The thing I was going to ask Mr. Kyle was that on the basis of the comparison, would he feel that the investment in air washing is worth while? In other words, does he get enough increase in his percentage rooting using the air wash to make the investment worth while.

MR. KYLE: To tell you the truth, I was in Korea while most of this was going on. From what I understand from our propagator, we do not feel that there is a real advantage over the outside mist However, this was our first year in outdoor misting and we did have better results compared to outdoors frames. In our locality, controlling the temperature is quite advantageous. For conditions in New York or somewhere else, it might not be needed. During the middle of the summer we get extreme changes in temperature and this way, we don't have to worry about working our ventilators.

MODERATOR REISCH: Remember, forced air cooling is in its infancy in the nursery business while we have had mist a little bit longer.

MR. HANS HESS: You mentioned propagating clematis under the combination of double glass and mist. Would you elaborate on that just a little bit?

MR. KYLE: Well, to tell you the truth, that is sort of a fallacy. You can't very well put mist under a double glass. We did have clematis in the open bench mist, and later we cut the mist off because it was getting too wet. However, we had the cool, moist air. I will let Mr. Englemann answer your question.

MR. HERMAN ENGELMANN: I think clematis propagation is easy if you can keep the leaves healthy. Clematis leaves are very tender and rot easily. It is a little easier to keep the leaves in good condition under the double glass. You must keep the leaves good for about 40 days to get a good root system. I think with plenty of sunlight and under the double glass we possibly got 80% to 95%.

PRESIDENT VANDERBROOK: Thank you very much, gentlemen, for the excellent presentations. We will now have a talk which I know many of you have been looking forward to on dwarfing and hybridization techniques for the plant propagator. It gives me great pleasure to introduce Dr. Karl Sax.

Dr. Sax presented his paper entitled "Dwarf Ornamental and Fruit Trees." (Applause)

DWARF ORNAMENTAL AND FRUIT TREES

DR. KARL SAX

Arnold Arboretum and Bussey Institution

Harvard University

Jamaica Plain, Massachusetts

The ranch type house and limited grounds demand smaller types of ornamental trees and shrubs for landscaping. The migration to the shrubs has also revived an interest in fruit trees. For such orchards, dwarf trees are essential to provide a variety of fruits in a limited space and to facilitate pruning, spraying and harvesting. Even the commercial fruit growers are becoming interested in dwarf or semi-dwarf trees to reduce labor costs.

In our breeding work with ornamental trees and shrubs we have produced several small ornamental trees which have been named and released to nurserymen Perhaps the most outstanding example is the "Hally Jolivette" cherry, named after the author's wife. The French name Jolivette means "pretty little one," an appropriate name for the tree, as well as the wife. This tree grows to a height of eight to ten feet and bears semi-double, pink-centered flowers which are borne over a period of about 10 days.

Another small graceful tree is the "Blanche Ames" apple, named after the wife of Oakes Ames, former director of the Arnold Arboretum. It has semi-double white flowers on slender graceful branches. The Washington Arboretum at Seattle has classed it among the best of the 50 varieties tested.

Among the dwarf shrubs produced by hybridization the "Arnold Dwarf" forsythia has considerable merit, although it is slow to come into flower. The original plant was eight years old before it flowered, but cuttings from flowering plants should flower in four or five years. The mature plant is only several feet tall and the spreading branches root readily and form a good ground cover. Even without flowers it is an attractive plant.

Ornamental trees and shrubs can also be made to produce either smaller or larger plants by the use of appropriate rootstocks and by other methods. We have used *Prunus tomentosa* as a rootstock for *Prunus triloba multiplex* with considerable success. The first year, the *P triloba* whips reach a height of 5 or 6 feet and the second year they are a mass of bloom. At the end of ten years the trees are still vigorous and bloom heavily. The Nanking cherry is also an excellent dwarfing stock for ornamental peaches and plums

Many different genera can be budded on *Crataegus* rootstocks. Perhaps the most promising combination is cotoneaster on hawthorn. *Cotoneaster adpressa praecox* budded on *Crataegus phaenopyrum* made excellent growth the first year, and when budded at the height of 5 or 6 feet the spreading forms of cotoneaster produce a most effective ornamental.

