

ral meeting in December 1976, in Mobile, Alabama. There were two devoted IPPS members who shared the keynote comments at this meeting. Bill Curtis, from Oregon, and Jim Wells, from New Jersey. Both these gentlemen have served this Society well and they are certainly dedicated members. The remarks of both these gentlemen were to explain the background and the history of the Society, and they were ably assisted by Bill Snyder, who also was a guest at this meeting. The presentations at their first and second meetings are printed in the Combined Proceedings, Volume 27, dated 1977. The Southern Region is growing rapidly; the International Board met with them at Huntsville, Alabama, in 1980.

We have seen the Society's history in a brief summary of the founding of Regions and Chapters-at-Large. The agenda for the International Board Meetings for the past 4 to 5 years has shown interest from other propagators throughout the world, as to the establishment of a Region in their locale. Hours of deliberation and counsel have gone forth to these interested parties and, in fact, such a topic was on the agenda of the International Board meeting yesterday.

Our Society is strong and viable due, in part, to a blend of the academic and the commercial member. Each benefits the other for obvious reasons. We practicing propagators need the results of testing and experimental work done in various university laboratories. The scientist member needs the application of his or her research conducted in the field under commercial practices. The one key to the success of our beloved Society is member sharing. So we have come 360 degrees around again to our motto, "To Seek and To Share".

Pertinent to this topic, Henry David Thoreau, writing in 1854, said as well as anyone possibly could: "I wish to live life deliberately. I wish to learn if life proves mean, why then to get the whole and genuine meanness of it; or if life were sublime, to know it by experience". That, ladies and gentlemen, is the International Plant Propagators' Society creed in words written long before the development of the Society. We all share one common goal — by bettering ourselves, we enrich all mankind.

PLANT PROPAGATION FROM A UTILIZATION VIEWPOINT

JOHN A. WOTT

*Center for Urban Horticulture, AR-10
University of Washington
Seattle, Washington 98195*

Beginning in the 1960's and continuing into the 1970's, Americans became increasingly concerned about their envi-

ronment. Even though these environmental concerns have fluctuated along with the reorientation to our economic and resource management issues, the concern for our environment continues into the 1980's. Let's begin by thinking about the changes which have affected the horticulture "world" (6).

First, we have witnessed a return to home fruit and vegetable production. This interest has helped to spawn such organizations as "Gardens for All" and the new "American Community Gardening Association". Then too, land for parks and "green areas" for everyday enjoyment is now a commonly accepted part of community and residential planning.

Those of us who work with the public have witnessed the almost overwhelming demand for information on the selection, use, and maintenance of plants in our everyday lives. Plant societies, many with specific plant identities, have appeared in large numbers.

Never before have Americans bought and used more bedding plants for summer color. Today we see a renewed interest in perennial flowers, as well as a concern for low maintenance landscaping. Also the rapid growth of suburbs and business complexes has created a demand for landscape architects who can design a more pleasing atmosphere in which we live and work.

We are all aware of the tremendous growth in our nursery production industries, many of which now produce thousands of identical plants in efficient complexes. Once planted, there developed the need for maintenance companies to keep these landscapes esthetically and functionally alive. Many municipalities, e.g., Seattle, have hundreds of maintenance companies ranging in size from "one-man, one-truck" operations to large sophisticated companies.

Urban Horticulture. One of the newest changes in horticulture is the number of academic and public institutions which are creating programs called "urban horticulture." It is described by Harold B. Tukey (5) in remarks at the XXI International Horticultural Congress in Hamburg, West Germany.

"A new science of horticulture — Urban Horticulture — is emerging spontaneously in many parts of the world. It is concerned with research and education on the functional uses of plants to maintain and enhance urban areas. Whereas most horticultural departments and institutes emphasize production of horticulture plants and products, urban horticulture is concerned with the problems of those who utilized landscape plants."

Since an increasing number of people will be living together in more confined areas, the science of urban horticul-

ture will have implications that will affect most aspects of production horticulture; thus, urban horticulture will need to concern itself with plants for beauty and ornamentation as well as functional use. For example, the science must consider which plants are suitable for screens against wind, headlights, and unpleasant views (3). Which plants will reduce noise and air pollution? Which plants can be grown for both esthetic and culinary purposes? Are some plants more suitable for improving the human psyche in densely populated areas? Thus, the urban horticulturist will be seeking plants based on their specific useability.

In most modern departments of horticulture, the research deals with relatively few economic crops. Furthermore, little research has been conducted on the large number of landscape plants. There has been even less research on how these plants grow in landscape situations. It's interesting to note that academic institutions such as the University of Washington, as well as botanical gardens such as the New York Botanical Garden, have both recently established urban horticulture programs.

