The Symbiosis of Plants and People

The 1973 B.Y. Morrison Memorial Lecture

AGRICULTURAL RESEARCH SERVICE · U.S. DEPARTMENT OF AGRICULTURE

The B.Y. Morrison Memorial Lecture was established by the Agricultural Research Service of the United States Department of Agriculture to recognize and encourage outstanding accomplishments in the science and practice of ornamental horticulture . . . to encourage its wider application to improve the quality of living . . . and to stress the urgency of preserving and enhancing man's environment.

Lecturers meeting these standards of achievement and capable of giving effective voice to vital environmental messages are chosen from nominations submitted to a formal selection panel established by the Department. Nominations are obtained from scientific societies and other professional associations, foundations, universities, and previous lecturers. Each platform is selected to provide a distinguished audience, and to promote an exchange of ideas among leaders working to improve our environment. The texts of these lectures frequently are reprinted in . popular and professional publications.

B. Y. Morrison (1891-1966) was a many-faceted man—a scientist, landscape architect, administrator, plant explorer, author, and lecturer. A pioneer in ornamental horticulture, he was the first Director of the National Arboretum, today one of the world's great botanic research and education centers. He gave the American public dozens of new ornamental plants, including the well-known Glenn Dale azaleas. He did much to advance the science of botany in the United States.

Morrison's plant exploration trips to the Orient, Europe, and Latin America made him a nationally known authority on foreign plants. He was one of the first Department officials to encourage introduction of ornamentals. His popular publications were among the first to promote plants to enhance the beauty of the land.

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The Symbiosis of Plants and People

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Garden writers recognize that the best columns are both informative and entertaining. If writing lacks these qualities, readers soon turn to more appealing prose. Although a good writer can make the most common practice interesting, he can communicate most easily when he has a topic that has, in itself, wide appeal. Horticulture is such a subject—involving plants and plantings, water and soils, air and nutrients, sunlight and photosynthesis, perspective and arrangement. In my opinion, today's society offers us a receptive audience—an audience to whom we can communicate the importance of the living plant.

Understanding living plants and man's relationship to them helps us to understand societies in transition. Let's reflect, then, on the symbiosis of plants and people, in the past, the present, and the future.

Man — The Gatherer

This historical sequence began with man who was primarily a gatherer. He gleaned much of his food by collecting seeds, fruits, roots, honey, herbs, tubers, and grubs. His existence was based on an understanding of the sources of plant food—where and when plants grew, which ones were edible, and how they were stored. He hunted and later raised domestic animals, but these, too, were directly or indirectly dependent on plant life. Societies prospered as people learned to work together, know their environment, and communicate that knowledge to their descendents. Societies and associations were formed because of the safety of numbers and the need to combine individual talents to acquire the basic necessities of life.

Tribes became communities. Communities became towns. Towns became cities. Provision for man's physical needs—shelter, food, water, and energy—was paramount throughout the early development of human communities. Less obvious was the satisfaction of man's social needs—communication, recreation, culture, beauty, and mobility. Societies that provided these needs in great abundance flourished and earned a remembered place in history.

The burgeoning of populations in large cities during the past several centuries has been a mixed blessing. Our modern cities provide great variety and access in terms of employment, recreation, education, and other desirable pursuits. The pace of living is stimulating for many.

On the other hand, space and beauty, the serenity of traditional landmarks and customs, and personal contact with the biological environment are often missing from our metropolitan areas. City dwellers are victims of overcrowding as well as the unchecked growth of concrete canyons.

Technology and Science

Technology—man's collective ability to apply knowledge to the practical problems of providing food, shelter, and substitutes for "manpower"—has given us the so-called "better life" of the modern world. Technology has modified our relationship to the biological environment, including plants, and the physical environment encompassing the forces of energy, the minerals of the earth, and electromagnetic radiation.

As a nation, we have been captivated by science with its attendant technology, and have chosen to measure progress in terms of economic and other material growth. Today an increasing social consciousness attempts to define the more evasive qualities of a model society and to relate them to man's aspirations. There is a world-wide effort to assess the net effects of past technology on many aspects of society. These indicators provide a basis for decisions concerning development of future technology. There is general agreement that decision makers must realign their values, giving less weight to short-term economic considerations and more weight to the long-term maintenance of a quality environment.

Among the social indicators that have been identified, many relate to man's environment, land use, pollution, and the relationship between man and plants. Years ago, we established daily minimum nutritional requirements for sustaining life. But what are the minimum requirements for parks or flower gardens necessary for human well-being and enjoyment? And how do we evaluate the satisfaction gained from bringing a Christmas cactus into bloom or propagating an African violet or causing forsythia to flower in early spring?

