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FRONT COVER ILLUSTRATION

LILY 'Imperial Crimson' and 'Imperial Silver'—two representatives of the new strains of hardy and strong growing lily hybrids developed in the U.S.A. These fine new garden lilies are direct descendants of the famed $L. \times parkmannii$ hybrids produced by our American historian, Francis Parkman, exactly one hundred years ago. Because of their hybrid vigor, these new lilies will thrive in many gardens where their ancestors, L. speciosum var. rubrum and L. auratum could not survive.

PHOTO BY HERMAN V. WALL

BACK COVER ILLUSTRATION

Carmine-Rose Hybrid Polyanthus. Pacific Strain of Polyanthus Primroses developed by Frank Reinelt.

PHOTO BY VETTERLE AND REINELT



America Calls For "Educated Muscles"

Who will be tending the world's gardens twenty years from now? Who can better attract our young people into this attractive field than we ourselves? And if we don't do it—who will be caring for your garden and mine in 1989? (See AHS News and Views, Winter 1968-69, p. 4.)

The answer to this question starts with my conviction that the rise and fall of horticulture depends literally on its grass roots; that is, that training the young as professional gardeners is absolutely essential.

Today we are increasingly aware of the need in the United States for skilled gardeners. The source of supply on which we have so long depended is drying up. We have relied, since the turn of the century, chiefly on individuals who were trained in foreign lands and foreign schools, in Europe and the Orient, where gardens are a tradition and gardening is a way of life. Now, even abroad, this trained personnel is scarce, except for public or commercial ventures.

An essential step in revitalizing our supply of gardening artisans is the formation of something like a guild of gardeners to assure the gardening business the same benefits as those of a profession—among others, guaranteed salary and the aura of respect to which those who successfully combine artistry with technical expertise are entitled.

But before we can organize the gardening experts we have to create them, and they will be only as good as the means we provide to train them.

Many fine horticultural courses are offered in this country, but we need infinitely more. If we in horticulture will take the initiative in publicizing the splendid career possibilities of our profession, many more institutions will find ways to attract young people, via academic courses, into the horticultural field.

It is the aim of the Society's new educational program to help interested communities include gardening courses in school curricula from kindergarten on up, as has been done so long and so successfully in Cleveland. However, it will take many Clevelands to produce a supply of talent great enough to meet the ever increasing demand for more beauty for our homes, communities and cities. We must embark nationally on an accredited system of training; we must produce what I like to call "educated muscles" to fill the growing gap between academically trained horticulturists and "garden laborers."

Some of our famous gardens and park systems have their own training programs. But, as in Europe, this does not meet the general requirement for "home consumption". Programs such as those initiated at the Norfolk Botanical Garden (Norfolk, Virginia) and at Sandhills Community College (Southern Pines, North Carolina) represent measurable progress but they alone cannot solve our basic problem. We must multiply such schools a thousand-fold—and fill them to capacity. Every city should have a training program. These schools will find that their students will have jobs waiting for them and that many can work up to five-figure salaries. Greenskeepers, among others, now earn this much.

Every member of the American Horticultural Society should help ferret out and recruit young people who have an interest in plants, to encourage them into the kind of training that stretches minds while it strengthens muscles—and equips both mind and muscle to benefit from and to utilize plant life

To enlist the young in this day and age, we must glamorize horticulture. For you and me this should be an easy task, for what other profession do we recognize as having such potential for satisfaction,—the satisfaction of being able, through one's own skill, to produce beauty from the world's greatest laboratory, the earth itself.

Now is the time when every group in horticulture must concern itself with providing educational opportunities across the land to develop competent workers in an uncrowded field which offers endless scope for undeveloped talent. Fill this need—and you will help yourself, your neighbor, your community, your country!

Since Pely yours,

Frederic Heutte
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Recipient of many national
and international awards in horticulture
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Emotional, Ethical, and Ecological Responsibilities toward the Environment

PATRICK HORSBRUGH

Professor of Architecture, Notre Dame University, Notre Dame, Indiana, founder, Graduate Program of Environic Studies

The Second Annual B. Y. Morrison Memorial Lecture was delivered before the General Federation of Women's Clubs in Cleveland, Ohio, on June 3, 1969.

