Now that I have discussed some of the newer methods of growing and some of the short cuts that are used in plant production today, allow me to mention two other developments which will have a bearing on plant production in the future. Plastic greenhouses used to supplement the existing glass area are working out to the decided advantage of many growers. They are being used, generally, as temporary growing enclosures for a three- or four-month period in the spring of the year. The other development in growing quality bedding plants has been the production of new, improved varieties. I am sure all of you are familiar with the advantages that hybrid field corn has over the old, open pollinated types. They grow faster and yield better. Although yields do not mean anything to people who want flowers growing in their yards, it does to you who are producing the plants. For example, hybrids grow faster By reducing the time required to grow a crop you can delay your sowing and still have a quality plant to sell in the spring If you can save three or four weeks growing time, that, is money in your pocket. Hybrids are more uniform and more vigorous in growth. They present a more attractive piece of merchandise and they give your customer, the home gardener more satisfaction. With hybrids there is generally less mortality as a result of disease and other problems.

I would like at this time to tender an invitation to any or all of you to visit our place any time you are around Chicago, Illinois this coming summer. That concludes what I have to say. Thank you.

PRESIDENT VANDERBROOK: Thank you, Mr. Jones.

The next presentation is, "Present Day Practices in the Propagation and Culture of Perennials" by Kenneth B. Fisher, Kingwood Nurseries, Mentor, Ohio.

Mr. Kenneth B. Fisher presented his paper. (Applause)

PRESENT DAY PRACTICES IN THE PROPAGATION AND CULTURE OF PERENNIALS

KENNETH B. FISHER
Kingwood Nurseries
Mentor, Ohio

The term "perennial," when loosely applied, covers all plants which live for more than two years, and as such applies to woody, as well as herbaceous material. For our purposes today the discussion will be confined only to herbaceous material, for that, after all is the material accepted under the category of perennials by the trade. This broad classification includes probably 3 to 5 thousand varieties.

Even this definition is too broad, for in parts of the United States, such as the far South and far West, some material which is of a true perennial nature, must because of tenderness be treated as annuals in the rest of the country and Canada. Some of the plants in nursery catalogs which are listed as perennials are actually biennials, i.e., *Campanula calycanthema* (Cup & Saucer), *Digitalis* (Foxglove), and *Dianthus barbatus* (Sweet William) Other plants offered in herbaceous lists such as *Iberis* (Candytuft), *Pentstemon* (Beard Tongue), *Phlox*

subulata, Teucrium, Vinca minor and the like, actually are evergreen and therefore are not herbaceous, but, of course are true perennials.

The propagation of perennials falls into the following three main categories: (1) by seed, (2) by division, and (3) by cuttings Other methods are used such as grafting and layering. Since many thousands of *Gypsophila* are grown in this country each year, grafting is done on a considerable scale. This method has been used almost exclusively insofar as the large flowering sorts are concerned, i.e. Bristol Fairy, the newer variety Perfecta, and the various pink flowered forms.

PROPAGATION BY SEED

As with most horticultural varieties, this method is not generally used, since the offspring do not come true unless, as in the case of Pacific Hybrid Delphinium, the production of seed is carefully controlled Fortunately, for the grower, there are many seed producers both in this country and abroad who carefully control seed production. As a result it is possible to grow from seed, named varieties of *Aquilegia, Dianthus* (Carnation), *Delphinium,* and the like Many of the herbaceous perennials offered by the trade such as *Delphinium belladonna, Coreopsis lanceolata,* and *Scabiosa caucasica* to name a few, are species which come true from seed. The following table lists perennials usually grown from seed.

Table I. — Perennials propagated by seeds.

Althea rosea
Alyssum spp.
Anchusa italica
Anthemis tinctoria
Aquilegia spp.
Asclepias spp
Campanula calycanthema
Campanula carpatica
Chrysanthemum max. Alaska
Coreopsis lanceolata
Delphinium belladonna
D. bellamosa
D. Bishop Strain
D. Blackmore & Langdon
D Monarch Strain
D. Pacific Hybrids
Dianthus barbatus
D. Grenedin
D Heddewigi
D. plumarius
Dicentra eximia
Dictamnus fraxinella
D. fraxinella alba
Centaurea montana
Digitalis spp.
Doronicum spp.
Echinops spp.
Gaillardia spp.
Geum spp.
Gypsophila paniculata
Hibiscus moscheutos
Iberis sempervirens
Lavendula vera
Liatris spp
Linum perenne
L. narbonnense
Lychnis chalcedonica
Oenothera missouriensis
*Papaver orientale**
Platycodon spp.
Primula spp.
Pyrethrum, single varieties & double mixed.
Saponaria spp.
Scabiosa caucasica
Thermopsis spp.
Viola cornuta