The recognition that one day there might indeed be a silent spring if modern civilization failed to recognize and correct its collision course with nature started people thinking about the common good. The urgency of the problems facing society led to formation of new Federal agencies responsible for hammering out, among other things, an assessment of the environmental impact of today's technology on man. These agencies also were charged with developing ways to moderate our continual insults to the environment.

Guidelines published this summer by the Council on Environmental Quality underscore the Council's determination to fulfill its Congressional mandate. The thrust of these guidelines is that agencies must "view their (proposed) actions in a manner calculated to encourage productive and enjoyable harmony between man and his environment, to promote efforts preventing or eliminating damage to the environment and biosphere, and stimulating the health and welfare of man, and to enrich the understanding of the ecological systems and natural resources important to the nation." Further, the Council strongly recommended objective consideration of alternative actions that might minimize the adverse impacts of new projects affecting man and nature. In essence, these working documents focus on man and plants—on man's surroundings both indoors and outdoors.

Making Choices

As Federal regulations are developed and implemented to moderate or eliminate the use of previously unrestricted technologies, those engaged in the cultivation and production of plants will be faced with making alternative choices, some economic, others less tangible. A few highly

susceptible cultivars, maintained only by frequent application of pesticides, may be eliminated from our inventories. Less effective methods for controlling pests may have to be used.

Perhaps the new constraints will spur development of more tolerant or resistant varieties and of less persistent, biodegradable chemicals or systems of control that integrate timeliness and threshold concentrations. Whatever the specific outcome of these new trends, the enormity of the problems facing us demands that all segments of society address the problems objectively and openly. The question is not, should we, but rather, *how* do we reach the goal of a "productive and enjoyable harmony between man and his environment"?

Quality of life, a term often used, but difficult to define, represents an aggregate of physical norms and human values that satisfy an individual's material, spiritual, and social needs. It involves a person's health and safety, his education, human habitat, freedom, harmony, and justice. Quality of life is a judgment based on one's values—material and social—that meet one's needs.

If uneasiness, frustration, and disillusionment are the antithesis of a desirable quality of life, then there is evidence suggesting that many Americans are dissatisfied with their present status. This past summer, for example, a Gallup Poll reported that "The mood of America at midpoint 1973 is one of disillusionment revealing a serious lack of confidence in key American institutions." Other surveys indicate that nearly 80 percent of the working public are frustrated with their present employment. And, whether it is symptom, effect, or treatment, millions of people clog highways on weekends, hoping to find, somewhere along the endless concrete ribbons, a little open space conducive to rest, relaxation, and a change in mental attitude.

The specialization inherent in so much of our society and economy creates a barrier that prevents us from seeing a project through from gestation to completion. It is therapeutic to relate to the whole cycle of nature; for example, when we plant and nurture a seed, then watch it grow and come to fruition. This sequence provides a reward and a sense of accomplishment that is difficult to evaluate economically, but is nonetheless real. The right of an individual to enjoy such experiences, to live in an environment that attracts and stimulates rather than repels and dulls the senses, cannot be implemented by a legislative act alone. Economics and desire must be melded into a finished product.

The challenge is to develop a society that recognizes the benefits of an intimate partnership among plants, people, and the physical environment and gives full value to a landscape planting, an arboretum, a vegetable garden, or manicured lawn space. This evaluation should involve not only aesthetics but also such considerations as the conservation of energy afforded by a canopy of foliage or a windbreak, the effectiveness of plants as pollution sinks, and the use of plantings as visually appealing noise barriers. But these ideas will prevail only if people like you—with conviction, with know-how, and with dedication—work cooperatively to educate the public and influence the decision-making process at the policy and legislative level.

The need for cooperation and participation reminds me of the old man who bought a rundown house. With hard work and sweat, he rebuilt the basement, painted the house, pulled out the overgrown junipers, rebuilt the lawn, sprayed the weeds, and built a rock garden. It was beautiful. One day his pastor came by and said, "Henry, you and the Good Lord have made this home a place of beauty." The old man took off his sweat-stained hat, wiped his brow, looked his pastor straight in the eye, and said, "Pastor, I know you're right. But, on the other hand,

you should have seen this place when the Lord was trying to do it all by himself!"

Don't misunderstand me. A return to nature divorced from man's efforts is not what I envision. I'm not advocating a renunciation of technology. As a horticulturist, I prefer the beauty that the old man created by working intelligently with his natural surroundings, molding them into an aesthetically pleasing and practically useful form.