Individual Involvement

My subject is nothing less than the condition of the environment of this nation. My commitment is to arouse American opinion to the most imminent disaster of environic sterility that confronts you as a result of the years of flagrant disregard for the natural factors and forces that retaliate against those who trespass upon the delicacy of the natural orders. My purpose is to identify the women of this country with the sanctity of stewardship in safeguarding the environmental standards that are so vital to wildlife security, and to personal and social well-being.

It is very appropriate that this subject of environic condition should be raised by the U.S. Department of Agriculture in the name and honor of that brilliant horticulturist, Benjamin Y. Morrison. A man of his sensitivities must have been most deeply aware of the desperate need for a better appreciation of the indivisible unity and uncompromised quality of the air, the soil, and the water, without which his specimens would not thrive, and without which humanity itself would perish. It is timely, too, that the General Federation of Women's Clubs

should concentrate its immeasurable volunteer energies and actions upon the disreputable state of the inhabited scene in its determination to encourage individual involvement in the redemption of urban and rural scene, and in the protection of wilderness resources.

Indeed, this issue of environic condition is, without doubt, the most urgent subject confronting organized society everywhere. It is common to all peoples alike, no matter what may be their standards of health, education, or aspiration. Upon the condition of the environment all else depends, and the natural chemistry of environic disintegration represents the most persistent, potent, all-pervasive force yet encountered in the demise of civilizations. Heavy is the hand of natural retribution.

I do not intend, however, to respond to this most welcome invitation by lamenting the conditions that prevail. I prefer, instead, to raise three positive issues for your consideration. These issues may quicken the pace of your devotion to the policy of individual involvement, which you have already set as the theme of personal action for the current session.

These issues concern our Emotional, Ethical, and Ecological Responsibilities toward the Environment. The words are deliberately chosen to emphasize those factors which do not seem to have received proper appreciation, but which are fundamental to any understanding of the constant messages which the natural and artificial environments reflect upon our ambitions.

The words are very different in their meaning, and are unlikely to be juxtaposed in terms other than that of environic crisis. I hope that their careful selection and inherent implications will stir our most distinguished reactors representing industry and administration, to provocative responses, for I have a special requirement of each of them.

Emotions

Environic condition is essentially an emotional subject, and I wish to recognize the value of this too-much-derided force which is so immediately responsive to surrounding conditions. Emotional reactions are aroused by the basic instinct for survival. And since our expectations of personal and social survival are now so endangered by the environic consequences of human behavior, I do not hesitate to begin with this sensitive subject of human emotion in general, and of feminine emotion in particular. for I regard emotion as the most vital extrasensory perception with which we are endowed.

It is time, also, that we respected the instinctive disquiet that is shown by certain of the more earnest "retreatnik" philosophers and rallied those distracted emotional energies which defy legal description, psychological category, or social standard. It is this same emotional response which is so mysteriously aroused by the indefinable "presence" of beauty, and so depressed by the "absence" of beauty.

We should no longer be embarrassed to refer to the emotions when discussing basic social forces, environic prospects, and personal aspirations. The term embraces, also, moods and motivations ranging from patriotism and social service to justifiable pride in achievement, from

individual independence to responsible involvement. It is exactly the right word to convey that state of sensibility and depth of feeling required for the compassionate interpretation of the circumstances of which we are part.

No one understands better the value of the emotional responses to the scene than Mrs. Lyndon Johnson, who gave the first B. Y. Morrison Memorial Lecture in Portland, Oregon, last year, thereby establishing the high position and purpose of this occasion. She has identified this basic impulse for beauty with unerring instinct, and has striven with tireless energy and conviction to extend the obvious emotional enthusiasm for trees and flowers into a broader appreciation of the landscape as a whole.

No amount of concentration upon detail can improve street conditions if the land-use strategies are deficient. No trivial titivation will redress the environic damage which now threatens the nation in all its majestic entirety.