Our experience with the Silver maple as a rootstock for Norway and Red maples has been very promising. Although *Acer saccharinum* is the fastest growing of all maples, it dwarfs "Crimson King," a variety of *Acer platanoides.* Such trees at the age of six years are only about 6 feet tall, even when grown in good nursery soil. *Acer rubrum* is also dwarfed when budded on Silver maple rootstocks, at least when it is budded 15-20 inches above ground level. Even when budded low on Silver rootstocks the Red maple flushes earlier in the spring and colors earlier and more brilliantly in the fall. Silver maple rootstocks might permit the Red maples to be grown more successfully in alkaline soils.

The common lilac budded on *Syringa amurensis japonica* is dwarfed, although the lilac is by far the largest of all lilacs The grafted plant is not long-lived, however, possibly due to borer infection in the main trunk.

It is also possible to get feeble seedlings to grow much better in some cases by budding them on other rootstocks We have been trying to get hybrids between *Syringa laciniata* and *S. vulgaris* in order to obtain new forms of *S. chinensis.* The cross is easily made and the seedlings grow well the first year, but at the end of four or five years practically all of the seedlings were dead. If, however, the young seedlings are budded on common lilac rootstocks, many of them survive and flower.

We grew about a hundred plum X peach hybrid seedlings, but almost all of them died the first year. If, however, they are budded on *P. tomentosa* they grow fairly well and budded on peach they make almost as much growth as peach on peach. Brock, of Australia has had a similar experience with apple X pear hybrids grown at the John Innes Horticultural Institute in England. Many feeble hybrid seedlings would probably survive if budded on a parental rootstock.

The dwarfing of fruit trees is an ancient art. European horticulturists have been producing dwarf apple and pear trees for hundreds of years. They found that certain apple seedlings, when used as rootstocks, would greatly reduce the growth of the scion variety and induce earlier fruiting. These selected rootstocks were propagated by stooling, and were originally known as French Paradise and Jaune de Metz. Eventually the clones became mixed, and in order to insure proper identity the East Malling Horticultural Station, in England, began test plantings nearly 50 years ago and later gave the clones numbers East Malling VIII and IX are the more extreme dwarfing clones, while East Malling VII is often used as a semi-dwarfing rootstock.

Mature apple trees thirty to forty years old, budded on Malling IX rootstocks, grown at East Malling are only about seven feet tall and bear about a bushel of fruit each. These dwarf apple trees bear fruit which is fully as good, if not better, than fruit grown on standard trees.

Pear trees are usually dwarfed by budding or grafting them on quince rootstocks. Various degrees of dwarfing are attained by grafting them on clonal varieties of quince which are propagated by stooling. We have found *Photinia villosa* to be a very dwarfing rootstock for pears, although the bud compatibility is poor In some cases pear on *Photinia* have fruited the second year These trees are now six years old and bear heavily, but grow very slowly. Pears can also be budded on cotoneaster and hawthorn. Seckel pears on hawthorne roots, with a cotoneaster interstock, are less than six feet tall the sixth year and bear heavily.

The Europeans also dwarfed peach trees by budding them on St Julian plum, but smaller trees are obtained by budding the peach on *Prunus besseyi, Prunus tomentosa* or *Prunus triloba.* About 15 years ago Karl Brase at the New York Experiment Station budded peaches and plums on *P. besseyi.* This rootstock produces dwarf, productive peach and plum trees, but the trees in the nursery often tip on their side and *P. besseyi* suckers badly from the roots. During the past ten years we have been using *Prunus tomentosa* as a rootstock for peaches and plums with considerable success The Nanking Cherry is not as compatible with so many peach varieties as is the Western Sand cherry, but it stands up better in the nursery and has a much more fibrous root system.

Prunus triloba seems to be a compatible rootstock for peaches, plums, and apricots, but we have tested it for only a few years. It will also take sweet cherry occasionally, but there is some overgrowth of the scion variety. Sweet cherries can also be grown on *Prunus maritima* seedlings and we have Washington and Windsor sweet cherry on beach plum rootstocks. There is considerable overgrowth of the sweet cherry branches, but the tree is alive and fruiting at the end of ten years. Karl Brase has had promising results with *Prunus sufruticosa* as a rootstock for dwarfing sweet cherries.