*Since this is a true species it can be grown from seed Better root systems are obtained from root cuttings All named varieties are grown from root cuttings

The time of sowing seeds depends on several factors. First, to be considered is the type of growing operation. The use of a greenhouse in the North for certain varieties, while not essential, enables one to start plants earlier, which might otherwise be too small to plant into the field the first season. A good example of this is *Campanula carpatica* and the *Geum* species. If one has only cold frames to work with, these same seeds would be sown in early spring rather than during the winter

Generally speaking, though, seeds are planted indoors in flats of good loamy soil mixed with peat and covered with either more of this same mixture or sand. Some of the very fine seeds, of course are just pressed in. Sphagnum moss can be used and I have seen very fine results obtained with *Helleborus niger* sown in sphagnum and stored in a cold house for two or three months before bringing into the greenhouse. Straight vermiculite makes a fine medium for sowing lupines. We have sown the seeds in this manner and kept them in the vermiculite until transplanted to the open field in early April in the vicinity of Mentor, Ohio. While we use sifted soil or sand for covering perennial seeds I know of one grower who makes rows in his flats with the edge of a lath, sows his seed in the rows and then covers the seed with Perlite. The use of Perlite he feels controls damping-off. One word of caution, however, the Perlite must be free of foreign materials. That offered for use in plastering often has other chemicals added to it which are injurious to the seedlings.

After the seedlings have developed their first or second pair of true leaves they are either potted or dibbled-off into other flats. Many of those plants which we pot could be dibbled into flats and later transplanted directly to the field if they could be handled early enough in the season. But not everything can be so handled and therefore we pot most of them, which stretches out our planting season. Formerly we used clay pots almost exculsively, and some bands. This last season we switched over almost entirely to peat pots, and found them more to our liking. As stated before, however, potted or banded material can go out later in the season, which is a definite advantage during the spring rush While we still hand trowel most potted items into field rows, some of those with larger tops can be set out with a mechanical transplanter, providing there is enough of one variety to go in to warrant its use.

In our area many items make up quite well by early spring sowing directly to field rows. Most plants so sown are of sufficient size the first fall. The list is long but includes: *Alyssum, Anchusa italiaca, Anthemis tinctoria, Aquilegia, Asclepias, Dianthus* (*Carnation*) Grenedin, *Centaurea montana, Chrysanthemum maximum* Alaska, *Delphinium, Dianthus barbatus, Digitalis, Echinops, Gaillardia, Gypsophila paniculata, Hibiscus moscheutos, Althea, Iberis, Liatris, Lychnis chalcedonica, Oenothera, Papaver orientale, Platycodon, Pyrethrum, Saponaria, Scabiosa, Thermopsis,* and *Viola cornuta.* Of these, if the season is poor for growing you might have to grow on for another season the following types: *Aquilegia* Crimson Star, *Iberis, Oenothera* and *Platycodon. Thermopsis* most always is a two year crop. *Dictamnus* very

seldom is ready for sale until the third year. This latter item can be sown to the field in the late fall and it will germinate well the following spring. If it is grown inside it should be stratified.

The exact time for outside sowing is difficult to tie down since so much depends upon the season. Usually we start in early April. Such slow germinating or slow growing items as *Aquilegia* and *Delphinium* are always first on the list. Some large growing items such as *Anchusa italica* and *Centaurea montanna* are sown as much as two weeks later in order to control size.

If one does not have the time in early spring, many perennials can be sown in beds as late as July or August and the young seedlings transplanted to permanent locations in the field the following spring. But in order to get a good plant by fall they must go out very early, in our section of the country. Such items as *Aquilegia, Delphinium* and *Pyrethrum* lend themselves very nicely to this procedure.

PROPAGATION BY DIVISION

This is of course, a simple operation. In most cases perennials so propagated must be planted quite early in the spring, although with irrigation, timing is not quite so important. The following table lists those perennials commonly grown by this method.

Table II. — Perennials from division.

