THURSDAY EVENING SESSION

October 21, 1965

The Thursday evening session convened at 8:00 P.M. with President Robert Boddy presiding.

PRESIDENT BODDY: At this time I will call on Bill Curtis, the chairman of the Nominating Committee, for the report of his committee. Bill Curtis!

BILL CURTIS: Here are the results of the nominating committee: for President, Howard Brown; for Vice-President, Henry Ishida; for Executive Board Member from the North to replace Bruce Briggs, whose term expires, Dr. Ticknor. He will be nominated for a two-year term. For the Executive Board Member to replace Phil Barker, whose two-year term expires, Dr. Andy Leiser. Now if you decide to elect Henry Ishida as Vice-President, we will need a replacement for Hank for one year on the Executive Board and we nominate Dave Armstrong.

PRESIDENT BODDY: Thank you, Bill. The election for these officers will be held at our Business Session tomorrow afternoon. At that time we will also receive nominations from the floor for these same offices. Now I will return the meeting to our Program Chairman, Howard Brown.

PROGRAM CHAIRMAN BROWN: Thank you, Bob. I think the order of business this evening will involve first, letting our speaker who was scheduled this morning and was willing to speak later because of the shortness of time, present his paper now. So in order to do that, I would like to call our morning Moderator, Bruce Briggs, to make the introduction. Bruce!

MODERATOR BRIGGS: Thank you very much, Howard. We are very glad to have Dave Graves with us. Dave is here from Stuke's Nursery, which is some few miles north of Yuba City, California. For many years they have been engaged in grafting of walnuts; this is a particular field which, to me, has always been a difficult one. I am very glad to see him on the program. Dave!

GRAFTING OF WALNUTS

DAVID L. GRAVES
Stuke Nursery Company, Inc.
Gridley, California

In my talk the emphasis will be on our commercial method of grafting walnuts by use of the whip, or tongue, graft. Success with this method of grafting is dependent on a number of factors, all of which must be coordinated. They are: —

(1) Healthy seedlings of sufficient size.
(2) Preparation of seedlings prior to grafting.
(3) Good graft wood.

(4) Proper tools and materials.
(5) Proper time for the grafting.
(6) A good job of the actual grafting, and
(7) Careful follow-up.

I shall later use some slides to show in more detail the above operations and the results obtained.

It is sometimes necessary to mention brand names in order to describe as completely as possible the tools and grafting techniques. However, we are not endorsing or recommending any particular brands as we recognize many others are comparable in quality and as satisfactory as those we use.

The seedlings that we graft in our nursery field are one year old trees. Under proper care these seedlings will have reached a height of 4 to 7 feet and have a caliper of ½ to one inch. A spacing of about 9 inches apart in the rows gives adequate room for satisfactory growth.

We start preparing the seedlings for grafting before they have stopped growing in the fall. In early September the lower branches are trimmed off to a height of 8 to 10 inches above the ground. A week or two later this is repeated and all side branches for an additional 8 to 10 inches are removed. Thus we have seedlings that are free of any side growth on the lower 16 to 18 inches of the trunk. Trimming is done in *two stages* so there will be little or no shock to the seedlings and they will continue their normal growth. This trimming operation is necessary, otherwise these lower branches would be in the way of the grafters when the grafting is performed in the spring. It could be done during or at the end of the dormant season, but we prefer to do it earlier so the cuts will have begun to heal.

The graftwood is cut from selected orchards during January and February when the walnut trees are dormant. Wood which grew the previous season is taken and only the basal portion of the shoot, which usually comprises about one half of the shoot, is used. This part is more mature with a greater density to the wood. The other half, or terminal portion, of the wood is discarded because it is pithy and soft and not desirable for use as graftwood. The wood is carefully selected and stored in 2 by 2 by 4 foot boxes with moist peat moss or cedar shingletow distributed throughout, keeping the wood from drying and at the same time not over-saturating or causing sogginess.

The prepared wood is placed in refrigeration at a maintained temperature of 33° to 35° F. which holds it in a dormant state until the time it is used. The range of storage temperatures for holding graftwood a long period of time is quite narrow, and the above temperature has been found to be the most satisfactory. A temperature above 37° F. for any length of time has been observed to cause the buds to swell, the bark to slip, callus formation to start on the cut ends and to weaken the wood. Freezing temperatures are likely to dehydrate the wood in addition to damaging the tissues of the cambium layer. During the grafting season only enough wood is brought out of stor-

age for each days grafting, and any not used during the day is put back in storage for the night.

