THURSDAY AFTERNOON SESSION

December 4, 1969

The afternoon session convened at 1:45 p.m. in the East Ballroom with Joe Cesarini serving as Moderator for the first section on *Propagation Techniques* and John Newhouse as Moderator for the second section on *Nutrition and Plant Growth.*

CHARLEY HESS: Before we begin this afternoon's program, I would like to recognize two Western Region members who were overlooked in the introductions this morning — Warren Berg and Ted Van Veen. Would you gentlemen please stand and be recognized? Thank you. We also have with us eight students from the Department of Horticulture at Niagara College, St. Catherines, Ontario who are accompanied by two of their instructors, Roger Gunthorpe and Ray Forester. Would you gentlemen stand and be recognized? Thank you. This afternoon's program is divided into two sections; the first, on propagation techniques, will have our old friend, Joe Cesarini, serving as Moderator.

MODERATOR CESARINI: Thank you, Charley. Our first speaker for this session on propagation techniques is an old friend of ours who really doesn't need an introduction, Mr. Al Fordham of Arnold Arboretum, who will talk to us on the production of juvenile shoots from root pieces.

PRODUCTION OF JUVENILE SHOOTS FROM ROOT PIECES

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Physiological juvenility in plants has long been recognized and much has been published concerning it. Through the years a number of articles have appeared in the Proceedings of this society describing juvenility and its importance to the plant propagator.

When plants are grown from seeds, characteristics which appear on the young seedlings often differ greatly from those which are found later in the plant's life. In the case of pines, the first or juvenile shoots are gradually replaced by mature growth. This slide showing seedlings of *Pinus canariensis* illustrates the transition from the juvenile to the mature stage. The presence of juvenility at the lower portions of the plants is indicated by pliable stems bearing solitary leaves which are bluish-green in color and are of soft texture. Evidence of maturity is manifested in the upper portions by leaves that are borne in bundles of three, are grassy-green and of firm texture. The interval between the advent of maturity and time of flowering and fruiting has been termed the "adolescent phase." These stages represent the normal course of events in the development of conifers.

However, in some conifers, particularly in the genera *Chamaecyparis* and *Thuja,* the juvenile to adult transition may fail to take place and some plants remain in the juvenile phase. These have been termed "fixed juveniles." An outstanding example of how firmly fixed they can become is shown by this specimen of *Chaamaecyparis pisifera* 'Squarrosa' the Moss cypress growing at the Arnold Arboretum. It was set out in 1894 and has remained juvenile for over 75 years. Although fixed juveniles are usually dwarf in character, this one attains large size. Nearby is a specimen of the species, *C. pisifera,* planted in 1891; there is little difference in stature. Plants which become fixed juveniles also retain a trait associated with the seedling stage — the ability of cuttings to root readily.

Juveniles do not ordinarily flower and fruit, for the morphology which involves reproduction is associated with maturity. However, a fruiting tree of Moss cypress was discovered near Newport, Rhode Island, when our society met there. Seeds were germinated and the ensuing seedling population is of special interest. Eighty-seven plants are now about 2 to 3 feet tall. Forty-eight resemble the species (*Chamaecyparis pisifera*) ; twenty-two are juvenile, similar to the parent; four resemble *C. pisifera* 'Filifera', and thirteen resemble *C. pisifera* 'Plumosa'. The latter three are cultivars which were described during the last century.

Juvenile Shoots from Root Sections

Shoots that arise from roots are physiologically juvenile and will frequently root when made into cuttings despite the fact that stem cuttings from the parent plants will not. In 1967 while visiting Professor Elwyn M. Meader of Rochester, New Hampshire, we viewed two trees of *Picrasma quassioides,* the Korean Butter tree, which had been raised from seeds collected by him near Seoul, Korea. This rare tree was not present in the collection at the Arnold Arboretum so we were anxious to acquire it. His trees had not produced seeds and the question of how it should be propagated arose. *Picrasma* is a close relative of *Ailanthus* which propagates by root cuttings so it was decided to try that method. Professor Meader provided root sections which on November 14th were placed horizontally in flats of sandy soil and covered to a depth of one-half inch. By December 28th shoots started to appear and when large enough they were harvested and inserted as cuttings. Further shoots developed and they too were taken. Production of shoots has now continued for two years, and 86 have arisen from eight relatively small root pieces. It is astonishing that food reserves in the roots have been sufficient to support this activity for such a period of time. A crop of shoots is presently on the roots and it has been decided to let them remain and function in an effort to replenish food supplies. When they go dormant the flat will be transferred to our cold storage unit and later returned to the greenhouse. It will be of interest to see how long the production of shoots will continue.