In urban horticulture programs, some emphasis will be placed on traditional-type research and teaching. But a vital part of these programs will be the mechanism to disseminate appropriate information to the people who will utilize as well as produce the appropriate plants. The flow of information must be a "two-way" street, aimed at the producer and consumer at similar times. It makes no sense to recommend a plant, only to find it is not available in the nursery trade. Likewise, it's not economically feasible to grow a plant which will not sell.

Much of the research in urban horticulture departments may differ from that now used in production agriculture. In production agriculture, uniform plants of a single cultivar are grown in large numbers in controlled conditions. This provides plants of similar size, flowering, and harvest time so that efficient production systems can be determined. This has been the mechanism by which our large nurseries now grow.

But in urban settings, plants are grown alone or in small groups in constantly changing environments. Many garden plots may contain over 100 species. In these sites, research on individual species is virtually impossible with conventional techniques. However, the computer modeling technique for individual plant growth may prove to be the method by which plant growth and response can be predicted for urban environments.

Plant Materials and Breeding. One of the most important

areas of concern in urban horticulture will be plant materials and breeding, where the plants will be studied for their beauty and function (4). This will include the traditional areas of horticultural taxonomy, plant collection and dissemination of new introductions, and plant evaluation. But in urban landscapes more attention will be given to cultivars and botanical varieties than to species. This will help to organize the myriad of "introduced" plants now offered to the gardening public.

We must also recognize the importance of amateur horticulturists who collect and often breed new cultivars. The trained taxonomist is needed to study and categorize these plants so they can be introduced, successfully classified, then propagated and used in the urban areas.

The increasing need for specific landscape materials will also cause landscape architects to need further assistance in selecting landscape plants to fit more defined requirements such as color, texture, form, size, low maintenance, pest resistance, and tolerance of environmental conditions. Again, the computer-age with its databased management systems may be of utmost help in categorizing what we already know or will need to know about plants in order to quickly select appropriate plants for design.

The Plant Propagator. What are the implications for the production industry, or more specifically, what are the implications for the plant propagator? First, we have noted that urban plants must be esthetically pleasing. Artisans and knowledgeable horticulturists have long extolled the enriching and therapeutic virtues of plants. The time has arrived when horticulturists will combine forces with the psychologist, the artist, and the landscape architect to quantify in scientific terms the total effect plants have on humans.

For example, horticultural therapists use plants in rehabilitation programs for the physically and mentally ill. Growing plants has a positive effect on social interactions in ghettos and prisons. Also, initial studies show lower absenteeism in offices with plants. Thus, a landscape design of the future may list the therapeutic requirements of the plant along with its seasonal and cultural requirements. This entire aspect of plant acceptance is almost totally unexplored. For the propagator, he or she will be asked to propagate those plants which have therapeutic value.

Esthetically Pleasing Plants. Along with the therapeutic considerations of the plant is its general esthetic appearance. The weird and often grotesque characteristics which graft incompatibilities form are often esthetically displeasing. For example, the rootstock used on certain flowering Japanese cher-

ries often outgrows the scion. As the public becomes more sophisticated in its knowledge and taste, they will be more critical of such plant growth habits. This means that if we desire to continue the use of the scion cultivar, we must find a more satisfactory, probably self-rooting method, for its propagation and subsequent growth in the urban environment.

Graft Incompatibilities. Another problem arising from the use of grafts is the long-term stability of the graft union. Trees used in the urban environment must meet the rigors of the people-pressure syndrome. For example, can the tree (or shrub) withstand the constant "tugging" on its branches by children? We are all familiar with the desirable new cultivars of *Acer rubrum*. Esthetically, they are marvelous. However, from the useability viewpoint, the eventual breakdown of the graft union limits their use in an urban planting. Will propagators need to produce it on its own roots?

Environmental Conditions. The environmental conditions within the city limits are composed of many microclimates. For example, the city of Seattle is built on many hills, hedged between Puget Sound and the Cascade Mountains and sheltered by the Olympic Mountain range. Add to this already complicated natural environment the man-made buildings, tunnels, and roads. Thus, the number of microclimates in this city becomes even more complicated.

Research will eventually tell us the best plants for even these many varied microclimates. In order to do this, we will need to return to a larger base of plant materials, selected from many seed sources. A flowering dogwood in a specific city microclimate may need to be from a specific geographic seed source. This may explain why dogwoods from southern collection sources may survive on south, protected slopes, but will suffer damage on north or higher slope elevations.

In the urban environment, plants will be selected to meet very specific growing conditions. As William Flemer III recently indicated in *The American Nurseryman* (2), the following are some of the concerns for environmental selections:

1. the width of the mature tree, and more specifically, the crown area,
2. the root space needed to support the crown growth,
3. how to maintain proper soil oxygen levels in heavy compacted traffic areas,
4. tolerance to de-icing salts and other soil/plant applied pollutants,
5. plant selection of size and type to avoid vandalism and urban destruction,

6. protection of trunks from people and their "mechanical toys",
7. tolerance of utility lines, construction, repairs, and
8. tolerance of air pollutants, and temperature-light effects.