It has long been known that many species, or even genera, can be grafted together. Mr. Burbridge in 1886 wrote that it was possible to "have on the same Thorn stock . . . Pear, Medlar, the Beam-tree, the Service-tree, the Mountain-Ash, the European and Japanese Quince... the Cotoneaster and the Pyracantha." It is also known that individual seedling rootstocks of the same species may vary greatly in their compatibility with a given scion variety We find that only about 10 percent of our seedling *Prunus tomentosa* are compatible with the Elberta peach, but other propagators report a good take of Elberta on *P. tomentosa.* We are now growing *P. tomentosa* seedings which are compatible with Elberta to see if their seedlings will have a high degree of compatibility In the search for seedling rootstocks, various species, varieties and ecotypes should be tested Unfortunately, such tests require a lot of time and land.

Clonal rootstocks are desirable because their compatibility and performance is known, but they have two disadvantages, first the cost of propagation, and second, the possible infection by virus which is transmitted by vegetative propagation For the past 15 years we have been testing certain apomictic apple varieties since they are genetically uniform and virus is not normally tranmitted through the seed. *Malus sargenti* seedlings grow too slowly and are not compatible with many apple varieties. *Malus hupehensis* and *M. toringoides* have also proved incompatible with many varieties. *Malus sargenti rosea* is more promising, but *Malus sikkimensis* has proved to be the best. The seedlings from old trees are almost all of the maternal type and are compatible with all varieties tested. Tests made at Long Ashton in England indicate that *M. sikkimensis* seedling rootstocks are less dwarfing than Malling VII, but at the New York Experiment Station Dr. Brase finds them to be more dwarfing. He also confirms our observations that the *M. sikkimensis* rootstock produces a more spreading tree. It appears to be a good semi-dwarfing, seedling rootstock for commercial growers. Unfortunately there are few trees in this country, seedlings do not produce fruit until 8-10 years old, and the young fruiting trees produce a large percentage of variants, apparently due to cross pollination of the flowers of the facultatively apomictic species, while young. Facultative apomixis does, however, permit hybridizing between apomictics and sexually reproducing species We have crossed *M. sargenti rosea* with

East Malling IX in an attempt to get an apomictic dwarfing rootstock variety. Apomixis is a dominant character and usually appears in the hybrids of *M. sargenti rosea.*

Because of the ease of propagation many nurserymen in this country are now using dwarfing interstocks instead of dwarfing rootstocks for producing dwarf apple trees This technique is not new. It was described by John Rea in 1665 as follows: "I have found out another expedient to help them forward, that is by grafting the Cyen of the Paradise apple in the Crab, or other Apple-Stock, close to the ground, with one graft, and when that is grown to the bigness of a finger, graft thereon about eight inches higher, the fruit desired, which will stop the luxurious growth of the Tree, almost as well as if it had been immediately grafted on the forementioned layers, and will cause the Trees to bear sooner, more and better fruits."

If the interstock is 5 or 6 inches or more in length a satisfactory dwarf tree is produced Another method now used by some nurserymen is to graft the dwarfing scion on a short nurse-root, bud the scion high and plant the graft deep so that the dwarfing interstock is 8-12 inches below the surface of the soil. The nurse-root will sustain the graft until the buried interstock strikes root. The nurse-root can be removed when the tree is set in the orchard or it can be retained as an anchor for the more feeble Malling VIII or IX root system.

Our experiments indicate that a greater dwarfing effect of Malling IX is attained if the dwarfing stem extends at least a foot above the ground, and for maximum dwarfing of the nurse-root interstock it may be advisable to have it extend nearly a foot below, and about a foot above, the ground level when set in the orchard

Interstocks can also be used as compatibility bridges to permit certain fruit varieties to be grown on a root system which is incompatible if grafted directly. The compatibility bridge has long been used in grafting pears on quince Some pear varieties, such as Bartlett and Bosc, are incompatible when grafted directly on quince rootstocks, so the quince is first grafted or budded with a compatible variety, such as Beurre Hardy, and the Beurre Hardy stem is then budded with Bartlett or Bosc.

The use of the compatibility bridge is an ancient art and was first described by John Parkinson in 1629 as follows: "The green and the yellow Nectorin will thrive best to be grafted immediately on a plumme stock, but the other two sorts of red Nectorin must not be immediately grafted on the plumme stock, the nature of these Nectorins being found by experience to be so contrary to the plumme stocks that it will starve it, and both dye within a year, two or three at most."

The compatibility bridge can be a useful technique in producing dwarf trees. We have used it to produce dwarf apricot trees and it may be of value in dwarfing pear trees. We have been unable to bud the apricot on *P. tomentosa,* but by using a peach or *P. triloba* interstock, the apricot can be grown on Nanking cherry rootstocks. The Stella apricot on *P. tomentosa* roots made a very dwarf tree less than four feet tall and flowered heavily at the age of three years. The variety Minn.