But for millions of our citizens—city-born, city-educated, and city-oriented—each generation heralds a lengthening separation from nature as embodied in the vastness of our remaining wilderness areas, the familiar contours of our rural countryside, or the cultivated harmony of a rock garden. For many people, the countryside has narrowed down to plantings along the interstate, a murky horizon filtered through jet exhausts, or crowded picnic areas where nature is tolerated rather than cherished. The symbiosis of plants and people is simply not visible to or appreciated by many who have not experienced the countryside.

Restricted Vision

As man has accumulated knowledge about the growth and development of plants and applied it in the field, the science underlying today's agricultural technology has become increasingly complex. It has fragmented into new fields of knowledge or plant science disciplines. This specialization has narrowed our focus and encouraged inbreeding to the point where many of these new subsciences are so encumbered by minutiae that, for specialist and layman alike, a vision of the totality of man's interaction with plants is often lacking.

Because nature is not, after all, divided into academic departments, the challenge for us is to bring together these bits and pieces—looking not just at the nucleus and the enzyme, nor only at the trees and the forests. We must

focus again on the totality—the overall view of the total environment and man. It might well be the broad-based horticulturist who, recognizing the need for compatibility between plants and their environment, can integrate the disparate pieces of essential knowledge found in the basic plant sciences. In this way, he will create an aesthetically acceptable viewpoint from a crossbreeding of ideas.

Genetic Engineering

Improved crop and ornamental cultivars, while in part the result of varietal improvement, are also the product of the concurrent improvement of the production environment. This process involves the whole management system, from planting through harvest. Pressures on production in the immediate future will lead to increased plant densities, closer-spaced rows, and more elaborate equipment to harvest large acreages of crops with uniform characteristics. But the outbreak of the potato blight in Ireland during the 1840's, Dutch elm disease in the 1940's, and, more recently, the rapid spread of Southern corn leaf blight through the productive heartland of this country, vividly underscore a basic ecological concept that uniformity breeds instability.

The narrow genetic base of nearly all our major crops makes them vulnerable to attack from pests. This vulnerability, combined with recent cropping patterns characterized by large contiguous acreages of a few crops, means that horticulturists and agriculturists alike can no longer depend on one resistance gene, one pesticide, or one cultural practice to stem the wildfire spread of pests. The long-term stability and protection of our crops depends upon the judicious combination of various pest-control techniques, including the incorporation of new germ plasm available through induced mutations or natural variation.

In nature, the introduction of exotic germ plasm has

played an important part in plant evolution. The process of evolutionary change under natural conditions is slow. But plant breeders, using a knowledge of genetics, have successfully transferred single genes or chromosome segments via the translocation mechanism and recovered crosses from widely divergent interspecific matings as well as from similar cultivars. In crop and ornamental plant breeding, however, the challenge is to incorporate the desirable features of the parents into a composite in a relatively short time. The wisdom of such men as B. Y. Morrison, therefore, becomes even more significant today as plant introduction and plant exploration programs take on new importance. The idea of locating, introducing, testing and disseminating exotic plants, fostered by others such as David Fairchild, emphasizes the need to move rapidly toward establishing international germ plasm banks to encourage closer working relations between the community of nations.

The options available for developing new crops and ornamental plants became more numerous as the processes of reproduction and inheritance became better understood. Similarly, the objectives of breeding have broadened to include such attributes as increased plant numbers, better response to applied nutrients, more efficient use of water, multiple resistance to plant pests, higher nutritive values, improved photosynthetic ability, and lower photorespiration rates.

Time for Adjustment

With progress, hand labor has been replaced by machines and other technologies—the substitution of capital for labor. We have substituted continuous cropping for rotations and nitrogen fertilizer for legumes. We have substituted selected, high-yielding germ plasm, which responds well in highly-specialized environments, for the broader-based,

more flexible, but lower-yielding germ plasm of our former cultivars. Today, faced with an energy shortage and greater demand for nitrogen by world markets, there is a strong possibility that supplies of this essential plant nutrient for the American farmer, horticulturist, and homeowner will be curtailed. With the recent emphasis on pulling out the stops on production, including the cultivation of marginal lands and the more intensive culture of crops, it is evident that the production community will soon be faced with alternatives. Coupled with more stringent standards for controlling point and nonpoint runoff, there will be a greater need to monitor the application of all plant nutrients to insure optimum plant growth commensurate with plant utilization—a need to take out the guesswork as well as the tendency to be overcautious.