Ethics

It is clear that emotional forces need to be tempered by ethical standards, and we are in desperate need of revised concepts of personal and social behavior toward the land and landscape. In brief, we must realize that henceforward we can no longer plan the landscape for selfish human convenience alone. We now bear the responsibility for the continuity of all other species, and have the discriminatory power of protection, cultivation, or destruction of everything that attracts our attention. We can measure the chances of our own survival by the ecological responses that arise from our choice of land uses, and the morality of our motives represents a logical extension of man-to-man behavior and touches all that is within our reach.

Your theme of "Individual Involvement" has never been more relevant. I wish to emphasize, however, that your program of actions must project further than the human associations which are implied, and undertake the responsibilities toward the environment to ensure that improved human harmony with

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those natural forces for which Mrs. Johnson has pleaded so eloquently. Such involvement is essentially a matter of ethical evaluation governing the human conduct and the determination of right and wrong in human relationships with the biospheric elements no less than with other humans.

Ecology

The concept of environic totality is obvious enough, but it needs reemphasis, for in our sophisticated legal conformities, we are bound by the insistence upon the division of lands, the limitation of administrations, and the sanctity of ownerships. All of these are divisive in territorial effect and fatal to the speedy redemption of sullen skies, of rancid rivers, and of refuse-laden streets, those faith-destroying features of our principal social achievements, our cities.

Possible Programs of Action

It is my privilege to suggest to your General Federation of forward faith three interrelated but distinct programs of simultaneous action. You may care to foster them if they should prove sound in the opinion of our experienced reactors here assembled, and if they should find favor with your membership.

The first program recognizes the importance of priorities and is *educational*. The second establishes the scale of the operations as being *international*. The third concerns the public acceptance of environic responsibility and is *organizational*.

Each proposal represents an individual challenge to personal involvement. Each proposal is singularly suited to the competence of women. Each undertaking offers special opportunities for leadership by the women of this nation in revising the ethical standards of behavior toward the natural and man-made enviria.

I submit to you, therefore, that the prime objective in environic comprehension is that of systematic inventory and assessment of conditions as they are, measured within the context of recorded history. Without a review of resources

and conditions, it is impossible to determine the degree of crisis that exists or the interrelationships between the factors. It is also impossible to appreciate the interplay of forces past and prevailing, or to anticipate the likely natural retributions of the future.

Education

Any such review implies search, research, and instruction involving all ages, of every society—conscientiously, consistently, continuously.

In asking for your assistance in establishing the priority of environic studies in educational curricula throughout the nation, may I declare that of all the subjects of human significance offered by the educational institutions of these United States, none is of greater importance than that of environic sensitivity.

Our capacity to accommodate the human races—in all their oppressive numbers and diverse demands—with the least disruption of the ever-moving ecological systems of thrust and adjustments is becoming evermore difficult to attain.

Yet there is no subject that receives less academic or public attention in proportion to its seriousness than that of environic quality and conditions. In this persistent ignorance of environic circumstances lies the prime cause, I suggest, of the demise of every society of which we possess record. This includes the ancient cultures of the valleys of Mesopotamia, the Indus, the Mississippi, the Nile, or the Yangtze Kiang onwards—until it is now our turn to be confronted with the consequences of inherited and present transgression upon the biosystems.

I plead, therefore, that this Federation might respond to President Nixon's appeal for the voluntary enlistment of citizens to combat poverty by seeking an Executive Order for the creation of a National Environic Commission. This Commission should ensure that the subject of Environics be introduced immediately at every level of instruction throughout the educational systems, public and private, collectively, starting with infants of kindergarten, including

institutions of advanced studies, and involving existing organizations for adult education. Poverty is the human price of environic misadventure and is indivisible from it. A fresh intellectual objective—cultural, ethical, and natural—is needed if we are to achieve any revision of standards of human behavior towards the environment, for the benefit of urban life, ecological regeneration, wild-life habitat, and wilderness.

There are very few who are in any way qualified to rise to such an educational challenge, but this is a period of extraordinary social distortion and it offers us the magical opportunity to learn something fundamental from each other-together, simultaneously, and irrespective of age. This is a rare moment when the instructor-instructed relationship can be replaced by a collective humility of common purpose enforced by dire emergency. There are those who sense the emotion of this emergency, and it is this extrasensitivity that I wish to seek and to harness for the crusade to identify, protect, and redeem the cancerous environic conditions that are rising to overwhelm us. It is in such crises that unsuspected talent emerges from unexpected quarters, and an Executive Order for a National Environic Commission may be the means of bringing it forth.

