ing to be held in Toronto, Canada, the first week in December. The Plant Propagator that will be published about the middle of November will have information about the meeting. Our program chairman for the Eastern Region is Dave Dugan. Dave would you please stand up? Do you have any words that you would like to say?

DAVE DUGAN: I certainly have. I would like to repeat Ralph's invitation to attend the Eastern Region meeting in Toronto. It is going to be a fabulous program. This will be the first time we have gone across the border. They are really putting together a tour you will never forget.

PRESIDENT TICKNOR: I would like to say a few words to you about membership. We need more members, and we want members who can take part. In the past year we had 31 new members sign in. We lost 31 so we just stayed the same. So I think we all need to find out what happened. One way to keep new members is to make a point to talk to them at meetings. Make them feel like they belong to the group. Another way is to get them to participate in our program and share their ideas. Our organization is built on this participation and sharing of ideas. I think I will sit down and turn the program over to Walter Krause.

WALTER KRAUSE: Thank you Bob. I am thrilled to see so many people at the Fresno meetings.

Our keynote speaker for this morning, Dr. F. W. Went, from the Desert Research Institute, University of Nevada, Reno, unfortunately will not be able to be with us. In the absence of Dr. Went, Dr. Andrew Leiser will speak to us on the subject Plant Introduction: Past, Present and Future. Dr. Leiser.

PLANT INTRODUCTION, PAST, PRESENT AND FUTURE

ANDREW T. LEISER
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I would like to talk a little about plant introduction. Although we, in this group, are primarily plant propagators, I think the propagator is as much or perhaps more interested in plant introduction than any other person in the nursery operation. At least working with the propagator and talking to him, it is apparent that most of the propagators are more avid plantsman than many of the people concerned with the producing of saleable plants as an end product. In addition with new plants, new introductions, the selection of clones and cultivars, a great many additional problems come to the plant propagator. We were talking about this as we were coming down last night. The possibility of really interesting cultivars in the genus *Eucalyptus* introduces one such problem.

What do we do when we get them? Nobody has been able to graft them on a commercial scale, nobody has been able to root them except for an occasional plant. This is just one of the challenges that will come from the introduction of new things and the selection of superior forms.

I would like to trace with you briefly the pattern of plant introduction in the past. I would like to review the past as a setting for what I believe we have to look to in the future in the area of plant introduction. The earliest plant introductions go back pretty well to antiquity. There are drawings in some of the ancient Egyptian temples indicating that plants were introduced by the Egyptians into the River Nile area from the Sudan long before the birth of Christ. Certainly we know that many of our food crops, grains, in particular were introduced at a very early date. So early, in fact, that we have trouble in knowing for sure the precise area of origin, or the species involved in the introduction of plants like wheat, rice, etc. As man had more time, he began to have an interest in things other than food crops. Some of the early introductions we now use as ornamentals were first introduced for medicinal purposes. This phase of introduction was quite fruitful for ornamentals as well as for the primary goal of introducing drug plants. Many of the early explorers that went out had positions as surgeons in there company and were frequently amateur botanists. Sometimes professional botanists turned physician. These people were responsible for a great many of our present introductions. Wherever man has travelled, someone in the group has been interested in plants and has collected them as seeds, cuttings or live plants and brought them home, wherever home might have been.

There was great impetus in introduction with the dawning of the European age of discovery when the known world changed from an inland sea, the Mediterranean, surrounded by the "flat" world to a round world with lands beyond the oceans. Columbus undoubtedly returned with plant specimens. Other things such as tobacco soon followed. In fact during the 17th and 18th centuries there were veritable floods into Europe of plants from all over the world. Many of these are still our best plants today, the plants we still grow and take quite a bit for granted. In addition to the introductions by many of these ship's surgeons and members of expeditions, others were made by the monks and clergymen of various denominations who went out on Christianizing missions. We see evidence of this in some of the generic and species names of plants, which commemerate these early missionaries. As early as the 1700's a great deal of introduction was done by correspondence. For example, Mr. Bertram, from Philadelphia, Pennsylvania, was in avid correspondence with friends and acquaintances in England whom he apparently met only by mail. He explored the eastern seaboard, down to Georgia and Florida in search of new materials of which he sent quantities to England where they became introduced and established. I suspect some of these early things that Bertram sent to England have come back to us via Europe in the form of the original species or of improved varieties and were really first introduced into United States trade from Europe rather than from the wild. Many of our garden varieties of our own natives originated in the gardens of Europe; varieties of Lawson's cypress and Colorodo blue spruce are outstanding examples.