The most important tool the grafter uses is his knife. It must fit his hand comfortably for it will be used 8 to 10 hours a day during the grafting season. The blade must be of high quality steel that will hold an edge well, and be of sufficient thickness so it will not bend when the sloping cuts are made on the rootstock and scion. The blade must be flat steel, not hollow ground, so it will be easier to make a smooth straight cut. Our grafters prefer a No. 8 Case knife which is a heavy duty grafting knife that has a 2½ inch blade and a fixed handle. A Corona No. 80 hand shear is usually used for cutting off the seedlings and cutting the graftwood into scions. Larger two-handle pruners are used to top off seedlings too big for the hand shears to cut. Whetstones and a leather strop are needed to keep the tools razor sharp and are used frequently during the day. For field use, this equipment is kept in individual wooden boxes about 2 feet long, 10 inches wide and 12 inches high. The box is constructed to provide shade for the scions so they won't dry out before being used. Only one-third of the box is used for the tools, the balance being for the storage of about a one-hour supply of scions of all calipers to fit the different sized seedlings. These scions have been cut about 5 to 6 inches long and usually have two nodes with two buds at each node.

About the first of March, the seedlings are cut off 16 to 18 inches above the ground. They are cut off 10 to 14 days before grafting starts thus giving the sap a chance to flow and "dry up" the seedlings. Experience has shown that a much higher percentage of the grafts "take" if this is done. The time for topping the seedlings varies each year. A cold wet spring slows the start of growth and the topping is delayed until it is time for them to start growing. Conversely, a warm dry spring encourages early growth and permits starting several days earlier than usual. If there are cold or frosty nights or a day or two of steady north winds after the grafting has started, there is a tendency for the sap to start flowing and the grafting must then be stopped until the seedlings are again dry.

When the grafter is ready to begin, the hand shears are used to re-cut the seedling. Only an inch or two is cut off — just enough to remove the dry surface that formed on the cut after it was topped some 10 days earlier. A smooth straight upward draw is made with the grafting knife and repeated several times until the desired slope is obtained. The knife is then placed in about the middle and across the face of this slope, and a cut is made straight down into the seedling about ¼ to ⅜ inch deep. This is done so the corresponding cut made on the scion will interlock when it is placed, or slid, into the understock. A scion the same diameter or slightly smaller than the rootstock is chosen from the box and a sloping cut is first made to match the face on the rootstock. The next cut on the scion is made by placing the knife across the slope cut, parallel with the grain of

the wood, and about ½ of the distance from the toe end. It also is about ¼ to ⅜ inch deep. This furnishes the tongue which will interlock into the same incision in the rootstock. The scion is then slid onto the face of the rootstock with the two split parts, or tongues, wedging tightly into each other. The top of the scion is then lightly tapped with the knife to be sure the cambium layers match at the toe, or base, of the union and on at least one side. The grafter next makes two or three cuts on the seedling close to the ground. These cuts are made just through the cambium layer and allow the sap to escape should it start flowing again before the graft has taken hold and started to grow.

A cloth cellulose tape, similar to white adhesive tape, is next carefully wrapped around the union to hold the scion tightly against the rootstock and to make it airtight. The tape is ¾ inch wide and comes in rolls 60 yards long. Tree Seal, an asphalt compound designed for covering wounds and cuts, is then brushed all over the tape and on top of the scion to keep it from drying and to eliminate any errors in taping. It is used cold and when dry is waterproof.

About an hour later, when the Tree Seal has dried, white wash is carefully sprayed or brushed on so it completely covers the rootstock and scion. This also prevents drying and helps eliminate possible sunburn.

By following the above procedures there is usually better than a 90% "take" the first time over the block of seedlings. Any misses are re-grafted 3 or 4 weeks later and eventually the block winds up with better than a 95% to 98% stand of grafts.

The careful follow-up that is necessary for success in grafting takes place in the weeks immediatelv following the actual grafting process. This includes such items as suckering the seedlings to force out the scion buds, selection of the best growing bud, and cutting of the tape. However, these are primarily problems connected with the growing of the young walnut trees and will not be covered here.

PROGRAM CHAIRMAN BROWN: Thank you. Well, the schedule calls right now for having a discussion of today's field trip. All of you received cards on which you could write down questions. These cards have been collected, I believe, and turned over to the Moderator. I would like to ask the representatives from the companies we visited today if they would come forward please and join us here on the panel. I would also like to introduce the Panel Moderator. Certainly he needs no introductions because of the fine job that he did in organizing and conducting the Tour today. Mr. Byrne is a graduate of UCLA in Floriculture and Soils. He is responsible for the floriculture nursery production work in Alameda County where he has served as Farm Advisor in the Agricultural Extension Service for the past six years. Mr. Thomas G. Byrne —

MODERATOR BYRNE: I would like to introduce the panel members tonight: Margaret Fleming, Production Manager of

California - Florida Plant Corporation, Fremont; Mr. Deiter Luck, Sunnyside Nurseries, Hayward; and Mr. Don Dillon and Mr. Fred Real from the Four Winds Nursery at Fremont, Calif.

First of all, Margaret, you mentioned earlier today that your organization was anticipating getting more into breeding and selection of chrysanthemums in the future. In general, what is the type of problem that you're facing? What do growers want? The people that you're growing for — do you know what they want? Can you give them what you think they want?