Leaves on mature trees of *Picrasma* are pinnate—yet the first leaves which appeared on the shoots were trifoliate as is the case with newly germinated seedlings, and this would be evidence of juvenility. It should be added that when propagated under mist the cuttings showed leaching and some defoliated. Of these, many produced new leaves and later rooted. Under polyethylene plastic they rooted well.

Several years ago we conducted an experimental project to test the feasibility of producing juvenile shoots from roots in quantity. Root sections of large size were collected from a 47 year old tree of *Albizia julibrissin* and placed in flats as described above. This procedure worked well and from three root pieces one inch in diameter and 5 to 12 inches long a first crop of 52 shoots was obtained. The root pieces exhibited polarity and masses of shoots tended to develop near the proximal ends. Had the 12-inch piece been divided into two pieces, its shoot production might have been doubled.

Leaves on the *Albizia* shoots showed no evidence of juvenility — they were bipinnate as is typical of mature trees. But juvenility was present, for the cuttings rooted in eleven days even though stem cuttings from the parent plant cannot be rooted. Large root pieces of *Albizia* will also continue to produce juvenile shoots for at least 2 years.

Elliottia racemosa, the Georgia Plume, has presented propagation problems and despite the fact it was discovered over 160 years ago, it has remained rare in cultivation. Sound seed production is sparse and the seeds have proven difficult to germinate. At the Arnold Arboretum repeated attempts were made to root stem cuttings of *Elliottia* by using a variety of timings and an assortment of root-inducing substances, but with little success. The next effort was to test whether or not root pieces would produce multiple shoots. Root pieces were treated as previously described and in 26 days shoots began to appear. Polarity was again evident and clusters of shoots developed at the root ends which had been closest to the tree. Leaves on the shoots resembled those of the parent plant but evidence of juvenility was indicated by the fact that all cuttings which were taken rooted and did so quickly.

It seems reasonable to suppose that the juvenile factor would be present in all shoots that arise from roots and therefore they would root readily as cuttings. When dealing with plants such as *Albizia,* masses of easily-rooted shoots develop and provide a means by which stock can be propagated quickly. However, before collecting roots for this purpose one should make certain the plant is on its own roots and that it is not a periclinal chimera. Instances have been reported where periclinal chimeras have not duplicated the parent plant when roots have been used for propagation.

LITERATURE CITED

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MODERATOR CESARINI: Thank you, Mr. Fordham for a very informative talk. Our next speaker also needs no introduction to us because he is a past-president and is well known to all of us — Mr. Vince Bailey. Mr. Bailey is going to tell us how to root softwood cuttings outdoors.

OUTDOOR SOFTWOOD CUTTING PROPAGATION

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I should like to introduce the subject, "Outdoor Softwood Cutting Propagation", with a discussion of the need for something other than the conventional method in the greenhouse although your results, and ours at Bailey's, have been very satisfactory with various types of mist.

The past 15 or 18 years have produced many variations of the use of mist propagation systems. Many of you here have heard a number of them described and no doubt have used one or more of them. We, at Bailey's, are very happy with a circular bed. My nephew, Rodney Bailey, discussed this with you two years ago. We are even more sold on the system now.

All of us are familiar with the fine stands obtained with many varieties when greenhouses are used. You are all familiar with the cost of building a greenhouse as well as the rather high maintenance cost. We need a reason for considering going to any other method. The reason we at Bailey's have adopted the outdoor method is purely a matter of economics. We are producing a quality liner at a greatly reduced cost by getting away from the high capital investment.

We have tried a number of methods the past few years to reduce the overall costs of producing liners from softwoods. You are all familiar with the development of root-promoting hormones, which are a great help. Cheesecloth and other similar materials have been tried and I am sure are still used by some. At Bailey's we adopted the open area with misting, or rather a fine spray, as a partial substitute or supplement to the greenhouse. The greenhouses are still used to full capacity, but the open, outside, method is used for further expansion.

The description of our method is as follows: The area is plowed and worked smooth with a disc and harrow. We are now ready to make the beds. With a dump truck and a Melrose