north. Recently they have discovered some species of nematodes in Antarctica.

BRUCE BRIGGS: This is about Off-Shoot-O. Do you get any effect on rooting with the application of Off-Shoot-O; does Off-Shoot-O affect rooting in any way?

BRUCE BRIGGS: Bob Ticknor, at the Oregon Willamette Valley Research Station, did some work on this and says that Off-Shoot-O did help rooting. Why, I am not sure.

CHARLEY HESS: We have a series of questions on hardwood cuttings. Bob Garner will moderate this group.

BOB GARNER: What is the best method of rooting named varieties of crab apple?

Well, we haven't had experience with crab apple at East Malling yet — I don't know if other people have tried rooting named varieties of crab apple. An experience we had with *Malus* in general — with the rootstocks and that sort of thing — we would take our shoots that were half grown, cut them right at the base, dip shallowly in IBA, but in the

very severe winter-spring conditions here, I wonder if you shouldn't try it in the fall and then after having rooted your hardwood cuttings in bins, you then hold them — not to frosty — through the winter then plant them out in the spring. Something like that. I think that is how I would do it if I had to do the job.

RALPH MOORE: Last year we tried some *Malus floribunda*; not a large quantity but the rooting was about 90%, using softwood cuttings. I think it was in June. These were tip cuttings treated with Jiffy Grow and rooted under intermittent mist; they came along fine and over-wintered successfully.

BOB GARNER: Is there any value in placing hardwood cuttings upside down to callus? Well, I am sure somebody has comments on this, but I think some of us remember a considerable amount of research done by a Frenchman, I think it was Massot. He took his bundles of hardwood cuttings and put them in a corner of a walled garden, upside down; people wondered why they callused faster. I don't know if they rooted faster, but they callused faster in this way. We suggested that it was a matter of heat. He had turned them upside down and they were covered with the sandy soil, and they were in a sunny corner. You know the sun can heat the soil considerably provided it is exposed, even in the dead of winter. We thought this was not a positional effect because, as Charley told us, auxins will move regardless of position orientation. If the tissue is appreciably moist and the temperature is raised, the callusing is more rapid. Does anybody else have anything to add to that?

CURTIS ALLEY: We ran one year's experiment with grape cuttings in bundles; we placed them right side up, upside down, and horizontally. They were all below the surface. The take we got was the same regardless of position — between 90 and 95% takes — but the resulting rootings, that is the weight of the rootings, were heavier when they were callused upside down.

BOB GARNER: Have you used any other medium than sand and peat, such as a sawdust? I suppose that is for hardwood cuttings.

Some years ago we tried a range of different proportions of peat and sand. We went high peat, high sand, right through the range, sort of from left to right, and we still, I am glad to say, came out with the old 50-50. I should point out that when I talk about peat-sand, our sand is hardly true sand. It is more grit. It is a sort of ½ inch grade grit. It is coarse sand and coarse peat. It is not a fine sand, like silver sand, which packs. You really must have a magnificent drainage. I haven't myself tried these other things, except I do recall that some 40 years ago I put in sphagnum moss, live sphagnum moss below the sand, and pushed the cuttings in until they rested on top of the layer of sphagnum. I don't think we got much higher percentage rooting but, my word, they did grow beautifully, those that did. They had constant

moisture from this sphagnum moss. I haven't heard it mentioned in America yet. Live sphagnum moss has special qualities. It prevents rotting of various kinds. It is able to control disease.

The next question — How much pre-treating of grafts from cold storage to the planting field should be done? Have you got to acclimatize them? From cold storage to the planting field. Comments, anybody?

We take plants from cold storage right to the field; in England from this jacketed cold store, I have been talking about, we gained experience in transferring stock late in the summer to the fields. We can take stocks straight from dormancy, held in cold store, and plant them out in May and June and get just as good results as though we had planted them earlier. We take them straight from the cold to the heat. Our cold storage temperature is about 32° F — the freezing point; outdoor temperatures vary not more than 70° to 80° F in the hottest days.