Fortunately, there is much evidence of such talent already in practical operation, even though it may not be formally trained in social and ecological subjects. During an informal workshop on Conservation and Outdoor Education, at Pokagon State Park, Indiana, I met many volunteer teachers and parents who had come to profit from the park's facilities, which were designed to stimulate interest in the natural scene for an enrichment of curricula.

Similar accommodations are now to be found across the Nation—from the studio-museum overlooking the geological wonders at Dry Falls, Lower Grand Coulee of the Columbia River, Washington, to the Marine Science Station, Crystal River, Florida. Such facilities are now essential to the educational advancement of the city inhabitant whose circumstances are now so artificial that the terrestrial, oceanic, and atmospheric realms need to be shown and interpreted as a special social obligation. We make a profound error by concentration upon urban affairs in the attempt to grapple with the crisis of the convulsive city, as distinct and separate from its environic context, City and country represent one continuous fabric, and society needs the interaction of both urban excitement and rural tranquility in proportion to the intensity of population pressure that the cities generate.

Telstar Opportunity

Especial reference must be made, here, to the potentialities of TEL-STAR, an instrument of extraordinary influence in translating environic information for all equipped to receive a visual message that is seemingly personal in scale, yet global in extent. The opportunity that Telstar affords for United States leadership in conveying the environic urgencies is momentarily beyond challenge. This temporary advantage should be used to express this foremost international dilemma of our time, a predicament which we share in common with all nations, irrespective of cultural standing or geographical location.

Here then, is the first issue of environic education which the Federation's own departments of Education, Conservation, and Public Affairs may care to consider as relevant to their own programs of promotion. It would seem that you are prepared already to crusade for studies in environic comprehension such as those begun by the new Consumer Protection and Environmental Health Service of the U.S. Public Health Service.

Student International Environic Assembly

There exists, in this country, a long history of international youth-service organizations ranging from the original British Boy Scouts and Girl Guides to Camp Fire Girls, 4-H Clubs, and the Pages Corps. It is within these groups

^{&#}x27;Sponsored by the Curriculum Office of the State Superintendent of Public Instruction, Indiana, April 1969.

that initiative is fostered. I believe you would wish to inspire these enthusiastic resources anew in response to the environic emergency.

An immediate opportunity now presents itself for action to be taken in the service of the United Nations. Last December, the General Assembly adopted a resolution proposed by Ambassador Sverker Astrom, the Swedish Permanent Representative, calling for a U.N. Conference on "The Problems of Human Environment" to be held in 1972. I believe that this Federation should consider the wisdom of encouraging the promotion in 1971 of something in the nature of an "Arising Generation Commitment Conference" to precede the U.N. event.

The procedures of the United Nations are not unknown to the students of today. The galvanizing effect of a student assembly on environic responsibilities preceding a major international gathering can be imagined.

Ambassador Astrom has recommended 20 carefully reasoned issues for the attention of the U.S. delegates, all of which touch directly upon student sensitivities. It is essential, I believe, that the imaginative sweep of these proposals should reach beyond those already committed to such concepts and become the cause of student expression also. Indeed, it should be realized that the value of all the tenets of social conduct which we have inherited on the ethics of man-toman behavior and of man-to-society accord now depends entirely upon the condition of the environment forming the context of the association.

If the environment is sour, so too are the human responses; if wastage burdens the economy, the social objectives are obscured; if the ecology is laid waste, organized society perishes. Upon healthful environic condition all else depends. The Tablets of Moses, the Declaration of Independence, and the Universal Declaration of Human Rights have no value whatsoever so long as the ethics of man-to-environment behavior remain

undefined and the imperative laws for the protection of environic quality are denied. Ambassador Astrom, in his concern for the maintenance of the natural conditions of the biosphere, requests that the U.N. should "consider the advisability of a Universal Declaration on the Protection and Betterment of the Human Environment."