MARGARET FLEMING: My impression is that in the florist industry — since the war — the price received by growers for their products is hardly any different than it was twenty years ago. The costs of production must have increased at least 300%. The only reason any of us have been able to stay in business is increased productivity, efficiency, etc. It's the job of the propagator to help the grower increase productivity, to improve varieties, to help with breeding, and with selection to produce varieties which will be uniform so that there will be hardly any dumpage. Varieties must be vigorous so that growing time will be reduced. A few years ago there were no decent white pot chrysanthemums. Breeders realized this, and started working on white pot plants. I'll bet there are fifteen of them now. Selection is exceptionally important. I think fifteen of the varieties which are among the top fifty in chrysanthemums now have been in the trade since 1920. These varieties have been selected and reselected to the point where the originator would hardly recognize them. Selection is toward size because growers are paid by the inch on the standard. You get more for 8 inches than for 7. We select toward vigor. If growers can produce in 14 weeks what took 15 weeks two years ago, they have saved one week of growing time, and in a short time can have another crop. This is very important. The schedules which are followed now are totally different than what they used to be, not only because of varieties but because of improvements in cultural practices. Just recently, working with a grower in St. Louis, he gave us a schedule he followed for March flowering. He finished some Indianapolis varieties, and some pompom varieties in 13½ weeks. When we first started supplying him 4 years ago, he required around 16 weeks for the same crop. He improved his culture. We improved our varieties. We both learned something. We deliver him a certain type of cutting which he prefers; it is a big, husky plant with tremendous roots by comparison with what used to be considered a good cutting. Then he never lets them rest. He plants them and nurses them right up to the finish and sells them well. He, therefore, operates at a profit in spite of increasing costs without compensating increase in returns. In breeding we wish to fill needs; there are no pink standards. We tried hard to supply pink standards but we still have no pink standards. We had a feeling that pot plant growers needed more varieties so we concentrated on pot plant varieties and did much better there. There's still room

for improvement but some of the varieties which you saw at Sunnyside this afternoon and some of the varieties on the floor are new to the trade within the past 12 months — not more than 3 years old with us — and there are many more coming. Pot plant growers like new varieties, and they can sell more pot plants because they have them. Cut flower growers are perfectly satisfied with Indianapolis, Albatross, and Good News; the variety would have to be just fabulous to knock these off the list. I won't say that such a variety might not come someday, but it won't be in the near future.

MODERATOR BYRNE: Thank you, Margaret. Deiter Luck, I would like to ask you about growth retardants. Deiter has been using growth retardants for some time on pot chrysanthemums. I would like to ask him what his program is and how he gets the right amount applied to 80 different varieties. I assume they all don't take the same amount. Maybe they do. Would you elaborate on this a bit?

MR. DIETER LUCK: To answer Tom's last question first, do 80 different varieties take the same amount of B-9 (B-995). Yes, they do. When B-9 became first available on an experimental basis, we started our work. We used many different concentrations, starting with 0.05% up to 1.00%. We found that the majority of varieties respond quite well to 0.25% although there are certain varieties that respond to 0.15% and others, like "spiders", would do much better at 0.30% or 0.35%.

B-995 is no magic chemical, but it can really help to improve chrysanthemums, especially in quality. You can use it as an emergency stop. If the crop gets away because the plants are crowded, or light conditions are poor, you can apply B-9 and it will stop the growth wherever it is. There is really no danger in using it. I have used high concentrations right up to the stage where the buds are showing color and I have never seen any injury with B-9. That is, without adding any additional wetting agent. If you do add wetting agents, then you may get some slight burns, but not without them. We are using B-9 as part of our growing program, just like we use fertilizer or insecticides. We take advantage of growing conditions which we could not do if we did not have B-9. Instead of delaying pinching in order to hold our pot plants to a decent height, we give them three or four extra days of light in order to get better foliage. We get deeper flowers, larger flowers, and even better color. Then in order to offset the height we gain by lighting them for three or four days extra, we use the B-9. I think everybody has his own recipe for how much or when to apply it. For us it works fine about three weeks after pinching. You have to have at least two inches of new growth. The "break" should be about two inches. If you apply it too early, then the plants grow out of it just before they're saleable, and then you might get real weak "necks". Certain spider varieties create a bit of a problem because they have long necks or soft necks; you can spray them with B-9 just about dis-budding time, and eliminate

the necks and get rather decent pot plants. We have grown fairly nice pot plants out of standard pot mums like Iceberg, which I have seen five or six feet tall. Makes a nice pot plant if you want to do it; so I think it has a place. It doesn't grow your crop for you, but it will certainly help to improve quality; with so many varieties, we would not be able to produce them so uniformly as we are able to do with B-9. That is what I have to say on B-9. There are other growth retardants; Cycocel is used on poinsettias; I know some people are still using phosphon on mums but I think B-9 is much easier to apply. It certainly works well for us. The cost is not excessive. The material will run between 2c and 2½c per pot. You almost have to use power spray if you want to treat 2000 or 2500 pots a week, but with low pressure and fairly small nozzles, where you can direct your spray into individual pots, it will run about 2c per pot, plus the labor — depending on how much you pay your personnel. If you figure $3.00 an hour, it costs ¾c per pot using a power sprayer; it is one of the easiest materials to apply and I think it is almost foolproof.