Narrow Selection Base. As indicated, one of the greatest concerns for the urban horticulturist is the narrowing selection base for plant materials. In a survey published in 1981, James Clark (1) contacted 12 large nurseries about their shade tree production. Between 1960 and 1985, the average number of trees produced will increase by 109%. However, the percentage of the trees produced by seed will decrease from 41% to 29%. Clearly there is a steady trend away from seed propagation. In red maple, for example, 80% of those grown in 1985 will be of six genotypes.

This trend away from seed propagation will narrow the genetic base of material left to us for selection and use in landscape plantings. How many of us in our nurseries have actually increased the number of cultivars of a specific plant available over the last decade? Probably not many. This means that the genetic base of plant material kept at the many arboreta, botanical gardens, or even amateur enthusiasts will be of even greater importance to urban plantings in the future.

In urban areas where trees may already be stressed, foreign organisms may cause devastation. Consider the implication of the Dutch Elm disease. In most cities, city arborists are now advocating the planting of many different kinds of street trees rather than avenues and avenues of the same kind of tree.

Modern Technology-Efficiency. The trend away from seed propagation has arisen because improved cultural techniques and research results have facilitated the use of asexual propagation methods such as grafting, cuttings, and most recently, tissue culture as a propagation tool. Equally, the demand for specific desirable clonal cultivars has stimulated interest in these asexual propagation methods. Our industry has basically been concerned with the ease of propagating, i.e., the best (or the least expensive) method for putting roots on a plant. We have generally streamlined our production facilities to handle thousands of a limited number of kinds of plants. In contrast, in the future, plants used in the urban environment will also be selected for their useability. The challenge for all of us is how to use the commonly accepted methods of propagation to produce the desirable plants for urban environments.

Monitoring of Modern Methods. As with the long-term desirability of grafted plants, so too will continued testing be needed on all forms of modern propagation, specifically on

tissue-cultured plants. We hope that after years of growth in the urban environment plants produced through tissue culture techniques won't "break apart" like some graft unions.

Plant Quality. The user of plant material is very much concerned about the quality of the plant materials which are propagated, grown on, then sold to them in the trade. A general survey of plants sold still shows too many plants with "curled" roots, too many pot-bound plants, and too many which are improperly pruned. If each of us is doing the proper job of propagating and producing plants, then why does the biggest loss of plants occur when they change hands from the retailer to the customer? Is it all the fault of consumers mishandling them? I think not!

CONCLUSIONS

Propagation from a utilization viewpoint will necessitate that we again move into other areas of plant selection in order to widen our base of plant availability. This implies then that attention will again be focused in greater depth on producing "difficult-to-root" types which have largely been eliminated from most plant propagation operations. True, the total number of these plants which will be needed may be small, but it will necessitate the re-establishment of specialist producers. Thus, there will be a need for producers who will produce large numbers of a limited number of kinds of plants, and also smaller producers who will produce a smaller number of a larger variety.

In addition, we will also need to develop superior trees and shrubs through selection and breeding, so the advantages we desire in a conal cultivar can be incorporated into a seed-producing plant.

Growing plants or gardening is one of the safety valves of society, particularly in the pressure atmosphere of modern cities. The basis of gardening in urban areas includes knowledge about plant selection, culture, pests, maintenance, and ecology. As people are increasingly crowded into dense clusters, the need for understanding growth of plants within cities and the effects of these plants on human beings becomes critical.

Thus, the plant propagator will need to concern his/herself with providing plants that are suitable for the people-pressure urban areas. The modern propagator will consider not only the rootability of the plant but also its useability. In urban areas the useability is fast becoming a very important factor in plant propagation and selection.

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SETTING OBJECTIVES IN A PLANT PROPAGATION COURSE

RICHARD A. CRILEY

*Department of Horticulture
3190 Maile Way*

University of Hawaii, Honolulu, Hawaii 96822

One educational principle is that learning is a function of perseverance, time, and teaching. The first component, perseverance is largely a personal characteristic of the learner as modified by his personal experiences and motivation. The second component, time, can be a limiting factor both when there is too little time or when there is too much (procrastination). This factor is elastic in that we can modify it.

The teaching component is complex. Whole curricula are based on the development of teachers. There are many aspects which must be studied, and the application of education theory to educating students is a practical result.

In agriculture, and specifically horticulture, we do not teach in formats designed by professional educators. Our methods follow a basic lecture and laboratory format and only occasionally do we reach out for different ways of doing things. Our clients in industry (= employers), on the other hand, are bombarded with new concepts: zero based budgets, management by objectives, systems analysis, etc. The feedback we receive from them is often contradictory to what we "educators" perceive as necessary in our product, the student.

How should we cope with the multitude of needs as perceived by us, by the employers, or by the student?

Those who have studied the processes of learning tell us, not unreasonably, that people learn best when they know