Here, then, is an especial but passing opportunity for the youth of the nation to express their instructive ideas and observations in a national precursor conference. This should cover the entire range of conditions and intentions respecting human enviria, wildlife habitat, and the conservation of spiritual and material resources. This should enable us to better appreciate the competitive frictions that destroy such amenities and to reexamine the relative values between necessity and desire in the limitations of context.

In particular, a Student International Environic Assembly should expose and explore the ethical issues arising from the human "right" to enjoy environic qualities, to be held in balance with ecological "rights" protecting those qualities from human imposition. The Assembly should review the morality of "waste," the social mores that "wastage" seems to produce, and the legal limitations of waste dissemination. A generation bred in affluence should produce differing standards of value and fresh concepts of near closed-cycle systems of waste re-uses to replace the wayward practices of supposed disposal.

Can you imagine any ethical issue more urgent and more likely to draw together the diverging social aims that now separate the age-expanding populations-the Flowerfolk, the Hipnomads, the Ghettocrats, and others who are genuinely rebellious against the practices which have systematically spread scenic devastation throughout city, suburb, and country alike? Can there be any subject more likely to establish a common cause between the gap-riven generations and the historical protection societies such as the National Trust, or the conservation councils such as the Sierra Club or the National Audubon Society? Can there

^{*}Agenda item 91, November 6, 1968. Resolution Adopted by the General Assembly, December 6, 1968.

be any circumstance more imperative than that of environic condition, upon which youth and age, instinct and experience, inspiration and administration should join in the name of social survival? For that is the simple warning that confronts us during our remaining lifespan. We are already in "the red."

The Glassboro Recommendation

For those who hanker for historic precedents, the idea of an international event devoted to the conditions of the environment may be attributed to President Johnson. In his emphatic commencement address given at Glassboro State College last summer,3 he proposed "... that the United States scientists join with the scientists of the Soviet Union and other nations to form an international council on the human environment." You will recall that this proposal was made one year after the high-tension meeting with Chairman of the Council of Ministers of the Soviet Union, Aleksei Kosygin. While scientists may exchange with scientists in amicable terms, the need is for peoples also to exchange ideas about these urgencies, and no one will deny the advantages of beginning that exchange at the earliest possible

In recognition of these passing opportunities, the General Federation might care to challenge the present mood, motivation, and merit of the youth of this Nation, and to galvanize those of purposeful disposition to organize themselves for expression on the environic state of the country. By such action, others may witness the resolve of this generation in their response to the U.N. initiative, and for the effective educational uses of Telstar.

It would seem that your junior and juniorette organizations are eminently suited for the encouragement of such a proposition and could receive assistance from your Public Relations and International Affairs Departments. Such a preliminary event should serve to assess the

issues, determine the priorities, propound the policies, and reestablish ethical convictions governing human responses to enviria of every kind of their indivisible totality.

Enviriculture

As the Department of Agriculture is the official instrument of government which fosters the farming economy and the cultivation of crops and livestock, it is the obvious agency to inspire and promote the concept of environmental cultivation also. Since agricultural specializations depend entirely upon the state of the environment, there is an obvious argument which recognizes the advantages of cultivating the scene, no less than the crop, depending upon regional characteristics—urban, rural, and wilderness—under a program of Enviriculture.

The prospects of enviriculture will depend upon the creation of an independent lobby whose purpose would be to define, defend, and promote the qualities and health of the environment, in all its natural diversity and man-made variations. A healthy environment is the fundamental basis of any system of social development, wildlife security, and ecological continuity—as an indivisible totality.

The renowned horticulturist, Benjamin Y. Morrison, in whose honor this series of memorial lectures was established by the Agricultural Research Service of the Department of Agriculture, may have developed similar opinions on what might be done. His special talents and devotion to the introduction of exotic plants and to the hybridization of herbaceous and ornamental shrubs must have made him acutely aware of the advancing environic crisis. Those who work with the microscopic detail of plant pathology, such as the eradication of wheat rust from the barberry-growing regions, upon which Mr. Morrison was engaged, must perceive the early signs of environic disorders and raise the signals of social danger.