About this time, in addition to the chance introductions by ships surgeons and others, plant explorers were sent to other parts of the world with the specific mandate of searching out better plant materials in particular geographic areas. From Europe, England and Scotland, France and other countries, explorers went to all parts of the known world. In the United States one thinks of England and Scotland in particular because much of North America was botanized and many introductions made by explorers sent from these countries. We have travelers such as David Douglas, (for whom Douglas fir was named) who did a good deal of exploration on the West Coast. We had joint expeditions, sometimes government sponsored, such as the Lewis and Clark Expedition, the Fremont Expedition, which had as one goal the classification and introduction of plants from the regions to be explored.

More recently we have had men like Wilson, Rock, Ward, Lathrop, David Fairchild, to name a few, who have made extensive explorations to particular parts of the world, sometimes in search of particular kinds of plants but more generally in search of just whatever they come upon that had outstanding horticultural possibilities. The areas where particular plants were the goal, sometimes seem to me to be in the minority. Some of the USDA plants explorers were looking for germ plasm for breeding purposes. In vegetable crops, potato introductions are one good example. Some of these explorers had primary goals of searching out rhododendrons in the southeastern, southwestern parts of China, which is the real center of rhododendron population. So we have had some effort in searching out particular groups of plants. This is the direction I feel we are going in plant introduction in the next few years.

By way of summation, we have seen introduction proceed from chance to the exploration of geographical areas and to occasional explorations for specific plants or for specific plant groups. The successes of these early introductions are many. I don't want you to leave with the idea that I am minimizing the importance of the past, because certainly the wealth of plant materials we have today has stemmed almost entirely from these early introductions. The examples are too numerous to mention, but examples are eastern dogwood, redbud, sugar maple, Douglas fir, redwood, and Lawson cypress; all of these were early introductions to Europe. We think of them perhaps as native, but they were introduced to the horticultural world through these early efforts of the plant explorers. And of course a great deal of effort has been expended on plants like magnolias and rhododendron.

But where do we stand at the present? Much of the present introduction, the main expeditions of the last decade, have been expeditions by the U. S. Department of Agriculture in cooperation with Longwood Gardens. I think most of you are familiar with some of their trips. Trips were made to Europe, where search was made for horticultural varieties primarily in private gardens, nurseries, and botanic gardens. The trip to Australia was to bring in some additional species of eucalyptus, acacia, and other Australian plants which might be useful in the warm regions of the United States. On a recent trip to Japan a good deal of time was spent looking for garden cultivars. In this expedition the emphasis on wild collections seemed to be (at least as I read the report of expedition) a search for individual variance, that is, a prostrate form of particular plant, an upright or bushier form, or better fruit color. The successes of these expeditions remains to be evaluated.

But what of the future? I believe that past efforts of plant introduction have been limited somewhat by the Linnaean and even Darwinian concept of the species as being a "type"; this is the idea that one herbarium sheet represents the whole species, in terms of the original nomenclature. This idea that a species is a very precise entity, easily recognizable with essentially little variation and quite distinct from any other species has limited our thinking. I think an expanding concept of what the plant species is argues well for the future of plant introduction. By this I mean we are more and more recognizing the species as quite a variable entity often in an active state of evolution and not one precise entity that we can represent with one herbarium sheet. I think that if you will look closely at some of our natives, Douglas fir for example, you will realize they are not all alike. It has been found both in forestry and ornamental use, that Colorado forms are hardy in New England while the Pacific Coast forms are not hardy there. The form from Shuswap Lake, British Columbia, is a much richer blue green and a heavier foliaged plant than the forms from the seed from other localities. The Christmas tree growers found it out in Scotch pine some time ago in the midwest and east. The northern varieties frequently turn very yellow in the fall. In fact I know of a nurseryman who got a batch of these in and he finally capitalized on it with the bright idea of selling "golden" Christmas trees. He sold all his crop but he never bought any more seeds of that source. He didn't want to chance repeating his success again. However, in certain areas, because of climatic adaptation the Spanish form of Scotch pine holds its winter color much better and is a better Christmas tree than those from other areas. I think we have only scratched the surface in this search for variation within the species. I have been calling this "ecotypic variation". There may be a better word, but for the moment we will use that term to describe this variation. An ecotype is a biological type that is separated either by climate, soils, or other factors from the main population or from other types of the population. Yesterday Bob Ticknor was looking at a group of seedlings of bigleaf maple from several locations in California that we have at Davis and remarked that the southern California forms of this plant look like a different species than those from the Pacific Northwest. I have felt the same way about them. The leaf is shaped differently; it is not as heavily toothed, is more deeply lobed and is much smaller. The other area that I think that will really pay off in plant introduction is the adaptation of laboratory methods for evaluation so that we do not have to wait ten, twenty or thirty years in order to determine how good a plant might be or what merit it might have in the landscape. I will discuss in a moment a few specific examples of what we are trying to do at Davis to illustrate what I mean.