604 made much more growth, but it too flowered and fruited heavily at three years.

Perhaps the most versatile bridging interstock is *Pyronia veitchi,* a cross between *Cydonia* and *Pyrus.* It is compatible with apple, pear, hawthorn and probably with other genera of the *Pomoideae.* We have used *Pyronia* as an interstock to grow pears on apple rootstocks and apples on pear or hawthorn rootstocks. Pears can be budded on some apple rootstocks, but the graft union with *M. sikkimensis* seedlings was poor and, although the tree fruited early, the fruits were very small. If, however, the *Malus sikkimensis* seedling is budded with *Pyronia* and the *Pyronia* stem budded with pear, the pear, although dwarfed, produces normal fruit at an early age. We have budded East Malling IX rootstocks and interstocks with *Cydonia* to see if dwarfing apple rootstocks and interstocks can be used to dwarf pears

Other techniques for dwarfing trees and the induction of earlier fruiting have long been used. The earliest technique for promoting fruit development was the girdling of the bark of fruit trees and vines. This method was used by the early Romans, and in the case of the grape it dates back to about 2000 B.C. in Egypt. It was described by John Williams of England in 1820 as follows: "At the end of July and the beginning of August, I took annular excisions of bark from the trunk of several of my vines, and that the alburnum might be again covered with new bark by the end of autumn, the removed circles were made rather less than a quarter of an inch in width . . . In every case in which circles of bark were removed, I invariably found that the fruit not only ripened earlier, but the berries were considerably larger than usual, and more highly flavored." This technique is a common practice in the vineyards of southern Europe and California.

Girdling of the bark is also used to promote earlier fruiting of apple trees Usually, however, the exposed wood is immediately covered with tape so that a new bark will develop directly from the exposed surface of the wood, thus insuring the survival of the tree even though the girdle may be too wide to be covered by proliferation of the bark above and below the girdled stem. Another method of stimulating fruit production is "scoring" the bark of the trunk or branches of the young tree Both girdling and scoring should be done before the initiation of fruit buds for the following year, which in our area is late June to early July for apples. Girdling checks phloem transport for about a month, but scoring is effective for only about two weeks, so that the scoring technique has to be timed more closely. It is also advisable to girdle or score in a long spiral to reduce the weakening of the branch and possible breakage in high winds.

A more permanent method of dwarfing trees is bark inversion. This is a relatively new method which was first described by R. H. Roberts of Wisconsin in 1935. A complete ring of bark several inches long is removed from the branch or trunk of the young tree and replaced in an inverted position., It is then bound tightly with a rubber band until the inverted bark is united with the wood — a period of ten days to two weeks. Bark inversions on the trunks of young apple trees, when done in mid or late June, almost invariably result in flower and fruit production the following year. We have inverted bark of one and two years old apples and induced fruit production the second or third year.

It is better, however, to wait until the tree is three or four years old before inverting the bark so that the tree is large enough to carry the fruit. The later inversion also results in a more permanent effect. A new bark is formed from the underlying wood at the vertical seam and this bark is normally polarized. As a result organic nutrients pass down this new bark readily and it grows so rapidly that it soon offsets the effect of the inverted ring of bark on the younger tree, and the dwarfing effect is lost. On older trees the ratio of inverted bark is larger and the regenerated bark at the seam is not able to take over normal transport for several years In the meantime the induced heavy fruiting tends to check vegetative growth. But the effect is temporary and after a few years new inversions on the trunk or on the branches are needed to keep the tree dwarfed. Even a double inversion, with the vertical seams on opposite sides of the tree, is not permanent in its effect because the regeneration tissue between the inversions permits lateral diffusion followed by lateral orientation of phloem and xylem in this area. Other tricks are being tried to make the bark inversion technique more permanent.

Another method of dwarfing trees was used by the early horticulturists of Europe. They bent the branches in a horizontal plane, and tied knots in the branches to check growth and induce fruiting. Seven years ago we tied knots in the stems of young seedlings of *Malus sikkimensis*. These trees are now only half the size of the control seedlings which were not knotted, but knotting did not promote earlier fruiting. We also knotted *M. sikkimensis* seedlings and budded McIntosh above the knot. These trees were also dwarfed and fruited earlier than McIntosh budded on normal *M. sikkimensis* seedlings. The stem at the knot has grown together and the ultimate fate and performance of such trees is not known.