These advance alarms were marvelously expressed in the '20's and '30's by that most penetrating political cartoon-

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^{8"}Return to Glassboro," address given at the commencement exercises, Glassboro State College, New Jersey, June 4, 1968.

ist J. N. "Ding" Darling of The Des Moines Register. His brilliant drawings clearly foretell the consequences of the persistent befoulment of his own time, so persistently continued.

A National Institute of Enviriculture

Of talk and argument there has been enough. We are aware of the dangers. We have some technological skills. But we still do not possess the necessary organized momentum of decisive action. It is necessary to form an independent nonpartisan association in order to propagate the concepts of enviriculture. It is necessary to encourage the 150 various conservation societies of the nation and to influence the departments of government—federal, state, and municipal—through a system of watchful authority in the effective fulfillment of their duties of territorial stewardship.

I want you to consider, therefore, the advantages of a National Association of Enviriculture, an independent, duespaying organization open to all, nonprofessionals and professionals alike, who are concerned with this vital need to "cultivate" the national scene. Such an association is not intended to duplicate the work of those groups now fighting so valiantly in the defense of particular features of the national treasury of natural and man-made beauty; rather, it would supplement their endeavors by insisting upon lasting ethical values instead of those of transitory political and financial gain.

Surely the ultimate in ugliness has been achieved in the North American city, and for a moment this cult of the hideous has proved to be very profitable. But such vulgar triumphs are now seen to be a dubious achievement and the continuing investment in the ugly must cease. There must be some proof against the successes of environic outrage. Some organized force of voluntary labor is still required to champion the causes of environic seemliness, especially in the neglected smaller communities of the nation.

President Nixon has recently appealed for the recruitment of millions of volunteer citizens who, it is claimed, "stand ready to serve and to help, eager to know what they can do and how they can do it," Their labor is intended to assist the work of his proposed cabinet-level Environmental Quality Council. The President has shown the immediacy of the political need. The opportunity for women is obvious. The request is awaiting your response.

Those who are concerned with the renowned National Trust for Historic Preservation in defense of the architectural heritage know that this organization would be of great relevance in developing an Association of comparable purpose—one that is addressed not only to historic features of the nation but also to the environic prospect as a whole. Further evidence of the need for such an organization may be found with The Civic Trust in Great Britain, founded in 1957 by the Rt. Hon. Duncan Sandys, at the behest of Sir Winston Churchill, whose painter's eye was well aware of the destruction of beauty of every kind.

An entirely new ethic is required upon which to raise a civic sensibility toward the elements of the scene—human, animal, and ecological—and to establish a social value rather than a financial "price" upon the seemingly priceless. It is unlikely that such standards can be expected from government agencies whose efforts are entirely devoted to the day-to-day tasks in the administration of inherited laws that they have been elected or appointed to maintain.

The Supreme Opportunity for the Leadership of Women

You will have caught, by now, the direction of my argument—that the women of these United States now face the supreme opportunity of the generation—that individually and collectively they possess the necessary variety of experience, talent, and capacity to provide the drive and inspiration to create a National Association of Enviriculture.

A perusal of the lists of activities of the General Federation of Women's Clubs convinces me of this. This vast

organization, united in its diversitywith its many overseas associates, its Junior Clubs, and its Juniorette Clubsrepresents a force of forward faith that is probably without parallel, and preeminently suitable to proclaim a crusade of cultural, ethical, and natural appreciation. Your Charter of 1891 expressly calls for the promotion of education, moral values, civics, and public welfare, the very ingredients which I describe as "enviriculture."

While I stress the basic thrust of emotion, I want to be no less emphatic about the practical capabilities of women. I refer specifically to some of your joint programs with several of the foremost industrial and commercial interests of national and international significance. For example, Shell Oil, Reader's Digest, Sears-Roebuck, and Citgo are each able to assist in any enviricultural works you care to undertake.

It has been my privilege to be concerned with the promotion of several environmental protection and education programs where women have provided the original inspiration. They have fought sluggish authority, outwitted realestate investors, raised funds, scrapped with lawyers, suffered from savage enemies, and yet maintained momentum until success was achieved. Permit me to mention just one such campaign, that which created the Texas System of Natural Laboratories, Inc., in which 22 of Texas' leading educational institutions have now joined. This consortium of institutions now benefits from the exceptional ecological qualities of a tract of land near Austin, whose treasury of life and information was almost lost forever. This self-sacrificing campaign was the original and sole work of one woman, whose practical vision and sound sense have set a standard to which other women have rallied to ensure speedy success.

