and brown and finally died. Most of the cuttings grew and rooted well. I was since told that some of the plants from which I collected my cuttings had stood in water Whether this caused the yellowing and death of the cuttings, I do not know.

DR. NELSON.: Mr. Hoogendoorn wanted to know if the *Taxus* leached or turned yellow and whether it was persistent.

In practically all instances we had yellowing of *Taxus* under mist, whether in the winter time or in the summer In 1957 and 1958 we had less trouble with leaching or chlorosis in the greenhouse, since we were shading.

We tried various treatments this year and found that where we supplied short days or shade, we did not get the chlorophyll killing or yellowing. The cuttings were actually greener I think at the end of the season than when they were put in. Now, short days are not necessary in this case, since shade is enough to stop this chlorosis The yellowing persists only in that portion which is affected and fortunately the new growth that comes out is green again. I have never seen any material where the yellow portion has ever turned green again..

(*Editor's Note*: The membership recessed for a period of ten minutes and then resumed the session.)

MODERATOR FILLMORE: We have heard a discussion this afternoon on the rooting of conifers under intermittent mist. The rooting of conifers by any method is a matter of interest to everyone in this group. Rooting under plastic is one of the newer techniques and to discuss this general subject we have Hugh Steavenson of the Forrest Keeling Nursery, Elsberry, Missouri. Hugh will discuss the "Propagation of *Juniperus* and *Taxus* in a Closed Plastic House" Mr. Steavenson.

Mr. Steavenson presented his prepared paper on the use of the closed plastic house as a propagating facility for evergreen cuttings. (Applause)

PROPAGATING TAXUS AND JUNIPERUS IN A CLOSED PLASTIC HOUSE

HUGH STEAVENSON
Forrest Keeling Nursery
Elsberry, Missouri

This is a very simple type of propagating structure and procedure, especially suited to folks like ourselves who have a bewildering array of other production and sales problems to worry about.

The system is essentially a cold frame type rooting procedure with provision to permit the rooted cuttings to grow on and develop a full season without disturbance.

Initially, let me say that just about every idea that we have incorporated in this procedure has been borrowed from other members of the Plant Propagators Society I want to mention Harvey Gray, in particular. A few years ago I took rather vociferous exception to Harvey's poly tent device because of the problems which existed under my par-

ticular set of conditions. A year or two later Harvey got me straightened out and we have had good success ever since by applying his principles. You can, of course, see in our procedure ideas lifted liberally from Templeton, Wells, Fillmore, Coggeshall, Hancock, Van Hof and many other members.

THE STRUCTURE

The structure makes use of the simplest sort of gable frame construction and is 16 feet wide to allow for two ground "benches" 7 feet wide, with a center 2 foot path. Although the structure can be any length, ours happens to be 172 feet, which accommodates 100,000 cuttings The foundation is made from 5 inch creosoted posts which are sunk 4 feet in the ground. All wood members, including trusses, plates, ridge and side boards, are pressure penta treated. (Just a word of caution on penta or creosote treated wood, be sure such members are thoroughly "baked out" over an entire summer before enclosing with plastic. If this can't be done it would be better to use heart redwood or cypress.) It is a very rigid frame which will withstand any gale and which should prove resistant to decay and termites for at least 20 years. No doubt it will be obsolete long before them. In fact it already is. Since viewing the Quonset-type structure originally developed, I believe, by Cunnigham at Waldron, Indiana, I do believe it is an improvement over our own.

Actually, I do not think that it is possible to build a durable structure more economically than our own. It is down to about 50c per square foot, ready to go. The Quonset salesmen have me convinced that they can apply and remove polyethylene sheets at a considerably greater saving than I can. We spend too much time each spring and fall performing this operation. High on our windy hill we find we have to batten down the polyethylene at about two foot intervals to make it gale-proof The Quonset engineers claim this isn't necessary and I hope they know what they are talking about.

