method by which the Eastern Region recognizes the contribution of individual members within the Society. This is appreciation for excellent research shared with members, or for a commercial propagator who shared a technique to increase the rooting success with a particular plant. The appreciation is also acknowledgement of service. The timeless extra hours that few people are aware of, such as, committee assignments, a phone call to help a fellow propagator with a serious immediate problem, and the willingness to do what needs to be done at that time.

Tonight we are all honored to be a part of a happy and joyous moment to share this prestigious award with two gentlemen this evening. For the benefit of our guests, our Society is a harmonious blend of the academic and commercial. Coincidentally this evening our two recipients also reflect this blending. It is unique in the history of our Society that two awards are shared with two segments of our organization.

I am proud to present this highest honor we have to two loyal devoted Society members tonight. To avoid confusion I am proceeding in an alphabetical order and promise just a few words. The first gentlemen I would ask to come forward is a person who has done unique and inspiring deeds for the Society. He is only the second person to serve two terms as president of the Eastern Region, the other being Jim Wells! He is also the only person to have served two terms as president of the International Board. He is dedicated, intelligent, caring, and also a close friend. Larry Carville, Tolland, Connecticut — would you come forward please?

The second recipient is also a past president of the Eastern Region. He has spent his life teaching and watching former students grow in the industry. Dr. John McGuire — will you please come up?

Friday Morning, December 17, 1982

Leonard Stoltz served as moderator of the morning session

CONSTRUCTING AND MAINTAINING DISEASE-FREE PROPAGATION STRUCTURES

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The intent of this paper is to assist propagators of woody plants in designing propagation facilities, correcting problems in existing facilities, and to point out correctable situations that may involve disease problems. The views are not those of a pathologist, but those from a profitable production nursery. The ideal propagating conditions are hospital and laboratory sterile standards; however, one must be practical and profitable, which may require making reasonable compromises. Emphasis is placed on preventive measures, not cures by the continuous use of fungicides or other remedies applied on the cuttings or plants after troubles have started. Difficult propagating subjects are not avoided, but are a major part of the production schedule.

The use of fungicides on cuttings is rarely necessary if growers select designs, materials, and methods which prevent diseases from becoming established and provide conditions that both stimulate cuttings to root rapidly and support root growth. The propagation structure should be low cost, low in maintenance and designed to produce as many crops as possible. The systems should approach full automation. As a test, any propagation facility that can not be closed and locked for one full week is not very efficient. This does not mean that propagation facilities should not be checked regularly for mechanical failure or power outages.

Wood Structures. Wood structures and propagation benches should be constructed of decay resistant materials. Treated white cedar, fir, or good grades of pine are equally good as cypress or redwood lumber and much less costly. Copper-base wood preservatives, used as a dip or painted on, make home treatment of lumber economically feasible, especially if the wood preservative is purchased in quantity by the drum. Thirty years of constant use with propagation facilities has proven the effectiveness of wood preservatives, Propagation beds over 25 years old, that have never been dry since being built, are still sound.

In addition to protecting the wood from decaying organisms, copper-base wood preservatives also serve as a permanent fungicide. These preservatives are not toxic to plants. For maximum uptake, water-base wood preservatives (1) should be used only on seasoned dry wood. It may be used on wet or green wood, but it is less effective. Water soluble copper-base wood preservatives are less costly and have proved to be equivalent to petroleum solvent copper-base materials. The availability of pressure treated lumber may eliminate the need to treat your own. It should be noted that in addition to excessive cost, the producers do not claim fungicidal benefits, any longer life expectancy or non-toxicity to plants.

Metal parts. All structural metals, not galvanized, including the plumbing and heating materials should be painted with metal primers containing iron oxide and zinc chromate to inhibit rust. Like copper-base wood preservatives, these primers are also effective long-term fungicides. Do not apply enamel paint over primed metals, because it will defeat the fungicidal effect of the primer. All nails, screws, and bolts used in construction should be galvanized or made of brass.

Walks. Poured concrete, wood, stone chip, or gravel walks often create physical hazards, maintenance and disease problems. Porous building block, 8″ × 8″ × 16″, laid dry on a coarse sand or pea gravel base make a safe permanent walkway that will not accumulate water. The blocks may serve as an edging for ground beds, especially if under elevated propagating or growing beds. If the need to control algae on these block walkways should develop, sprinkle or spray copper sulphate solution annually, preferably at the start of warm weather. Because of the porous characteristic of the block, the surface normally remains dry, making it difficult for algae to develop, thus providing a safe skid-proof surface.