The restraints on our present technologies, necessary to obtain the goal of a "productive and enjoyable harmony between man and his environment," probably will lower agricultural productivity unless we find alternatives to some of today's production practices. We might, for example, use more trap crops as a means to control pests. Or we might plant early germinating cultivars that quickly form a dense canopy capable of crowding out weeds before they become established. In some regions, we might go back to rotation as a tool to build soil fertility. And we can give plant breeders the admittedly difficult job of breeding into our high-yielding strains the old-style flexibility of earlier cultivars. These earlier cultivars could compete with weeds, pests, and other vagaries of their natural surroundings without the aid of man's technology.

A Closer Partnership

In the delicate balance between man and plant, horticulture might well point the way to both increased food production and improved quality of life. Horticulture is a blending of science and art, logic and ritual, nature and

man. Horticulturists integrate the diverse materials of the biological and physical environment—knowledge gained from scientific investigation, and from aesthetic sensitivity —into an interacting whole that is a testament to the partnership between people and plants.

Our society cannot, of course, retreat to the idyllic country life extolled by Virgil when he wrote, before the birth of Christ:

> "A harmless life that knows not how to cheat;
> With home-bread plenty the rich owner bless,
> And rural pleasures crown his happiness.
> Unvexed with quarrels, undisturbed with noise,
> The country king his peaceful realm enjoys."

But if we could look into the future, we might find our cities designed to interact with and complement their natural environment rather than shutting it out. In the countryside, conservation practices would be the rule, with land shaped to preserve the soil and conserve moisture. Streams would run clear, and the byproducts of agriculture would be considered valuable assets as they were recycled into production systems. Breeder reactors would fuel the thermonuclear plants. The effluent water from these plants would provide energy for adjacent greenhouses producing year-round crops. These crops would be transported to nearby markets via hooded belts.

The challenge today is to plan for tomorrow. But only if we truly appreciate and understand the vital role of plants in our world, will we be able to plan wisely for the continued, productive symbiosis between people and plants. And only if we recognize the human dimensions of progress will we be able to apply what we have learned so that this knowledge may light the way to a better tomorrow—a tomorrow when society wisely uses the expendable in creating a house to live in and a garden to support our future.

Dr. John P. Mahlstede, the 1973 B. Y. Morrison Memorial Lecturer, is Professor of Horticulture and Associate Director of the Experiment Station in Agriculture and Home Economics at Iowa State University, Ames. Born in Cleveland, Ohio, Dr. Mahlstede received his bachelor's degree in botany from Miami University, Oxford, Ohio, in 1947. He was awarded his master's degree in pomology the following year and his doctorate in ornamental horticulture in 1951 from Michigan State University, East Lansing.

In 1957, Dr. Mahlstede became professor of horticulture at Iowa State University, where he taught plant propagation and nursery management and was in charge of the University's nursery research program.

He helped develop the use of polyethylene wraps for packaging dormant nursery materials and the technique of holding dormant perennials in frozen storage. He was cited by the National Mail Order Nurserymen's Association in 1955 and 1971 and received the Norman J. Colman Award from the American Association of Nurserymen in 1958 for outstanding research accomplishments.

He became head of the Department of Horticulture at Iowa State in 1961, a position he held until his appointment as assistant director of the Iowa Experiment Station in 1965. He was appointed associate director in 1966.

With the late Dr. E. S. Haber, Dr. Mahlstede coauthored the textbook "Plant Propagation" used by many universities. He has published numerous scientific articles and has contributed to the Encyclopaedia Britannica and the Grolier Encyclopedia.

Dr. Mahlstede's professional society memberships include: American Society for Horticultural Science (elected a fellow in 1969, president in 1971-72) ; International Society for Horticultural Science; American Association for the Advancement of Science; International Plant Propagators Society and the Iowa Academy of Science.

Previous Lecturers and Cosponsoring Organizations

1968 Mrs. Lyndon B. Johnson; American Institute of Architects, Portland, Oregon, June 26.

1969 Prof. Patrick Horsbrugh, creator of the Graduate Program in Environic Studies, Notre Dame University; General Federation of Women's Clubs, Cleveland, Ohio, June 3.

1970 Dr. Arie J. Haagen-Smit, Chairman, President's Task Force on Air Pollution; American Society of Landscape Architects, Williamsburg, Virginia, April 28.

1971 Mr. Ian L. McHarg, Chairman of the Graduate Department of Landscape Architecture and Regional Planning at the University of Pennsylvania; The Thirty-sixth North American Wildlife and Natural Resources Conference, Portland, Oregon, March 10.

1972 Dr. Rene Dubos, Professor Emeritus of the Rockefeller University; American Association for the Advancement of Science, Washington, D.C., December 29.

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