We use a double layer of polyethylene separated by battens, with taut chicken wire down over the frame to support the lower layer of polyethylene sheeting. We feel the double polyethylene layer is important for added insulation. Furthermore, a single layer, whipping against the chicken wire, will be cut before the winter is over. We use 2 mil. polyethylene for the inner layer; 2 or 4 mil. for the outer layer. As Harvey Templeton points out, thickness doesn't make too much difference, as the material has only a life of one season at any rate. When it is removed, it is still usable as a stock shipping wrap.

We have installed frost-proof hydrants at 50 feet intervals, which allows a 25 foot section of hose to reach all corners of the house.

CUTTINGS AND MEDIUM

Yews are taken and stuck in early October while junipers are placed in the bench in December, when our fall shipping has been completed. We use the Fillmore method of making the cuttings in the field, treating them as they are made, and taking them directly to the propagating structure We believe this method saves time, saves confusion and

chance of variety mix-up, and it reduces opportunities for infection. It is true that this procedure is not too practicable under zero conditions, but it is fine whenever the weather is reasonably mild.

We like a short, stocky cutting, usually of one-year wood although we are not concerned if we get back into two-year wood. We do avoid the light tip growth. In other words, we want to come up with a stocky, husky liner and believe it is important to have a cutting of this character on which to build Three girls in an eight hour day can prepare 15,000 cuttings, ready for sticking.

Hormodin powder is used for treating both yews and junipers. We have continued to check against a 5 percent I.B.A. quick dip, but have had no apparent differences in results. We have also checked against Chloromone without any startling differences being evident. The question has arisen whether in a cold-frame type procedure any hormone treatment is of value. From our observations we believe it is.

Because the rooting medium is also a growing medium, we use the existing soil into which is incorporated almost equal parts of peat and sand. Our soil is a deep well-drained loess, famous in song and story for growing plants. We figured if Templeton could do such a good job rooting cuttings in his Mississippi mud we should be able to do alright in our good Missouri loess. Each season we test our medium for fertility and pH. We maintain a high level of fertility and a pH of 7 or somewhat higher (this pH level is in agreement, incidentally, with recent Illinois recommendations). After working in our peat and sand additions, we top with a 1½" layer of U.C mix, 50-50 sand and peat with nutrients added. Over this we have used a light layer of vermiculite which we think helps maintain a better moisture condition in the house.

Medium and house sterilization has been accomplished by chemical treatment, since we do not have steam sterilization facilities In a sealed house of this type, chemical sterilization is easily accomplished as the gas, or vapor, is readily confined. The one year we used methyl bromide, rooting of *Taxus* was slow and erratic. White root tips were repeatedly burned which was accompanied by the formation of numerous "wire" roots We are convinced that the methyl bromide created a toxic condition for the yew cuttings. Since this experience, we have used allyl alcohol, which is recognized as a pre-emergence herbicide, not a fungicide. With the heavy applications we have used (about 2 gal. per 100 square yards in a one to 50 water solution) we are inclined to believe that most living organisms in the house and in the soil to a depth of a few inches must be killed. At any rate the house must be aired for several days before anyone can work in it. Cuttings are stuck shallow (about one inch deep) and at the rate of 40-45 per square foot They are simply inserted using a notched 1" x 2" board guide without any firming.

FALL, WINTER, SPRING MANAGEMENT

Theoretically, in a sealed polyethylene house, there should be no moisture loss. Nevertheless, there is some and we do sprinkle daily during the warm autumn days to maintain a humid, moist condition

in the house without flooding the soil. As colder weather becomes more common, waterings are reduced to two or three times a week with very infrequent sprinklings during the winter months. By this time of the year (early December) all of the yew cuttings have callused nicely.