CURTIS ALLEY: By pre-treating, I believe, is meant callusing. For grapes I would recommend 4 to 6 weeks callusing after making the graft — prior to planting. With grape grafts we have to callus them before planting if the graft is going to be successful. This is not as necessary in the early season — in January or February. This callusing of cuttings or bench grafts prior to planting is strongly recommended for grapes. The best take we have obtained was when we planted cuttings in April. Not only were the cuttings well-callused but the top bud was out ½ to 1 inch and roots were evident at the base of the cuttings. If bundles of grape cuttings or bench grafts have been held in cold storage they should be moved out 4 to 6 weeks prior to planting and warmed to obtain callus and root development and to start bud activity.

BOB GARNER: Rooted Myrobalan B understocks do not seem to transplant well; that is, rooted under mist. Why?

LESLIE HANCOCK: We have had no problem with this.

BOB GARNER: No problem he says, but Myrobalan B is what we would call sensitive; it is a very sensitive stock. It is cheap and quick-growing in England and you would think it is common and easy to handle, but actually it doesn't handle at all well. It is almost herbaceous in a way, and transplanting it so it doesn't desiccate is difficult. It needs proper treatment. It is a sensitive, quick-acting thing, and we say it is almost perishable.

CHARLEY HESS: What is the length of supplementary light period for deciduous azaleas?

JOHN McGUIRE: As long as you break the light period — we use a 3 hour light break. We turn the lights on at 11 p.m. and turn them off at around 2:30 a.m. This is sufficient for any of the Exburys; any of the deciduous azaleas will tend to grow on in that situation.

CHARLEY HESS: We have a project at Rutgers; Dr. Norton there is working on controlled crosses between two dogwoods and he is getting a population of seedlings which look like red flowering plants from seed and, of course, we also should mention the Japanese maple, another colorful plant. He got a very high percentage of the plant population to be the desired type, if you know the parents.

CHARLEY HESS: Will Hugh Stevenson explain his technique of growing sassafras from seed?

HUGH STEVENSON: For one thing, we have trouble in getting good viable seed, locally. It germinates rather late in the spring and comes up after most other things are up, but it grows vigorously and you can get a 24-inch branched plant in a year. I think it is a matter of getting a good viable seed in the late summer or fall.

CHARLEY HESS: What are the merits of *Juniper horizontalis* 'Prince of Wales'?

BILL CUMMINGS: This is one of the closest ground-hugging junipers that we have in our collection. It is a solid mass and makes an excellent ground cover. It has a good green color in the summer months. I don't see how any plant could be more prostrate than this one.

CHARLEY HESS: What are the merits of *Tilia cordata* 'Morden' and is propagation wood available?

BILL CUMMINS: *Tilia cordata* 'Morden' is registered with the Canadian Ornamental Plant Foundation, which is a gentlemen's agreement among the nurserymen in Canada, something like the Plant Patent Act in the U.S.A. and something like the British system. I don't think all the methods of introducing material into other countries has been ironed out yet; they will be but now we cannot release budwood of that or any other material which we are registering with the Canadian Ornamental Plant Foundation.

CHARLEY HESS: Thank you, Bill. What are the merits of *Tilia cordata* 'Morden'?

BILL CUMMINS: There is only a small percentage of seedlings of *Tilia cordata* that will stand our "banana belt" climate. We obtained a number of seedlings from Sheridan Nursery 30 years ago. There is one remaining. This is *Tilia cordata* 'Morden'.

CHARLEY HESS: Can we consider the question of continuous mist versus intermittent mist?