As a result of similar personal experiences in Texas, Nebraska, Illinois, and Ohio, I am convinced that a nationwide crusading organization is required. It is needed to supplement local campaigns to stimulate local initiative to further action, under the practical enthusiasm of "woman power." Why not?

Moreover, the placid nature of those who plead the cause of envirology is temperamentally unsuited to the clash of arms that arises from the conflicting demands of industry and other vital land uses. At this moment of militancy, there is no alternative-other than that of collective pressure-to insisting upon respect for environic values. A special attempt should be made to identify the opinion of women with such conditions and policies, because this is basic to their home-building instinct and responsibil-

You may care to be reminded of the influence of women upon living conditions during the pioneering days-a period recorded so eloquently by Professor Dee Brown in his book, "The Gentle Tamers," a fascinating revelation of feminine courage and stalwartness.4

It was the women, it seems, who responded most heroically to the hostile landscape of those days. I believe that it will be the women again who will respond most vigorously to the now vengeful hostility of the envirium that has been provoked by our wayward material competitiveness. The unrecorded costs of such materialism should be remembered. While it has made this nation momentarily the envy of others, raised standards of life temporarily beyond general expectation, and brought transitory benefits, we cannot deny the loss of envirial health, the sacrifice of esthetic seemliness, and the evaporation of spiritual conviction.

Your basic pioneering and homebuilding instincts are the most powerful motivating force available with which to galvanize this nation into further action for the tremendous environic housecleaning that must proceed at once. I believe that a women-sponsored, nonpartisan, independent National Association of Enviriculture can provide the political, financial, and social leverage necessary to compete with the careless causes contending for the "right" to use the Nation's resources for this sectional and selfish benefit.

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Professor Dee Brown, "The Gentle Tamers," Putnam's New York, 1958.

It would seem from your fine record that such actions are not new to this Federation. In the last two years, you have adopted resolutions pleading for air and water pollution controls. Your recent appeal for water pollution controls had its origin in action taken by your predecessors as long ago as 1900, while your latest resolutions on highway development and beautification arose from forethought expressed in 1954 and 1957. Indeed, you are to be congratulated upon your early environic awareness, and it is upon this sound evidence of instinctive action that I challenge the women of this nation, through the General Federation of Women's Clubs, to quicken their pace in the protection of the elements in which you expect to survive.

The Secretary of Agriculture, Clifford M. Hardin, has just given expression to President Nixon's agricultural economy program of "opportunity and abundance" requiring "an honest and explicit recognition of the importance of a sound agriculture to our national wellbeing. . . "5 What opportunity can there be for "abundance," while the necessary enviricultural stability is forfeited to other demands of incidental commercial advantage, recreational whoopee, and even bad farming practices, such as the careless use of pesticides?

While so much attention is being devoted to urban affairs, I am grateful for this chance to stress the importance of rural context. Urban vitality depends upon agricultural ecosystems and industrial land-use economies that develop and conform to a near closed-cycle routine of self-digesting "waste" in the continued processing of materials, and upon ready access to the spiritual refreshment which the natural landscape provides.

In the interests of social stability, city and country must now be seen as complementary in this "one Nation, under God, indivisible. . . ."

Summary

In summary, I suggest that since the General Federation of Women's Clubs exerts an influence abroad, it is essential that you should be able to meet the mounting foreign criticism of American motives with convincing evidence of what you intend to achieve here at home by the means of consistent, purposeful programs of individual involvement.

The acceptance of the challenges of the Emotional, Ethical, and Ecological Responsibilities toward the Environment-to which women's sensitivities are known to respond with sympathy-can provide you with such evidence. It is one of the conundra of human history that the domestic order for which the women are responsible in the home has been allowed to expand no farther than the seemliness of the surrounding yard. While the male instinct may concentrate upon invention and construction, the female instinct is devoted to the maintenance of standards, and at this moment it seems to me that the prowess of the one has outstripped the powers of the other. I have no hesitation, therefore, in addressing you upon the physical state of the nation, and in suggesting actions which I believe to be necessary for the redemption of the environic health of this land—once so beautiful—stretching subdivided, from sea to murky sea.