All our introductions to date. numerous as they may be, are perhaps just the nuggets of gold, to use an analogy, panned downstream from the main mother lode, or turned up by chance. The mother lode remains to be tapped.

Another area of introduction not fully exploited in the past, is receiving more and more attention. This is the improvement of woody ornamentals through breeding. This involves the crossing of species such as has been so prevalent in rhododendrons, the crossing of desirable types within the species and finally the selection from these new plants. This breeding is just as truly plant introduction as going out into the wild and finding a new species. And it will continue, I think with increasing value, to increase our supply of new plant materials. Here again new techniques can speed the way. An example in the Midwest, is a "crash" program to breed apple varieties resistant to apple scab and a number of the diseases that limit apple production which was started in the 1950's. By manipulating the seeds, e.g. excising the embryo, the pathologists have been able to speed up the germination and the initial growth in apples so that they have gotten several generations in a ten year period. Normally it might take 10 to 15 years for one generation. Extended photoperiods have been used to increase the size of the plants. Chilling in refrigerators could be used to accelerate the annual cycling. These plant breeders have come up with rather substantial progress in what was considered rather slow breeding program in a matter of just 10 to 15 years. I think these techniques will be applied more and more to some of our ornamental materials as our awareness of these methods increases.

There are two other methods of introduction that we can look to in the future for a great deal of increase in our plant pallete, the plants with which we can paint the landscape. One method, perhaps one of the simplest, is a more thorough evaluation of species that either have been tried only haphazardly or not at all. These may be species that have been overlooked because we already had a good species of a genus. For example, *Carpinus betula* (European carpinus) is well known but how many use or know the Japanese carpinus? It might be as good or better than the European or the American species. This is an area of plant exploration that can be accomplished in an easy chair by just going into text books and finding the full list of species and the way they grow. When one finds a genus with two or three known good species and several unknown species, one might ask: what about these unknown species? If we find no record of their having been tried, they should be obtained and evaluated. This approach holds promise for great progress in plant introduction. In large genera such as rhododendron or eucalyptus, there are a great many species that have never been thoroughly tried. Some of the eucalyptus species have apparently never been tried in the United States. By using all sources of existing knowledge of the genus such as the Australian books that list the habitat and then looking to our needs we can select numerous species that we should look at more closely. For example, some of the hardier eucalyptus may be suitable for use in western Oregon and Washington. In California we are also interested in these hardier species because at the present eucalyptus plantings are limited by temperatures in much of the state. The genus is not used much in foothill areas where temperatures get down lower than most of our present list of eucalyptus species can withstand. So we in California are also interested in hardier sorts.