As we get into the lengthening days of late February and early March, closer attention must be given to watering and shading. Even at the outset of the operation (October) we find it necessary to shade the west side and south end of the house and we keep some shade on the west and south sides throughout the winter. As the bright days of late March approach, it is remarkable the heat build-up that occurs in a house of this type. With a maximum of 60° or 70° F. outside, inside temperatures may zoom to 100° F. In fact, I think our all time high was 130° F. Now cuttings will be killed along the west and south edges of the house unless careful attention is given to shading and watering. It has always been a source of wonder to me how plant tissues can survive the terrific diurnal temperature fluctuations that occur in a house of this type. Minimum night temperatures will approach those of the outside. In March we have observed the temperature in the house plunge from 100° F. to nearly 0° F. with no apparent ill-effect on the plants (even broadleaf evergreens take this extreme fluctuation as long as moisture conditions are satisfactory). Nevertheless, the spring period is the most critical for this operation. We are anxious to build up the soil temperature to induce early rooting, although at the same time, great care is required to avoid "burning up" the cuttings. Watering becomes much more frequent; perhaps repeatedly during the day on warm sunny days. Shade is added as we get into March and April By late March we begin cutting holes in the polyethylene near the ridge to release excessive heat. This also releases moisture which means extra sprinkling. Air movement and drafts are controlled by stretching light burlap over the holes in the polyethylene. By June 1 rooting is largely accomplished, particularly with the yews, and at this time all the polyethylene is removed and replaced with approximately 60 per cent shade. During this "shock" period, waterings are more frequent but are again reduced as the plants become accustomed to outdoor temperatures and humidity conditions.

SUMMER CARE

Throughout the summer, natural precipitation is supplemented with hose waterings as required to maintain a good moisture level in the beds. Maximum growth is encouraged by monthly feedings. For this purpose we use a dry feed consisting of 5 lbs. hoof and horn, 4 lbs. single superphosphate and 1 lb. potassium chloride, mixture applied at the rate of 2½ lbs. per 100 sq. ft. As this is slow pay-out material there is little danger of burning and our well-buffered medium gives further protection. You will observe that this is heavy fertilization, that is, equal to 2½ tons per acre, and it does make for strong, dark growth. The cuttings are pruned back heavily in mid-summer to encourage stockier growth.

CUTTING REMOVAL

By mid-September we have a strong, one-year rooted cutting-liner, which are ready for the transplant bed. The house is cleared and we are ready to start the next crop

(Editor's note: Mr Steavenson reviewed his talk by showing a series of colored slides which illustrated the principle features of his discussion).

MODERATOR FILLMORE: We thank you, Hugh Steavenson, very much.

We will proceed now to the next two speakers and there will be a brief question period following the addresses by Harvey Gray and John Roller Mr. Harvey Gray, please.

Mr. HARVEY GRAY: I fear this might be a little bit hard on you fellows to have a double take as far as my presence is concerned, although I hope you will bear with me on the subject of yew and juniper cuttings under what I propose to call a vaporproof chamber.

Mr. Gray discussed the subject of rooting evergreens in a vaporproof chamber. (Applause)

THE VAPORPROOF CHAMBER

HARVEY GRAY
Long Island Agricultural and Technical Institute
Farmingdale, New York

What I have in mind as a vaporproof chamber, I think was brought out a year ago in Cleveland. However, for those who were not there I would just briefly make a statement as to what my conception is of a vaporproof chamber.

A vaporproof chamber, as I visualize it, is made of polyethylene plastic, as was first brought to the Society's attention in Cleveland several years ago by Roger Coggeshall I have modified some of the points that were originally presented by Roger in an effort to make sure that the area is really vaporproof.

I mean to say that if this case, which is rarely ever 12 inches high (the width and length of the case is immaterial, but the height I feel is quite important) is down on the ground, as in the case of a ground bed, then we are only concerned with sealing this vaportight by stretching our plastic to the ground over the top, over the ends, and sealing it with soil.

However, if it is on an elevated structure, such as a bench, with wet pipes quite likely underneath for bottom heat, the plastic will go on the bench bottom before any media is placed in it. The plastic will come up the sides and then over the top as well as across the ends and sealed as tightly as it is humanly possible. This is my concept of a vaporproof chamber.

Now that this chamber has become vaporproof, no water can escape except for the extremely minute amount that can and apparently does pass through the plastic itself.

Now on the subject of rooting of yews and junipers in such a chamber; two years ago we set out some trials with yews in the summer time. The *Taxus* cuttings were made when the plants had produced about eight inches of growth and were treated with a growth regulator.

One batch of cuttings was placed under intermittent mist. The other batch was placed under this vaporproof chamber. The vaporproof