Why do dwarfing stocks, girdling, bark inversion and knotting of the trunk curtail vegetative growth and promote earlier flowering of fruit trees? Thomas Andrew Knight, for many years the president of the London Horticultural Society, had the answer in 1820, when he wrote as follows: "The true sap of trees is wholly generated in the leaves, from which it descends through their bark to the extremities of the roots, depositing in its course the matter which is successively added to the tree, whilst whatever portion of such sap is not thus expended sinks into the alburnum and joins the ascending current, to which it communicates powers not possessed by the recently absorbed fluid When the course of the descending sap is intercepted, that necessarily stagnates, and accumulates above the decorticated space, whence it is repulsed and carried upwards, to be expended in an increased production of blossoms and of fruit."

Knight had observed the swelling of the trunk above the girdle and the swelling of the dwarfing rootstock below the graft union. This swelling he attributed to the checking of the downward flow of the nutrient sap in the bark. His conclusion has been confirmed by the use of radioactive tracers. A solution of radioactive phosphorous was fed into the petiole of a leaf on the upper branch of an apple tree dwarfed by an East Malling interstock, and of an apple tree dwarfed by a double bark inversion In one case the radioactive concentration in the trunk of the tree was measured with a Geiger counter several days after treatment. In the other tree the radioactive concentration was measured by making autoradiographs of the sectioned trunk. In the bark inversion tree the radioactive phosphorous was concentrated at the upper end of the inversion and in the dwarfing interstock tree it was concentrated in the East Malling IV interstock In both cases the radioactive tracer was carried through the blocked region, but was diminished in amount below the inversion or the dwarfing interstock. This test was done by Alan Dickson and Ed Samuels, Harvard graduate students, financed by Stark Brothers Nurseries.

Another graduate student, Stanley Berg, confirmed Knight's conclusion that the accumulated sap is carried upward "to be expended in an increased production of blossoms and of fruit." Chemical tests made several weeks after a bark inversion showed that the leaves contained several times as much soluble carbohydrate as the leaves of the control trees.

That the reduced vegetative growth and the induction of earlier flowering is due to the accumulation of organic nutrients in the top of the tree, and not to the starvation of the root system, is proved by the fact that a bark inversion on a single branch will cause that branch to check its growth and produce fruit, while the untreated branches will continue to grow vigorously and remain unfruitful

The knotting of the stem also checks the downward flow of nutrient sap as is shown by radioactive tracer tests, but not as effectively as a dwarfing interstock or inverted ring of bark. The induction of fruiting by bending the branches in a horizontal position was attributed by Knight to the "stagnation" of the nutrient sap, but we have not yet been able to confirm this conclusion by radioactive tracer tests

The horticulturist does not need to be convinced that horticulture is both an art and a science, and that both are essential for future progress. Most horticulturists also realize the pleasures of working with living trees and would agree with Professor Sorokin, emeritus professor of sociology at Harvard University. In describing his azalea garden in a recent issue of *Horticulture,* he wrote: "I firmly believe that in our magolopolitan and super-industrial civilization, gardening is one of the noblest and most effective methods for moral and mental educaton, for keeping the equanimity and peace of mind, and for curing most of the physchoneuroses of modern man" But this idea is not new either William Langford in his book "The Practical Planter" published in England in 1681, wrote as follows: "When thou goest to work by these directions, then as a good Christian, observe the Characters of Divine Wisdom, Power, and Goodness, that thou shalt everywhere meet with in this ingenious and beneficial employment" and concluded with a quotation from Eccliastics 9: 7 — "Go thy way, eat thy bread with joy, and drink thy wine with a merry heart, for God now accepteth thy works."

PRESIDENT VANDERBROOK: Thank you, Dr. Sax, for your interesting talk and report on your most specialized work. If there are any questions the audience would like to ask Dr Sax, we will take a few minutes for them.

MR. WILLIAM BURTON (Burton's Hill Top Nurseries, Casstown, Ohio): Dr. Sax, would a bark inversion help initiate blooming on a wisteria?

DR. SAX: We tried that and it didn't work. I don't know just why. The wisteria bark is awfully thick and awfully tough. It doesn't seem to like to go back on too well, and is somewhat corrugated underneath.

MR. ENGELMANN: I would like to ask if plants which have been treated with Colchicine are more difficult to root. In Boskoop, Holland they tried to get a smaller sized flowering clematis with Colchicine. They got it but they can't propagate any more.