An introduction program in eucalyptus is underway at Davis. The traditional way of testing the hardiness of a plant is to get it out at a number of locations and then sit back and wait. Maybe next winter will be cold enough to separate the men from the boys. If it isn't, wait another year, then wait perhaps 3 or 5 or ten more. For example, the winter of '49-'50 in Washington was a real test, but it was not till '56 that another real test occurred. However, both freezes were so sudden and so severe and so many things were killed that one really didn't separate the "men from the boys". Little could be learned about hardiness at the intermediate ranges. To reduce the chance and loss of time we have adapted a laboratory method for estimating hardiness used in apple breeding programs in the East for use with eucalyptus. Briefly it is this. We take twigs and freeze them at certain temperatures for various periods of time e.g. 2, 4, 8, 16 hours, thaw the twigs slowly, and then in either two or three ways estimate the amount of injury to these twigs. We can chop the twigs up and extract the soluble fraction out of the twigs by shaking them in water for 24 hours. Then by passing an electric current through the solution to measure the conductivity, the soluble salts can be measured. The more soluble salts that there are in the solution, (not sugar) the more readily will electric current pass through the solution. We do this with some twigs that were not frozen and with the ones that were frozen. If the passage of electric current through the solution is about the same for frozen and unfrozen twigs then we know they were not injured. If more current passes through the solution from the frozen twigs than the unfrozen twigs, or, at 4 hour freezing versus the 2 hour freezing, then some injury has begun to take place. Freezing injury damages cell membranes and cells and allows the salts to leak out. Cells are like a package and as long as they are undamaged they will hold a good share of these salts inside the cell and won't allow them to leak out. A more rapid way of determining the injury is to take two electrodes (we make these ourselves using battery clamps and the tips of sewing needles), press these electrodes into the twig, pass an electric current between the electrodes and measure the flow of electric current to determine whether or not we have had injury. Because of the many things that affect hardiness such as the fertilizer program the year before, soil mixture, how rapidly the temperature drops and so on, this only gives us a relative measure of hardiness. We can take conductivity readings for several eucalyptus species that have been grown for years to use for comparison, e.g. one that doesn't injure at 20°, and does injure at 15°, another species that doesn't injure at 15°, but injures at 10°, or kills at 10°. Then we can compare electrical conductivity readings of the known and unknown species. In this way an estimate can be made that species "x" is about as hardy as *E. polyanthemos* or that it is not as hardy as *E. ficifolia,* one of our most tender species. This same technique can be applied to any other group of plants as far as we know. The third laboratory method still involves the freezing and thawing, but we treat the tissue with a chemical. This chemical reacts with certain enzymes released in the plant. Freezing inactivates the enzyme and by analyzing the amount of this chemical that is changed and again comparing with control species, we can estimate the temperature at which damage occurs. This chemical test was used extensively recently at Purdue by Dr. Fred Lanphear. As a check on the injury and the critical level of damage he took part of the twigs that were frozen, stuck them in a mist propagation bench and waited two weeks. He wasn't trying to root them, but after two weeks in mist, the twigs that were still green, had tight bark and sound cambium were obviously not injured. With injured twigs the bark was sloughing, the cambium was damaged, etc. Thus he had quite a reliable estimation through this biological assay in the mist bench of the level of conversion of this chemical associated with injury in twigs. We have been using the two electrical methods and we will be using the chemical method for estimating the hardiness of a number of Eucalyptus species that have not been grown at all, or have been little grown, in California. If the plant in the field is doing well and its branch structure and growth rate is attractive, we can, with some degree of confidence go to the nurseryman and public and suggest the use of the species for particular climatic areas. We will also be using these hardiness tests on other groups of plants or for ecotypes within species.

Before I get into the intensive study of variations within species (ecotype selection) per se, I would like to mention briefly the second area of re-introduction or introduction that could produce quick results. This is the re-introduction of many of our existing plant materials, about which we know very little in relation to the overall variation to the species. Three examples follow. *Coculous laurifolius* is an evergreen, very straggly shrub that has a very handsome foliage and is very rugged and durable. Apparently it has only been introduced into California once and all of our plants are one clone. In other words, the plant was introduced into California as a single seedling and every plant in California comes from that one plant. We don't have any idea whether this plant is truly representative of the species. We have no idea how hardy the species might be if collected from the highest elevations or the highest latitude of its range. Another plant that probably was introduced from a limited range is *Pittosporum tobira.* It occurs quite extensively in Japan, but it was probably introduced from the nearest occurrence to a town, a seacoast city no doubt. So we probably have a low elevation, and because of the distribution of cities in Japan, probably a southern or east coast Japanese import. Although used as a houseplant in the Pacific northwest it is not reliably hardy there so far as I know. This matter of hardiness should be of great interest to California nurserymen, as well as those in colder areas because many ship plant materials all over the United States. If we could find a *Pittosporum tobira* (or any other "tender" plant) which was hardy at ten or fifteen degrees lower temperature than the form we are now growing. think of the expansion and potential market! *Pittosporum tobira* occurs near the sea on the western side of the three southern islands. It is also found in southern Korea and in China. What are the possibilities here for re-introduction of hardier material? I think they are tremendous. I could name 25 or 50 examples but I won't bore you in such a short time. Another example is *Xylosma congestum*. It, as far as I know, is not hardy much out of the milder parts of California. We grow this, as a "tall" ground cover. It is used for mass planting, often pruned or sheared one way or another to hold to a height of two or three feet. There is a problem with the nomenclature and identity of this plant. A check of the more common references list it as *X. congestum, X. senticoscem, X. japonicum, X racemosum* and *X. r.* var. *pubescens.* It is described variously as a small shrub, shrub or small tree and tree to 80 feet. Similar confusion exists as to its habitat e.g. southern Japan, Formosa and China, versus Japan, Korea and east to central and west China! If it occurs in the mountains of Korea or in central and west China we certainly should be able to introduce ecotypes of much greater hardiness! The variation suggested in the descriptions also sounds exciting. Dr. "Chinese" Wilson said it was one of the most handsome evergreen trees of China. Yet we grow this as a shrub. However, some plants in cultivation become tree-like if not pruned. I suppose we are missing out by not re-introducing xylosma from Korea and if possible China. In fact we are probably overlooking a real goldmine.