MODERATOR BYRNE: Thank you, Deiter. Now the last question I have is kind of a perennial one; in Alameda County's nurseries—the ones with whom I deal—container-grown plants, in general, are grown in a medium that has some dirt in it, and I am from the school — the dirt school I guess you would say — where I studied under Dr. Ray Lunt, and some of this rubbed off — where you grow good plants if you have some dirt in the soil. So, Fred, I would like to ask you why you are the only one in our county using an artifical soil mix. What advantages does it have for you?

MR. FRED REAL: After coming from southern California, and using the soil there, to northern California, we found the soil here even worse than that we had down there. With the Soil and Plant Laboratory people working with us, we decided to go into the UC mix. We were supposed to use peat moss but the financial condition of the nursery at that time was such that we could not afford peat moss, so we decided to use sawdust and everybody thought we were crazy. But now I find that we can hardly get sawdust ourselves anymore because some nurseries are getting it from us. We are real satisfied with the UC mix. There were times when we wondered, but we have finally got some dirt into it. At one time we were getting too much sawdust into it and the water was going though it pretty rapidly and we couldn't really get the mixture the way we wanted, but I think we are now where we really have it at its best, at least the way we like it. Also the cans are lighter; with the soil mix we have, we find it holds moisture quite well in our operation. We do not water our plants outside but once a week and we water every can by hose. Personally I like the soil mix and I can't see why a lot of nursery plant materials would not do well in it. I think that redwood sawdust may not be satisfactory for some

nursery materials or flower plants on account of toxicity, but otherwise I think it is fine.

MODERATOR BYRNE: Thank you, Fred. At this time we will open the discussion to questions from the floor.

MR. RALPH PINKUS: I want to know the soil mixture you are using with the redwood sawdust. What percentage is redwood and what is the percentage of other materials?

MR. DON DILLON: As close and as accurate as you can get with a skip loader in a transit mix, our mixture is composed, roughly speaking, of ⅔ redwood sawdust and ⅓ sand. Sand is a great big wide world of wonder, and we have gone all the way from white sand, Kaiser sand that is white as snow — beautiful, not a thing in it, and we know it, to the by-products from the gravel quarries for the silt and the real fine sand accumulates. Where this can be obtained in some uniformity, we find this is very good. At the present time we are using a similar material unwashed as it comes from about 25 or 30 feet down, a mixture of very fine particle sand with a slight amount of clay or silt in it. To this is added the usual ingredients of the UC mix, calcium, dolomite lime, blood meal, superphosphate, and so on. I think one of the reasons why we use it is the fact that we do have some control over what is in it. It is uniform. It may be uniformly bad in the opinion of some people; we think it is uniformly good, but it is uniform. It is the same as we can make it from one batch to the next and this is its great quality. I think in everything we do in the nursery business, we should try to standardize, to get into known quantities, whether rootstocks, scions, or soil mixes or amounts of fertilizers. When this man starts talking to me about percentage of 1.0% of B-9, we are talking about known quantities. The soil mixes fit into the same category.

MODERATOR BYRNE: I have another question that ties into this as redwood sawdust becomes less available, and it is becoming so; more of it is going into landscaping purposes. Apparently it is just not much available in the southern part of the state. What thought have you given to using other types of sawdust? There is a vast quantity of sawdust of other species available in the state. Apparently other types or species are being used in the Northwest and other areas.

MR. DON DILLON: We have not given much consideration to other materials. We have been holding our breath and hanging on with the redwood as long as it will last. I understand studies are being made, tests of many other materials, and it seems from what I have heard — I have not read any of this material — most of the wood by-products, after a period of time, come into a certain common denominator. They react at about the same rate. They decompose at the same rate. We have held to redwood by the virtue of the fact that there is very little shrinkage. There is very little decomposition and very little nitrogen demand, but as far as finding another material, we

haven't investigated this. Up until just a short time ago, Tom, you mentioned we are the only ones using this material, but I have been supplying sawdust to six other nurseries in our immediate area.

MODERATOR BYRNE: Do we have another question from the floor? Yes, Sir —

MR. BRUCE BRIGGS: Mr. Luck mentioned that if he used a wetting agent with B-9 he had burning. If he used B-9 plus the wetting agent could he dilute the B-9 and get the same results?

MR. DIETER LUCK: I have never tried to do this; I was using various concentrations of B-9 but I did not see any differences in effect by using wetting agents vs. just plain B-9. The reason I used wetting agents was that there are certain varieties that just don't seem to take the material easily. You can see it. The leaves are waxy and they just don't want to accept it, but after getting some burning, I have gone back to using just straight B-9. It works quite satisfactorily.