Achillea Angels Breath
A. Snowball
A. Tagetta
Ajugas spp.
Armerias spp.
Artemesia Silver King
A. Silver Mound
Aster Harrington's Pink
Campanula carpatica Blue Carpet
C. c White Carpet
C. c. Wedgewood
Chrysanthemum maximum Aglaya
C. m. Esther Reed
C m. Majestic
C. m. Mark Riegel
C. m. Mount Shasta
C. Hardy Garden Sorts
Dianthus caesius
D. deltoides
Dicentra spectabilis
Eupatorium spp.
Helenium spp.
Heliopsis spp
Hemerocallis spp.
Heuchera spp.
Hosta spp.
Iris germanica
Iris kaempferi
I. sibirica
I. spuria
Lychnis viscaria fl. pl.
Monarda spp.
Myosotis spp.
Pentstemon spp.
Phlox subulata
P. stolonifera
Plumbago larpentae
Polemonium spp.
Primula spp.
Pyrethrum named double.
Salvia pitcheri
Sedum Acre
S. spectabile Brilliant
S. spurium
Thymus spp.
Tritoma spp
Veronica amethystina
V. incana
V rupestris
Vinca minor
Viola cornuta Catherine Sharp
V. c. Purple Glory
V. odorata Royal Robe
V. o White Czar

It is difficult to give the size of the division necessary even for one specific plant, since it depends so much on location, soil, weather and time of planting. Generally speaking, the earlier planted division can be smaller. With *Dicentra spectabilis,* one eye is sufficient, but it must be planted as soon as the soil is workable. With such fast growing items as *Artemesia* Silver King, and *Eupatorium*, one runner is sufficient to have a salable plant by fall. Another factor controlling size is scarcity of stock and how quickly you want a salable plant. As long as the division has a root or two or even latent root buds, if it is set out early enough and other conditions are satisfactory, it will take hold. However, such very small divisions may take two seasons or even three to make salable plants. In our nursery, on the other hand, we have some trouble with *Phlox subulata* varieties, particularly such robust types as *Phlox subulata alba* and *Ganyi.* If planted early in the spring a small division, with a few roots, becomes almost too large by late fall or the following spring. Garden chrysanthemums make a salable plant by fall if only one runner is planted as late as mid-June in the Mentor area (this is without irrigation). Only with experience under local conditions can the propagator get an idea of the size necessary for the production of salable plants, in one season.

PROPAGATION BY CUTTINGS

This method of propagation can be broken down into two categories, i.e., top and root cuttings. The perennials grown from these two types of cuttings are listed in tables III and IV.

Table III. – Perennials propagated by root cuttings.

Anchusa myosotidiflora	*Polygonum reynoutria*
Papaver orientale	*Rudbeckia* The King
Phlox decussata	*Stokesia* Blue Moon

Table IV. –Perennials propagated by top cuttings

Artemesia Silver Mound	*Platycodon*, double varieties
Aster Frikarti	*Phlox suffruticosa*
Carnations, named Varieties	*P. subulata*
Chrysanthemums, Hardy Garden	*Santolina spp.*
Dicentra spectabilis	*Sedum spectabile* Brilliant
Gypsophila, named Varieties	*Teucrium spp.*
Iberis Little Gem	*Veronica* Blue Spires
I. Purity	*V* Crater Lake Blue
I. Snowflake	*V.* Icicle
Lythrum spp.	*V.* Minuet
Pachysandra spp.	*V. Longifolia subsessilis*
	V. Sunny Border Blue

Of the plants from root cuttings only the *Papaver orientale* is made in the late summer when the plants are dormant. The roots from one

year old plants furnish the most and best material. The roots used should be about an eighth of an inch in diameter for best results. The pieces are made about an inch to an inch and a half long and kept upright, since most nurserymen plant directly to 2¼ inch pots. These are then placed in a cold frame where they root and are carried over winter prior to field planting in early spring. In propagating *Polygonum reynoutria* we literally chop up the root sections which have large dormant buds. This is done in early spring and the pieces (about 1½ inches long) are planted directly to the field. *Anchusa myosotidiflora, Phlox decussata, Rudbeckia* The King, and *Stokesia* Blue Danube and Blue Moon are handled somewhat alike. It is best to dig the plants, with some soil, in late fall and store in a cold house until after the first of the year. Although some freezing will not hurt the plants, make certain that you can get to the plants when propagation time comes around. If freezing has occurred thaw them out gradually. Some growers sow their root cuttings in benches in a cool greenhouse, covering with about one inch of soil or sand Other prefer to stand the cuttings upright in rows in grape crates or similar boxes with an inch or two of soil between each row This latter methed allows for mobility in the greenhouse and is especially useful if one is lacking bench space. In addition, it also facilitates spring planting since the boxes can be taken directly to the field for planting.