I'd like to come back to what I think is the most fruitful area of plant introduction in the future, the area of thorough and intensive ecotypic study of some of our better plant species. Many of our species have rather wide range in nature. Many have been introduced from rather limited areas. An example is *Cedrus deodara* which is native in the Himalayan Mountains. A look at the map will suggest to us that our introductions of this plant probably comes from around Lake Cashmere, which is a rather mild, moist valley, in the Himalayan Mountains. This is the area where civilization and the species come together around the lake and where it is used, as I understand, as floats for the house boats on the lake. This is probably the mildest of the climatic range in which this plant is native. The range of this species goes to Afghanistan into mountains a good many thousand feet above the elevation of Lake Cashmere as near as I can tell from an atlas. Presently *Cedrus deodara* is limited to the Pacific Northwest and California, and the southern tier of states. I predict that we might be able to introduce *Cedrus deodara* into Denver, Colorado, or at least Chicago, Illinois, with proper selection. What does this mean in terms of the wholesale nurseryman's market?

An example of a pine that has been very satisfactory in California, in terms of drought tolerance, heat and smog resistance is *Pinus halepensis* and its allies. This plant is native throughout north Africa, the southern interior of Spain, France, Italy, the Balkans, Greece and the islands of the Mediterranean. Its variety *brutia* which has now been given species rank, *P. brutia,* continues into Turkey, the mountains of which I understand get pretty cold. Another form of the *P. brutia* is native in Crimea. I understand the British froze their ears off there, a hundred years ago or so. It extends even further, to the Caucasus Mountains on the eastern shore of the Black Sea.

Where do our plants of Aleppo pine come from? Apparently they come from different seeds source because the Aleppo pine along Foothill Boulevard in Glendora, is the most straggly looking kind that I have ever seen. Most of the *Pinus halepensis* grown in Davis are not at all like those in Glendora.

Some are very dense, upright, almost columnar or narrow vase-shaped forms and some are intermediate in form. These pines have been planted at different times, have come from different nurseries and probably different seed sources. We have made a little sampling from some commercial sources of *Pinus halepensis* and *P. brutia* and a tremendous difference could be seen in two or three year old plants; some of them were single stem, horizontal branched, nice erect little plants and others are scrawny and straggly, similar to the Glendora form. We have perhaps ten plants each from five different sources. In three or four of the sources, the plants within the source are quite uniform. In one or two of the sources the plants are quite variable within the source. But all the sources vary from one another to considerable extent. This encourages us to think that in a matter of three or four years we can make predictions about the growth patterns of these pines, and by going to the laboratory with hardiness tests we can come up with some firm recommendations as to seed source to give plants of particular form and hardiness.

In cooperation with the U. S. Forest Service (Pacific Southwest Forest and Range Experiment Station) we have obtained about 40 to 45 different seeds sources of *P. halepensis* and *P. brutia* representing the whole range, east to west and sea level to the high elevations. These plants are now two years old. Distinctive differences are showing up already. Some of the seed lots were grown at the Institute of Forest Genetics at Placerville. The winter of 1967-68 was colder than normal and differences were apparent in the seed rows at Placerville. On some lots, the tips were burned back, in others the needles were just brown and the tips didn't die back. Certain seed selections had 1/3 to ½ mortality, and others came through with flying colors with no sign of injury whatever. The possibilities here are most promising and I think that in about one more year some definite conclusions can be drawn. I predict that we will have *Pinus halepensis* which are much better adapted to specific uses than we have ever known before in California. We may even have selections suitable for use in Washington, Oregon and other areas.