MR. PETER LERT: I might add to that question. The original B-9 material, the experimental material, contained no wetting agents and so had to have them added. At that time I ran rather extensive tests — all pointing up basically what Dieter has said. Added wetting agent is not a good substitute for concentration. If you increased the wetting agent enough, you induced injury.

MODERATOR BYRNE: I do not know if you noticed out at Cal-Florida that the girls were dipping the chrysanthemum cuttings in rooting hormones. Why would they do this on mums? I can stick these things in a glass of sand or water at home and they root very fast.

MARGARET FLEMING: Chrysanthemums root very well without rooting hormone of any kind. In years past we used to use it on some varieties and not on others, but that is one more classification. We have dozens of other breakdowns, so why save a couple of dollars on rooting compound and have people work separating all these out. Really, now that we know the difference we would still use it, regardless. It gives more roots over a bigger area and more uniform rooting. If we don't use rooting compound, or if (other people have quality control problems, too) by chance, the mixture is not too good, or they forget to put in the IBA, then we get roots only from the bottom of the cutting in about three rows and this is not very satisfactory. As a matter of fact, about three weeks ago we delivered a whole week's production of cuttings with roots only at the very butt of the cutting. We had a new batch of rooting compound and it did not take long to find out that something was wrong with it. With hormone, the cutting stands up better, takes hold faster, and we think it is much better than one with just a couple of skinny roots coming our of the base.

MR. ALBERT NEWCOMB: Do you know how deep the soil is sterilized by the steam rake treatment?

MARGARET FLEMING: Deeper than we used to think because now they tell us that 140° F. is enough. We used to be

told that 180° F. was necessary; we think that we are sterilizing to 180° F. in the top several inches and then to 160° F. some more inches down and then to 140° F. some more inches, the total of which is about 14 inches; it depends upon the soil preparation. We rotovate. We sub-soil once a year. We have to have a certain moisture content. All of these are factors. Steam pressure is no factor, whatsoever, because we have too much. It has to be cut down. With the chrysanthemum, a shallow rooted crop, and a very fast crop, it has proven to be adequate even though there are still people who still doubt it. If you have verticillium wilt, as I said this afternoon, on old tomato ground, you must sterilize your soil.

MR. CURTIS ALLEY: Why are plastic pots not used more than they are?

MR. DIETER LUCK: We have to serve two markets with our chrysanthemums — super markets and retail stores. Retail stores prefer clay pots. Super markets, they don't care. They take plastic pots or clay pots because the clay pots are covered with foil and they can't see the pot; they will accept the plastic pot and use it without the foil because it usually stays cleaner than a clay pot. We do use plastic pots in sizes smaller than four inch because they are much easier to care for since they do not take so much watering. They hold a little more soil and are easier to care for, but again it would make things more difficult to plant some of each variety in clay pots and some in plastic pots; that is the main reason why we are using clay pots. Otherwise, we have grown just about every crop in plastic pots and they do quite well. I would say just as well as in clay pots if you treat them accordingly — but one of the main reasons is to simplify things.

PROGRAM CHAIRMAN HOWARD BROWN: We would like to take this opportunity to show our appreciation to the hosts of today's Tour. We have plaques here that we would like to present to each of these representatives for letting us visit their fine operations and for taking all the time to show us through and answer our questions — Don Dillon, Sho Yoshida, and Margaret Fleming.

We will now have a second panel of the evening to answer questions on this morning's talks. Bruce Briggs will moderate.

MODERATOR BRIGGS: Our panel will consist of the morning speakers: Dr. Dale Kester, Dr. O. A. Batcheller, Dr. Curtis Alley, Mr. Don Sexton and Mr. David Graves. To start, we have a question submitted to the panel. The question is: Over in Europe, in the Mediterranean area, I understand the general practice in T-budding is to remove the wood from the shield. Is there any advantage to this and, if so, elaborate. Would you answer this ,Jolly Batcheller?

DR. O. A. BATCHELLER: Well, this is sometimes called a June or "flip" bud here in the United States. We cut in rather deeply in our initial cut underneath the bud. The second cut

above the bud goes merely through the phloem tissue and then you take your finger or thumb nail and merely peel off the phloem tissue and that part of the cambium that adheres to it. It was one time thought that in June budding early, removing the xylem, you get a closer contact of the cambium layers. The buds would heal faster and grow faster. The time involved makes it expensive and difficult to do and, if the bark is not slipping, it is nearly impossible because you have nothing to push to give your buds strength in order to insert it. I do not believe there are any great advantages to it here in California or where we have good growing weather and the bark slips rather quickly.

MODERATOR BRIGGS: Thank you. Is there anyone in the audience who would like to add to this?

MR. LLOYD JOLEY: There was considerable work reported in England some time back, probably in the 1920's or 1930's, in which they found no difference in removing the wood from the bud vs. the wood left in the bud. Professor Bradford, working at East Lansing, Michigan, did considerable work along that line at one time. He never published on it, I believe; but he found no difference. At Chico, California, I have tried budding *Pistachia,* both with wood removed from the buds, and wood in the bud and it made no difference.