DR. SAX: The Arnold Giant, the original tetraploid is definitely more difficult to root than the diploid parent, but it isn't impossible to propagate The triploid is very easily rooted, but we have had a little trouble with this tetraploid.

MR. WILLIAM COLE: I just wondered how you can protect the bark inversions from drying out.

DR. SAX: We use a special rubber budding band about an inch wide. You bind it tight to cover all the exposed edges of the inversion so it won't dry out. After ten days, the bark heals on and one can remove the rubber band I think it might be well to leave it covered more loosely with some protective covering or painted with a mixture such as Chlordane in lanolin The borers seem to like this soft growth which develops following a bark inversion

MR. COLE: I thought you might be interested in knowing we used some of these inversions on a lot of Red maples and the graft union was so weak after the second or third year they blew off or fell off when you touched them.

DR SAX: That is likely to happen with a lot of these wide hybrids. There are all sorts of things that prevent good compatibility. One is the imperfect graft union Others are an interaction between the stock and scion and still others result from an excessive check on phloem transport. It isn't a simple problem at all. What the nurserymen do with *Prunus besseyi* or *tomentosa,* is treat them rough at digging time. If you treat them rough at digging time you are likely to weed out the weak sisters.

MR. C. H. HENNING (Niagara Falls, Ont.): I would like to ask Doctor Sax if he has used the bark inversions on mature trees at time of blooming. We have semi-circled flowering crabs and we removed strips of bark a quarter of an inch to half an inch wide, and did not cover them with tape We used a tree wound paint and completely covered the area. It took several years for the cambium to unite.

DR. SAX: In that method of girdling, the wound should heal-over before the end of that season, or you are likely to have trouble. That is a very old trick In England, they usually cover it with tape. Instead of covering with tape we just wipe it with lanolin. It is a good deal easier than putting the tape on it. The effect of this method is, I think, a little more temporary and it is possibly a little more dangerous than the bark inversion, but it is less work

What we are playing with now is simply scoring. If we score at the right time it is easy to make a diagonal cut, or spiral around the tree We had a little Burmese boy this summer who found that it takes two or three weeks to regenerate a new connecting tissue in the new bark following cutting with a knife. I suspect if that is done at the critical time before blossom bud initiation, which with us would be about the 15th or 20th of June, that it would throw the tree into bearing It is even more temporary than the narrow girdle. The Chinese have used that for a long, long time

One of my colleagues who is a bamboo expert, and has spent most of his life in China, said the Chinese commonly used to cut a spiral around the tree to get the thing to flower That would be a lot simpler than these other methods.

PRESIDENT VANDERBROOK: If there are no other questions for Dr Sax, Mr. Harvey Gray has some slides he would like to discuss a moment

(Editor's Note· Mr. Gray supplemented his discussion with a series of six color slides.)

MR. GRAY: I would like to mention a technique which might be related to the subject of structures for aiding the rooting of cuttings. In the rooting and growing of the Kurume azaleas, it is common in our section of the country, Long Island, to place the cuttings quite close together in the rooting bench Upon rooting, they are lifted and carried on through the winter in the greenhouse in order to get some top growth so the plant will come along at a more rapid rate. It occurred to me through the use of the plastic we could eliminate this moving and cut the costs of the whole operation.

The greenhouses in such a growing establishment are usually empty at this season of the year. With that thought in mind, the media that was selected was sphagnum moss peat. The bench was lined on the bottom and sides with plastic. Onto that plastic we placed the sphagnum peat moistened to the degree that it will lose only a few drops of water on the application of pressure. Then the cuttings are set at a spacing similar to that used in transplanting.

A "bird cage" made of wire netting is then set in position over the bench and the plastic is brought over the top and held securely in place with a water seal over the top When the cuttings are rooted the plastic is pulled back slowly and finally the wire cage is removed Remember the plastic is underneath and therefore they will need a little drainage now. They are not watered up to this point, other than the initial watering. Now that the bed is open to evaporation, water is required from time to time, and the plastic on the bottom of the bench must be cut away with a knife. We would cut down through to the bottom of the peat to sever the plastic in numerous places to accommodate seepage. The medium should be fertilized to encourage root and top growth.

PRESIDENT VANDERBROOK: Are there any questions you would like to ask Mr. Gray about this illustration? If not, we are adjourned.

The session recessed at 12:00 noon.