Propagation bed drainage. Poor rooting and stem decay can often be attributed to poor drainage through the bottom of the propagation beds. These beds should be so constructed that gravitational free water from either automatic misting or from hand watering can flow freely though the bottom. Six inch wide boards arranged crossways in the bottom of the bed should be spaced one inch or more apart. A ⅛ in. mesh galvanized hardware cloth should be placed over the boards to retain the propagating medium without interfering with drainage. The life expectancy of the hardware cloth is 5 to 10 years, depending on the mineral content of the water. Design the width of the propagation beds to accommodate the width of the hardware cloth to minimize having to cut the wire, thus exposing sharp ends. A few strategically placed staples may be needed to keep the hardware cloth in place before covering with medium.

Propagation bed depth. Because automatic misting often applies more or less water than needed, the side boards of the propagation beds should be over 6 inches high, so as to accommodate at least 6 inches of medium. Compensation is made for irregularities in the misting pattern due to foreign substances or slight imperfections in the misting nozzles. This increases stability to the moisture content of the medium. A slight reserve area of moisture is held at the lower depth of the medium, which may be withdrawn by capillary action to stabilize dry spots. This reserve area in a deep bed is low enough so as not to endanger the cuttings. When using a deep medium, should the ground beds below the propagation beds be used, near non-drip conditions may be maintained by careful adjustment of the misting system.

Automatic misting. Minimum operational cost and maximum efficiency in a propagation house means use of automatic misting. A well designed and programed system can exceed the best that can be or will be done by hand watering. This reduces the probability of plant diseases. The spacing and height of misting nozzles is critical, if mist is to be applied uniformly. Before purchasing misting nozzles, it is important to know your water pressure and pressure fluctuations. Suppliers charts are available. Adjustable oil burner type brass nozzles with stainless steel inserts and on-off valves under each nozzle provide flexibility, near uniform misting, and minimum maintenance problems. Mounting these nozzles on vertical standpipes, at least ½ in. diameter, from feed lines, ¾ in. diameter or larger, located on the floor of the beds, makes for a trouble free system. All feed lines should be of sufficient size to maintain equal pressure at the extremities of the system.

All feed lines should have fine screen filters incorporated with the electric control valves and with each nozzle. The smallest amount of grit or foreign matter may distort the mist pattern giving a source of wet or dry spots. Copper piping is more trouble-free than galvanized. Deep well water is preferred to surface pond or stream water. Grit particles and disease contaminated waters may be avoided.

Timing controls for misting. With automatic misting, two types of timing controls are advisable. For summer softwood cuttings, a one-second interval, variable adjustment time clock is recommended. During autumn, winter and spring when firmwood cuttings are propagated, a humidity control system is adequate. Both of these mist control systems should be wired in series with a 24 hour time clock and the two systems made switchable. The humidity control system may be needed only for 4 to 6 hours during some winter months, while the 1-sec. clock may be fully activated 12 to 14 hours during high temperature summer months (2).

Automatic ventilation. Ventilation in propagation houses is extremely critical, especially for summer softwood cuttings. An uniform non-dehydrating system in a propagation facility may be achieved by using a vacuum exhausted (negative pressure) system. (3) Outside ambient air is brought into the building and uniformly distributed through large punched airtubes and exhausted gently with large slow speed fans. This type of ventilation has very low dehydration, is easily installed, does not require special equipment, requires low maintenance, and has a low operating cost. All ventilation should be controlled by a thermostat, in series with a 24 hr. time clock, to prevent the exhaust fans from running continuously on hot summer nights.

Timing coordination for misting and ventilation. Foliage diseases, especially on softwood cuttings in summer, may be reduced by coordination of the late day, cut-off time of the misting and ventilation systems. If several night hours of the 24 hour daily cycle can be without moisture on the foliage, leaf disease may be reduced. Timing the mist system to cut off 15 to 60 minutes before the ventilation system turns off is usually adequate. Determination by trial is necessary, since local conditions, equipment, and buildings are variable. The misting should turn on shortly before the ventilation in the mornings.

Rooting media. One of the more controversial subjects in propagation is the selection of the rooting medium. Required is a material that is light, easily handled, low cost, has a middle limit for passing and retaining moisture but coarse enough to exchange gases, offers physical support, is sterile, and compatible with all plant families. After trying 30 to 40 materials or combinations, dustless perlite has been my material for nearly 35 years. The use of perlite made it possible and practical to go to automated control. In processing, perlite is heated to 3300°F, therefore is more sterile than most materials available. There is no need to use it for long periods, since it has high salvage value as a mulch in growing areas until contaminated and then may be combined into the potting soil mixtures before fumigation.