MR. WILLIAM CURTIS: In the northwest we use dewooded buds when we want to get started earlier. The wood is soft. The buds are a little bit soft, not quite matured enough. Sometimes you can get started a few days earlier in your budding. We found that it works very well with flowering cherries, where it is sometimes difficult to get a good stand with ordinary budding.

MODERATOR BRIGGS: Dale Kester. In double budding, do you permit the interstock bud to leaf out?

DR. DALE KESTER: The interstock is a small piece of wood, or a thin slice, a quarter of an inch thick, at the most, with no bud on it. The bud is removed to make a budless shield.

MODERATOR BRIGGS: Thank you. Curtis Alley, should the string for budding be waxed?

DR. CURTIS ALLEY: I have not used wax string in the budding I have done. If you use a wax string and cover it with soil, I believe you're going to be in trouble because it will not rot out. If you use wax string and leave it above ground in the air, you will have to cut it. However, I am sure wax string would make the particular seal much more waterproof.

MODERATOR BRIGGS: Don Sexton, what time of the year do you graft *Magnolia grandiflora?*

MR. DON SEXTON: At Monrovia Nursery in southern California, we graft *Magnolia grandiflora,* I believe, in January and February; this is the best time and, of course, it takes a while to heal in and to develop. Some tend to be a little slow. They don't all come on quite as rapidly as we would like them.

When the scionwood is reasonably dormant is the time we do it.

MODERATOR BRIGGS: Do you do any budding as well as grafting on *Magnolia grandiflora?*

MR. DON SEXTON: No, we are not doing any budding on these at all at the present time. The understock is usually reasonably large and by selecting, just as with walnuts, the scions for size to match the understock, we can graft both rather large and small understocks.

MODERATOR BRIGGS: Don Dillon, have you tried in your work to check the amount of foliage you have to keep on your cuttings under mist.

MR. DON DILLON: As I mentioned this afternoon, on our citrus we intend to retain all leaves. The wood that we use is not soft wood or very recent growth. It is pretty well hardened off. We do try to retain all the leaves wherever possible. As far as any experiments to see how it works with and without, we have done this against our will, so to speak. Sometimes when the mist goes haywire, we lose the leaves and we know that we don't make any money doing it. The plants just don't root properly, the grafts don't heal properly, and we have them headed for the dump pile.

DR. DALE KESTER: In rooting cuttings of the type that Don is doing, he is rooting them and grafting at the same time. If he removed the leaves, as he said, he would just completely inhibit root initiation.

MR. LLOYD JOLEY: In the case of double working apples, you will get better increase in the diameter of the interstock if you take the leaves all off. That has been done in work at Michigan.

MR. ALBERT NEWCOMB: Dr. Ford, in Florida, carried out an experiment where bare-rooted citrus trees, on which they left a large number of leaves, were found to be likely to wilt and not grow well. If they took all the leaves off, the trees did not transplant well; but if they left on a moderate number of leaves, the plant grew the best. These were rooted, budded, bareroot trees ready to set in an orchard. It was a rather complete experiment; we followed this program ourselves and verified it in our own work. Citrus trees with some leaves retained seem to be able to transplant better, start, and grow better than if they are completely defoliated.

DR. DALE KESTER: In this whole case where you are dealing with a leafy plant, you are working with two processes that are opposed to each other. On the one hand, the leaves stimulate rooting. At the same time, there is a loss of water from the leaves which may result in wilting; the two processes work against each other, so the end result is a compromise between the two.

MODERATOR BRIGGS: Thanks, Dale, for the clarification. Dale mentioned this morning that if you added a hormone, such as naphthaleneacetic acid, to the inserted bud or scion, it did

not seem to help the grafting percentage. Has this actually been proven, or is it a matter of timing?

DR. DALE KESTER: What this statement was based on is that although naphthaleneacetic acid and other growth regulators stimulate callusing and theoretically should help grafting, no practical benefit has been consistently reported. Many people have tried it in various ways, and although a few people have reported some benefit, most people have reported none. Failure to produce practical benefit may due to incorrect methods, timing, etc. Since there are reports in the literature where some people have produced some benefit, perhaps more work needs to be done.

MODERATOR BRIGGS: Thanks, Dale. Another question, what type of graft would you advise for azalea grafting?

MR. DON SEXTON: We use a side graft, usually with a tongue. These are usually very small azaleas. We also grow the standard type, the so-called tree azaleas on the southern *indica* stock that may be 2 or 3 feet tall. These are a little huskier and we are able to work them in much the same manner as other grafts and then we tie them with a strong thread. We use just a regular, good quality, white thread; we do not wax it. Then the grafts are plunged and held under polyethylene for several weeks, just as are all the other items.