This distinct variation occurs even in species with very limited natural range. I will conclude with a brief discussion of one such species, *Pinus canariensis,* which is restricted to the Canary Islands. If you were a seed collector and went to the Canary Islands or if you would write a seed collector there for seed of this species, where would you get the seed from? I think if the collector was like most of us he would get in his car or pony cart depending upon his degree of wealth, go out of town until he came to the first stand of *Pinus canariensis* and collect the seed. Those would be at the lowest elevation where the species occurs on the Islands because the cities are all down on the coast. The seed might come from any of four islands. But on the largest island of the Canary Island group, *Pinus canariensis* actually occurs above snow level. We think of it as being tender as cold will burn Canary Island pine at Davis at 22 or 20°F sometimes. And yet it does grow in its native habitat above snow level. One might think that because this species is restricted it might not be very variable.

Through the Forest Service we have obtained 16 sources of the Canary Island pine representing almost every two hundred foot elevation interval and representing each of the islands and some windward and some leeward stands (i.e. wet vs. the dry sides of the islands). From these seed sources we are already picking up rather dramatic differences in growth habit. We are quite certain that differences in hardiness exist here. About 10 of the selections were grown at Placerville and the same cold weather in 1967-68, that gave some injury in *P. halepensis* resulted in apparently severe injury in the *P. canariensis*. We left the plants in place during 1968. By the end of the growing season survival ranged from over 90% to 0%. Two facts were readily apparent: 1) with one exception hardiness increased with elevation, and 2) plants from any given elevation on one island differed in hardiness from those at a corresponding elevation on another island.

Growth differences varied from broad, bushy plants in some collections to narrow upright or columnar plants in other seed lots. Some seed lots grew nearly twice as fast as others. And from our relatively small planting we have several forms that may develop into cultivars because they are dwarfs, golden foliaged sorts, etc.

In closing I'd like to repeat the analogy, this is gold country. What we've found so far are just the nuggets and we've only started to tap the real mother lode.

WALTER KRAUSE: Thank you Andy. Are there questions for Dr. Leiser?

LARRY KNOWLES: What would be the effect of taking seeds and cuttings from high mountain areas to low elevation areas for propagation and then taking the rooted cuttings and seedlings back to their original site at high elevation?

ANDREW LEISER: If the new plants are not taken back to high elevation too early in the spring or too late in the fall when frost or cold temperatures would damage the unhardened plants propagated at low elevation, there should be no problem with survival and growth.

Plants taken from high elevation to low elevation may grow better at low elevation than the same species of plant from the lower elevation. However, I doubt that you can take a species of plants from the milder climate and have as much chance of success in the more rigorous climate.

HOWARD BROWN: In regard to the topic that is being discussed, I would like to mention that the Carnegie Institute at Stanford University is doing a study on *Mimulus* where they take plants from a number of elevations and test them under greenhouse conditions. This work has been published by Dr. Heisy of the Carnegie Institute.

RALPH JACK: I have found that *Abies magnifica* or silver tip fir from 8500 feet elevation in the Sierra Nevada mountains back of Fresno does very well in Silvertown, Oregon. This observation follows the botanical rule that a given number of miles north is equivalent to a given number of feet elevation.

UNIDENTIFIED SPEAKER: Christmas tree growers in the Dakotas who buy black spruce seed from the southern limit of the spruce area are getting very poor shapes, with branches far apart. Seed from the northern part of the spruce area gave very good shapes. This was probably a difference in the response of the two types to daylength.

WALTER KRAUSE: Our first panel this morning is on roses; this is a subject dear to many persons hearts. The moderator for the panel is Dr. Tok Furuta of the California Agricultural Extension Service. Tok.

TOK FURUTA: Thank you, Walt. You are right on the fringe of perhaps one of the greatest rose growing areas in the country. I am not sure if we surpassed Texas yet or not, but we have come pretty close to it if we don't. We have a very great concentration of rose growers about 100 miles south of Fresno and we have a few others in the state of course. There is one in northern California and we still have one back in the southern California.

I should like to open the panel by asking you a few questions about rose plant production.

AN APPROACH TO ROSE PLANT PRODUCTION

TOK FURUTA
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What is the role of diggers, nippers, or chicken pickers in the production of dormant eye, started eye or two-year rose plants? And is there a relationship between fertilizers and the type of diggers in rose plant production? Many questions such as these should be answered by each producer and consultant because the production of rose plants depends upon the economical functioning of a balanced system of production, and the system functions efficiently only when these questions are adequately considered.

The production process or system currently used for started eye and two-year rose plants may be subdivided into approximately 12 major stages or steps. (For dormant eye plants, a step (9 below) is omitted.) These are:

1. Preparation of the land.
2. Gathering, processing and lining out understock cuttings.