Crowding in the propagation bed. Crowding in the cutting bed is a frequent source of plant disease problems. Cuttings having large leaves may have the outer ends of the leaves reduced up to 50% without deleterious effects. This may allow up to 50% increase in count. Using light wooded small cuttings to increase count is a fallacy.

Shading. Excessive shading may also contribute to plant diseases. Flame proof polypropylene net shading, preferably about 50% shading, placed on the outside will be needed from April to October. Any shading during the winter is unnecessary and may be detrimental at times. Sprayed shading compound lacks uniform density and is difficult to schedule a programed removal. Additional short term spot shading on new cuttings may be made by using light weight open weave (Dutch type) burlap, placed directly on the cuttings and kept moist by the misting system until acclimated.

Sanitation and fumigation. Work areas and equipment may be cleaned by using a chlorine laundry bleach solution.

Soil mixes for potting cuttings and seedlings and for seed sowing may be sterilized inexpensively and safely with methyl bromide gas in pressure containers. A dump truck with a tight bed makes an excellent inexpensive portable versatile fumigation chamber. If well sealed, porous potting mixtures may be fumigated to a depth of 30 inches by increasing the normal dosage rate by 100 to 150%, based on the density of the mixture. This is not practical and not recommended for large quantity operations, such as for container potting mixtures.

Heating propagation structures. Heating since the energy crisis is an extremely controversial subject that does have a bearing on disease control. The ideal conditions for rooting firmwood broadleaf and coniferous cuttings in the cold season is a *medium 10°F warmer than the overhead temperature.* Hot water fin radiation immediately under the beds provides this condition as well as gives the most constant non-fluctuating temperatures. Extremely varying temperatures retard rooting and also encourage development of foliage diseases, especially when the thermostats call for no ventilation to reduce the condensation.

Automatic controls. Controls for heating, ventilation, misting, lighting, and security should be near to or in the area being controlled. Automatic controls make the need for a central control panel obsolete with their only function to impress the uniformed. Central control panels increase line resistance, make trouble shooting difficult, increase installation and maintenance costs, and can prolong downtime.

I have discussed many subjects that you may consider to have no bearing on propagation disease problems. These suggested methods have produced, however, a propagation environment that has required no use of fungicides on the cuttings or plants for over two decades.

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MICHAEL DODGE: Are your houses oriented north-south?

CARL ORNDORFF: Yes.

TOM McCLOUD: Have you ever had a problem with snow load on your houses?

CARL ORNDORFF: The slope is 1 in. per foot. On one end we have had snow drifts 4 ft. deep. The fiberglass sagged a little, however no structural problems developed. The other end is swept clean by the wind.

ORNAMENTAL PLANT PROPAGATION IN JAPAN

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Japanese nurseries are among the best places in the world to observe a great diversity of cultivated plant species and variants, but they are much less rewarding for those who are intent on broadening their knowledge of propagation techniques. In Japan even the most prosperous nurseries rely on propagation techniques which many American nurserymen would consider primitive, inefficient, or inappropriate. When we do find imaginative propagation techniques in Japan we often observe them among hobbyists or in small, specialized nurseries, and then used to create a certain aesthetic effect rather than as a means for what we consider efficient production. It would surprise no one here to see pines grafted in Japan, but the Japanese practice of grafting scions of *Pinus parviflora* on stock of *P. thunbergiana* to combine the distinctive foliage of the former with the handsome bark of the latter might strike some of us as an excessive effort for an aesthetic effect.

The use of grafting to produce a pot of *Pereskia* with a dozen or more kinds of assorted cactus appended to its branches or to add branches at strategic points on the trunks of imperfect bonsai takes the use of grafting well beyond the point to which most American nurserymen are willing to go to make a sale. Yet examples of this kind of effort can be found in almost any ordinary nursery or garden center. The situation in Japan is often the reverse of the situation here where large aggressive nurseries are frequently in the forefront in the development and application of novel propagation techniques. This difference is a reflection of many of the fundamental differences between the Japanese and American approaches to ornamental horticulture and nursery production.

A basic feature of Japanese nursery production which has a strong effect on the choice of propagation techniques is the relatively small demand for plants for garden use as we perceive it in the West. Few families in Japan own more than a