DR. O. A. BATCHELLER: I have seen Roy Wilcox grafting azaleas that were less than ⅛ inch in diameter. In grafting them they merely cut one side, then made their scion rather tapered, forced it in and then tied the grafts with cotton thread and put them in peat moss; they got a very good union. It was a modified cleft graft.

MODERATOR BRIGGS: Is it possible to apply some kind of "antidote" to buds to prevent such growth as the suckers arising from the base of plants. Dale Kester, will you answer this?

DR. DALE KESTER: If kinetin, adenine, and such substances are associated with growth of buds, then I suppose someone ought to be able to invent an anti-kinetin that would inhibit bud growth. In the experiments where kinetin has been studied, the initiation of buds is involved. In bud inhibition we are talking about a bud that is already formed but is dormant. To keep it from growing we are talking about a different process. Growth is associated with both auxins and kinetins but bud inhibition is probably more apt to be produced by an anti-auxin. The other problem here is that we might inhibit the whole plant rather than certain buds. This question could come up again tomorrow in the symposium on "Growth Made to Order."

MODERATOR BRIGGS: We have a question here for Don Sexton. Will *Juniperus* 'Wintergreen' root well from cuttings?

MR. DON SEXTON: No. We have not had any success growing this particular juniper from cuttings. We have not really tried to grow any the last couple of years because we have not had any results. Now, 'Robusta Green', we do grow

from cuttings and we do get reasonably good results although it is somewhat difficult and we do not get nearly the quantity we would like to have. It is rather slow in every respect and in growth afterwards, too. We get more rapid growth by grafting.

MODERATOR BRIGGS: I would like to mention the use of shellac as a seal in grafting. We used it a little this summer. I know the Saratoga Horticultural Foundation has used it for maybe the last two or three years. It looks real fine. It is easy to apply. It dries real quickly. The alcohol in it does not seem to hurt the plant. Shellac itself is pretty much made up of bugs, it is a protein. Therefore, there is nothing injurious to the plant.

MR. WALTER VAN VLOTEN: Somebody told me years ago that the black, cold grafting wax — we call it in Canada, Bracko — has some oils in it. It is an asphalt product. That is, would it be harmful to the tissues of your graft? Is there any truth in that?

DR. CURTIS ALLEY: If this is the same compound as Tree Seal, or Treheal, which has an asphalt base, I am not aware that it is toxic to plant material. I have not heard of this product that you are talking about. These are the only two that I am familiar with — still there is one other compound, too, that is black, which is manufactured at Merced, California, that has a slightly different solvent; we have tried it and found it to be non-toxic to grape material. All three of these have an asphalt base. They are water soluble. You can thin them out with water.

DR. O. A. BATCHELLER: One comment I would like to make. In horticultural class, when I was in college, we spent three laboratories making grafting wax with beeswax, tallow, lamp black, etc. In my first class in grafting at Cal Poly in 1946 we wanted to graft over some avocados; down there they chop them off six inches from the ground and stump graft them. I prepared the proper wax with beeswax, tallow, resin, and lamp black and had just the ideal mix to withstand the hot temperature. Now down there we put paper bags on the top after grafting to protect it from the heat; so the next lab period we went out to check. Of course, we tear holes in the corners to provide ventilation, but the bees are hungry in southern California and they had gone in — because it contained beeswax — and had taken all the beeswax out; in fact, they had stripped all the wax off the graft and, of course, it was dead. Tree Seal or Treheal is good and, as far as I know, the range of distillate they use in the emulsion is such that it is not toxic or harmful to plants.

MR. FRED REAL: Has anyone used plastic tape in budding?

MR. DAVID GRAVES: We do not use it ourselves. We have never tried it but I know that there are nurseries who are using plastic material to wrap around grafts.

DR. DALE KESTER: We have used it in class work quite a bit and it is really quite successful. I have seen published reports from Australia that certain plastics contain some toxic material and were injurious.

MR. WALTER KRAUSE: We have used polyethylene ½ inch tape on walnuts and had some burning beneath the plastic. The plastic was also covered with Tree Seal as a grafting compound.

MODERATOR BRIGGS: This question occurs in our area; some people get more growth on plants in a metal can than in a plastic container with the same item under the same conditions. I am again wondering is there a toxic condition from the plastic that we are also facing.

DR. O. A. BATCHELLER: My guess is that up in Washington the black can absorbs more heat and therefore the plants have a little warmer root condition.

MODERATOR BRIGGS: They are both black though, Jolly.

DR. O. A. BATCHELLER: In Wageningen in Holland, I saw reports of their investigations regarding the use of plastic pots versus clay pots; under proper watering conditions, they claim there was better growth of roots in the plastic container than in the porous clay which everyone says, "breathes and provides better conditions."

MR. WALTER KRAUSE: I have a question for Mr. Graves. After the grafting process in walnuts, what do you do with the sucker growth? Do you retard it or do you keep it absolutely cleaned off entirely? That is, below the graft union.