Well, I will begin with one aspect of it. We did start out with intermittent mist and when we got into larger water particle size, to use mist in outdoor conditions, we were putting on a large volume of water and so then problems developed — leaching, drainage, excessive cooling of the medium temperature and high use of water. So all these things suggested that it would be much more efficient to use an intermittent mist, 4 seconds every minute, or something like that. These

are some of the reasons for switching from continuous method to intermittent mist. I do recall, however, that we had in some of our earlier experiments, I think, nozzles set up which would produce the type of mist that Jim was describing, that would seek out the cuttings and as it circulated around the chamber would land on the leaves. Under these conditions, we used mist continuously and we had good results. So I think it is not a complete yes or no situation. It depends on the type of nozzle you are using and if you have a nozzle system which gives a very fine mist you could, perhaps, go to the continuous situation, but if you are using a heavier mist, then an intermittent form is best.

JIM WELLS: Charley, this question is brought on by the excellent paper we heard earlier by Koslowski, in which he pointed out the violent changes that can take place in the plant structure in a very short time. I thought this was one of the most significant things that I have heard here at this meeting; it made me wonder if we had missed something in moving on, as you have described, to intermittent mist. We had something which would take care of these fluctuations in the very light, gentle mist with which we began; would there not be a virtue in going back to it, thus preventing these sudden changes in the plant yet not getting into leaching, cooling temperatures, and so on.

BILL CURTIS: Rudy Wagner, at Wenatchee, Washington — where they have lots of light and where it is real warm in summer — is doing an excellent job rooting outside under constant mist in a lathhouse. He has beds that are 3 feet off the ground so they have excellent drainage. He turns the mist on when he goes to work at 4 a.m. and shuts it off at night when he goes back home. That's no kidding; he puts in those kind of hours. You can check with Rudy tomorrow and he will tell you exactly what he is doing. I think he uses Monarch nozzles. I have seen his set-up; he is doing a tremendous job there outside under his conditions with the very high amount of light and warmth there in Wenatchee in the summers.

RALPH MOORE: Many of you have been to my place; those from the Western Region were there a few years ago when we had the meetings at Fresno and you saw us rooting miniature roses. We were also experimenting with other kinds of plants. We have high light intensities in summertime, too. We have raised tables or beds; we used to root in a medium of half peat and half perlite. Now we use a mixture of 1 / 3 soil, 1 / 3 perlite and 1 / 3 peat moss. We put this right in plastic pots and put the cuttings in the pots and turn on the mist. We use two types of misters, then we have lawn sprinklers — Perma-Rain, which are made in Lindsay, California, for orange groves. They turn slowly. We turn them on them at 7:30 or 8:00 a.m. and turn them off at about sundown.

BILL CURTIS: Many years ago, in fact 10 years ago it was, we had a meeting out at Asilomar, California; that was when the Western Region was formed. A gentleman who is up here in the front seat,

named Wells, came out and I heard him make this remark, “You fellows in California are making a tremendous mistake. With the light you have here and this heat you should be rooting material outside in beds under constant mist.”

JIM WELLS: Did anyone heed me?

DOUGLAS WEGUELIN: In intermittent mist, we do have to remember that what we are trying to do is to keep the cuttings cool rather than wet. We are keeping them cool by keeping them wet, but the basic thing is to get a temperature gradient with the tops cool and the bottoms hot. With mist you are trying to keep the cuttings cool with the least amount of water. You can either have, as Jim says, a very fine mist using so very little water that you can afford to be continuous or, in very hot climates, the bad effects of excess water is so slight that you can afford to be liberal with water, but in every other situation intermittent mist approaches more nearly what is desired.

CHARLEY HESS: I do feel as the water evaporates from the leaf you can get the leaf temperature below the air temperature and, under those conditions, you can reduce the vapor pressure and reduce transpiration.

BRUCE USREY: We use intermittent mist in California and we propagate in a hot, dry area, but there are some things that cannot take a constant mist; they have to have it dry. We propagate a lot of junipers out there — a lot of cotoneasters in full sun. With constant water they would rot. They have to be able to dry out.

CHARLEY HESS: We must be careful not to generalize. We all know different plants require different handling. With this we will wrap up the Question Box for tonight.