We take top cuttings of *Artemesia* Silver Mound in the winter from forced plants. This variety can also be divided We find however, that with our soil, divided plants often become overly large in one growing season. We therefore prefer to root cuttings during winter and pot or band them. Such plants make up very well after one season in the field Here again if we took very small divisions quite early in the spring we would achieve the same results, although as we know not everything can go out the first week of planting We usually force plants of *Aster Frikarti* during winter and make cuttings at that time. This last September we stuck cuttings in flats of vermiculite and put them under our mist system. They have rooted well and we hope they will now carry along in our greenhouse to be potted later and go to the field this coming spring We have also stuck some *Veronica* Icicle, *V longifolia subsessilis,* and Sunny Border Blue in our outdoor mist system this past July. They rooted well and we intend to leave them there until next spring In the past, these have been made from plants forced in the greenhouse We have always been plagued with the Leaf Spot disease to some extent The infestation is not noticeable on field plants although when material is brought into the confines of a greenhouse it becomes quite apparent. It is our hope that those in the outdoor mist will carry over winter, outside. If so, that will probably become our standard operating procedure. We have done this with *Dicentra spectabilis* with very fine results. One definite advantage of using mist for *Dicentra spectabilis* is that the cuttings do not have to be soft. Soft cuttings will root but so will those that are fairly hard. After rooting, the tops die off and apparently the crop is lost. However upon examining you will find new buds have formed and if left in the frame over winter they are ready to go to the field in early spring

We use standard procedures insofar as other top cuttings are concerned. Most of our carnation cuttings are made in November or December. If we have sufficient plants in the field we just cut off the tops and bring them in to make our cuttings. If it is a variety of which we do not have enough cutting material, we dig some plants for forcing As with most perennials we use Rootone F After rooting they are potted or banded for field planting in the spring. We have already made our *Iberis* cuttings. While they can be made later, we make them at this time in order to obtain larger plants. Fast growing varieties of *Phlox subulata* are propagated by cuttings, since spring divisions give us too large a plant by fall. Such cuttings are made in late March and planted to the field about one month later. *Phlox suffruticosa is* propagated by inserting the dormant shoots, about an inch long, into the sand with just the tip showing. This can be done anytime from very late fall or early winter to early spring. We use somewhat the same method with *Lythrum*. While we have forced old plants in the greenhouse for top cuttings we also find that if the soft top growth of spring is cut, they can be rooted inside in sand and planted directly to the field. We have taken these cuttings as early as April and as late as June with equally good results.

In discussing plants from divisions I have failed to mention that insofar as *Armeria* and *Lychnis* are concerned, we find that if crown divisions are made in December and January, stuck in flats of vermiculite, and then placed in a deep frame, that they will root nicely by spring.

Knowing that I have not kept up to date with practices being used outside my own area I canvassed a number of nurseries which are growing them From the correspondence and telephone conversations I garnered some very worthwhile information. From material supplied by Bill Cunningham of Cunningham Gardens, in Waldron, Indiana the following information was especially interesting It seems they grow around 20,000 *Gypsophila* Bristol Fairy each year They have discontinued grafting, in favor of cuttings These are made in the fall and spring and placed under mist. The rooting medium is composed of ⅔ coarse sand and ⅓ peat. They mix 50-50 fernate and Hormodin #2 for dipping their cuttings. Good plump cuttings are taken from field plants in September and October. These are stuck in the greenhouse bench which is equipped with a mist system using Florida 550 series nozzles The mist is on for 18-20 seconds and off 20 minutes. The cuttings are exposed to full light After rooting, the cuttings are potted directly into peat pots and grown on in the greenhouse In the spring, sometime in April or May, cuttings are made from these pot plants in the same manner as mentioned. When pot bound these and the fall potted plants are set in the field. This method gives a very fine plant by the end of the growing season. Such plants, Mr. Cunningham, admitted, might be too large for mail order and advised that cuttings taken in June and rooted at that time would be ideal for this type of outlet. Last year Mr. Cunningham made an experimental planting of Hardy Phlox (*decussata*) in peat pots They orginally were root cuttings made in the conventional manner Instead of planting

to the field, some 50,000 were planted into 2¼ inch peat pots using a loam potting soil. They were set in 6 foot frames, 4 to 5 inches apart. These were then mulched in with a mixture of ½ sand and ½ peat. Weekly feeding was accomplished by means of a liquid fertilizer. Response was so good that they intend to expand this phase next year.