MR. DAVID GRAVES: We leave the sucker growth on for a certain period of time. We want this sucker growth to absorb all the material from the roots until the scion has had a chance to knit into the rootstock. Now, we do not want to let the sucker growth get too long or it will overgrow the scion; after six or eight weeks we go in and strip off any sucker growth that has come to see if the graft can take it; if the graft does not wilt or show any signs of going backwards, we can go ahead and strip off all the sucker growth. This will force all of the growth into the English variety that we are growing.

MODERATOR BRIGGS: Is it harmful to apply water to a graft union during healing? In making an evergreen graft, you put it in the greenhouse and maybe wait twenty-four hours before you water it; or vou may apply water immediately after grafting. Is there any harm in doing this?

DR. DALE KESTER: Well, I do not know too much about the evergreen situation. In general, free water or at least a very high humidity on the union is not desirable. With a lot of water, you might get a fungus problem which would cause some trouble. This may be the thing causing the problem, but as far as getting callus to grow, free water, as I understand the situation, is not harmful and probably would be beneficial.

MR. WALTER VAN VLOTEN: I would like to ask about chemicals used in keeping grafts clean under mist, instead of what they use to call double glass grafting.

MR. DON SEXTON: We apply Captan dust after the grafting is completed and just before the polyethylene cover is put on. Our house, of course, is periodically cleaned out and sprayed with Bordeaux or some other fungicide. We try to maintain clean conditions. Usually the knives are dipped in something — sometimes Agramycin — we try to maintain clean conditions at all times. But we do not heal any of our grafts under mist because they are all grafted on a rooted understock. As I pointed out, while they are placed in moist conditions under the polyethylene, they are not watered any further for several weeks unless it is noted that they happen to become dry. They normally would not dry out under polyethylene, especially with the small amount of foliage they have at the time of grafting. Remember we have thinned out the foliage on the stock and cut it back rather severely. The scion itself has a relatively small amount of foliage, not soft foliage, so that we do not have a great water loss, especially when the humidity is maintained at a high level under the polyethylene. We have rather different conditions than at Four Winds Nursery where they are healing a graft union and rooting the understock simultaneously under mist.

FRIDAY MORNING SESSION

October 22, 1965

This session convened at 8:00 A.M. with Moderator Tokuji Furuta, Extension Specialist in Ornamental Horticulture, University of California, Riverside, California, presiding.

MODERATOR FURUTA: In the realm of nursery production and marketing, including propagation, I should like to think of it as a system — just as we have systems of rockets which orbit man, and a system of communications in which we can communicate vast distances in a very short time, so our systems of production and marketing will enable us to profitably produce plants in a very efficient manner and, hopefully, at the highest net profit for the firm. I think that we need to use the concepts of systems engineering to analyze our problems, and, of course, basic to the concept of systems engineering and analysis is the fact that we have to know what each component will do and how it functions in relationship to other parts of the system and particularly the limitations of each component. In order to understand the components of the systems that we are working with we have to have research at the various levels of basic research and development research in order to put this to use.

This morning we will consider several topics, the information of which has been or is being developed by research personnel in this state and in every other state in the Union. It is only a little over a score and ten years that we have begun to understand the nature of plant growth regulators and what they will do. And yet, in this short period of time, we have gone from a very infantile knowledge of plant growth regulators to the point where we cannot only say that we can control plant growth, but we can say that we can control it profitably and practically.

Our first speaker this morning is Peter Lert, who will discuss Plant Growth Made To Measure. Pete:

PLANT GROWTH MADE TO MEASURE

PETER J. LERT
Agricultural Extension Service
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San Jose, California

Historically, man has always shown much interest in tailoring the growth of plants to his economical and aesthetic needs. All of our cultural measures, to some extent, involve tailoring plant growth — even if this only means the growing of larger and more vigorous plants. However, most people think in terms of regulating plant height when we talk about tailoring plants to measure.

At our meeting at San Dimas, California, in 1962, Dr. Harry Kohl presented a paper in which he pointed out that a variety of factors independently and interacting can influence plant height. These include genetic changes, clonal selection, pruning of tops or roots, light, temperature and moisture. But in this modern age of scientific marvels, people are less interested in some of these very effective but "old hat" ideas than in the use of chemical plant growth regulators.

While many chemicals may alter plant growth, including fertilizers, herbicides, auxins and kinins, it seems well to restrict today's discussion to gibberellins, growth retardants, and the growth inhibitor, maleic hydrazide.

So much has been said and written about the discovery and development of the gibberellins that it seems superfluous to say much about them at this time. However, for a better understanding of the mode of action of growth retardants, it is necessary to remember that gibberellins occur naturally in all plants and are responsible in part for the mechanism of elongation. Strangely enough, this particular aspect of gibberellins has not found too much practical application in commercial horticulture. However, other influences on flowering and fruiting have been developed to improve quality or time of maturity. Our moderator for this panel, Dr. Furuta, demonstrated that high rates of gibberellic acid could be substituted for the cold