Mr Roderick W. Cumming of the Bristol Nurseries offered the following information: "We are now grafting all *Gypsophila,* such as Bristol Fairy and Perfecta, on roots of either Bodgeri or Rosy Veil. These two understocks, of course, must be grown from cuttings preferably for one full year in the ground. We find that the roots are more fibrous and not as long and unmanageable as those frequently encountered from grafts of *Gypsophila paniculata,* which is the standard procedure. Therefore, they are much more readily shipped in plastic bags during the spring season. We have also found that it is no trick at all to root Bristol Fairy under mist, especially if dipped in indolebutyric acid. The roots of these plants, however, become so very long after a year in the ground that they are completely out of the question as mail orders items" "Some of the members may want to engage in the asexual propagation of *Platycodon,* particularly some of the newer double types. Our method now is to cut the old plants back just as soon as they flower enough to be identified for mixtures. This would commonly occur about late July and the stems are cut back to about one foot. Then by Labor Day they have made a large number of short cuttings from the leaf axils and these root very readily under mist treated with some kind of hormone, by October 1st. Of course, the increase must be carefully protected over-winter in a frame, but in view of the difficulties we once had in introducing our own doubles, it is much simpler today."

Mr. Pitzenka of Pitzonka's Nursery in Bristol, Pennsylvania wrote that most everything they do is standard procedure. He did say that for *Asperula,* the plants are brought in during the winter and planted. As the new shoots sprout they are cut and rooted in sand. Most of their propagating is done during December and January in a semi-cool greenhouse. Day temperatures should go no higher than 80°F. and night temperatures no lower than 58°F. Bottom heat is essential for good rooting. The following paragraph is quoted from Mr. Pitzonka's letter: "When transplanting young perennials, it is essential to plant into a sterilized soil medium since it may contain nematodes, weed seeds and disease organisms that tend to lower plant quality and size. We use chloropicrin in areas where we have ample water to seal the ground and methyl bromide elsewhere, using plastic covers to restrict the loss of the gas"

PRESIDENT VANDERBROOK: Thank you, Mr. Fisher for a very informative and complete presentation on the subject of perennial propagation.

MR FISHER: There are two gentlemen in the audience on whom I would like to call to supply additional information on this subject. Mr. John Sjulin of Interstate Nurseries, wrote me and commented on storage procedures for divisions and layers. Rather than to have read

his letter in my formal presentation I am wondering if Mr. Sjulin would comment on this subject?

MR. JOHN SJULIN (Interstate Nurseries, Hamburg, Iowa): Well, as I wrote in the letter, we take our divisions or layers and rather than store them over winter in flats we put them in a box in the freezer. Actually the divisions are taken late in the fall. These are then placed in polyethylene bags, packed in wirebound boxes and put in the freezer room. We have had the freezer down as low as 26 and have not had any damage. We never allow the room to go above freezing for any length of time.

MR. FISHER: Thank you, John. In the November 1st, 1955 issue of the American Nurseryman there appeared an article entitled "Mist Spray Growing and Nutriculture" by Clarence Vanderbrook The actual work was carried on at the C. W. Stuart & Company establishment. Mr. Henry Weller of this firm is here and so I would like to call upon him for comments at this time.

MR. HENRY WELLER (C. W. Stuart & Co., Newark, New York): Aside from our field operation for the past four or five years, we have been growing perennials from the cuttings to maturity under intermittent mist. With our chrysanthemums, the cuttings are taken approximately in the second week of July. We use a 3x5" plastic bag. The mist runs approximately one minute on and five off, during the rooting period. After that, we break down the period, operating it one out of ten. As soon as the cutting has rooted we start feeding. We use a water soluble plant food, which contains the basic nutrient elements. This is continued once a week to September first, after which it is gradually cut down, with an idea in mind of hardening off the plants before shipping. Prior to shipping, through August, in the case of chrysanthemums they are clipped back or nipped three or four times to wind up with a plant six to eight inches in height in full blossom

MR. FISHER: Thank you very much Mr. Weller.

PRESIDENT VANDERBROOK: The next presentation is "New Concepts in the Pot Culture of Perennials," by George Rose, Henry Field Seed and Nursery Co., Shenandoah, Iowa. Mr. Rose!

MR. GEORGE ROSE (Henry Field Seed & Nursery Co., Shenandoah, Iowa): This talk, gentlemen, will be concerned mostly with the production of chrysanthemums. The reason for this is that I think I can give you a little more continuity if I follow through our efforts to develop this one type of mail order plant. Our firm is a mail order retail firm, and as such, our growing and production schedule must be fitted for this type of business. Therefore, some of the material I will present will not be applicable perhaps to your own business.

Mr. Rose presented his paper on "New Concepts in Pot Cutlure in Perennials" (Applause)