You will permit me the special privilege of reminding you that in only 7 years' time, you will be inviting the world to rejoice with you in celebrating the bicentennial of nationhood. It is imperative that your visitors of 1976 not observe that the tyranny of a remote political power has only been replaced by the tyranny of an immediate economic system that has submerged both people and territory in an environmental agony that is laying waste the most magnificently varied landscape ever to be governed by one system of freely uniting states.

When architect Thomas Jefferson revised John Locke's phrase of "life, liberty and property" to read "life, liberty,

^{*}Secretary of Agriculture Clifford M. Hardin, "Secretary's Goal—An Agriculture Keyed to Opportunity and Abundance," Hot Springs, Arkansas, March 18, 1969.

⁶John Locke, Two Treatises of Government, 1690.

and the pursuit of happiness," he was aware, in his determination to describe those certain unalienable "rights," of the immensity of this continent and its emotional challenge to movement, scenic enjoyment, and the spiritual fortification that such splendour inspires. He was rejecting the prohibitive prospects of "property." No matter who owns what, and under what laws property may be held and how it may be used, there is always the overwhelming responsibility of boundary-defying environic condition.

Landscape architect Benjamin Y. Morrison must have been acutely aware of the significance of environic influence on his many horticultural experiments during his 28 years' service with the Department of Agriculture as Senior Horticulturist and Director of Plant Introduction, and later as first Director of the National Arboretum in Washington. People, like plants, will thrive only within a narrow margin of tolerance, and you should not be deceived by those who would persuade you that people are the most adaptable of creatures. While great feats of individual endurance confirm the possibility of human hardiness, the evidence of social demise from environic change is too great to be ignored.

It is clearly time that those unalienable rights of the Declaration of Independence be confirmed, as Ambassador Astrom proposes, by a Universal Declaration on the Protection and Betterment of Human Environment to ensure that future conditions will indeed permit the

"pursuit of happiness."

Through the courtesy of the Department of Agriculture, I am privileged to address this 78th Annual Convention of the General Federation of Women's Clubs as a foreigner, a subject of my Sovereign Lady, Elizabeth II, and to speak to you upon issues that are of supreme national importance. Notwithstanding this possible impertinence, I plead with you to concentrate your energies upon the priority of environic condition which controls all other natural and human circumstances.

There is a rising tide of opinion in Congress devoted to the causes of environic protection, seemliness, and territorial redemption, led by Senators Nelson, Bayh, Jackson, Tydings, McGovern, Williams, Yarborough, and others who deserve your support in their work upon which sound urban rejuvenation must depend.

I would like to see an extension of The Morrill Act of 1862—that most outstandingly successful educational and agricultural program ever to have been accomplished by a democratic system of federal and state governments, which has contributed more than any other enactment to the educational, scientific, and cultural preeminence of these United States—whereby the study of agriculture is supplemented by a comprehension of enviriculture.

I now look forward to the responses from your membership regarding my recommendations concerning Individual Involvement in the Emotional, Ethical, and Ecological Responsibilities toward the Environment:

- 1. The development of instructional programs in Environics, the study of biospheric condition and hygiene, at all grade schools, institutes of advanced learning and for adult educational systems.
- 2. The promotion of a student-run International Conference on Environics in the U.S. in 1971, to encourage the United Nations Conference on the Problems of Human Environment proposed by the Swedish Representative.
- 3. The creation of a National Association on Enviriculture for the promotion of environic comprehension by the people, and the encouragement of Congress, State Legislatures, Municipal Councils and all other organizations in their determination for environmental understanding and harmony.

"The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new so we must think anew and act anew. We must disenthrall ourselves, and then we shall save our country,"

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⁷Thomas Jefferson, Declaration of Independence, 1776.

A New Era in Hybrid Lilies

JAN DE GRAAFF



Jan de Graaff comes from an illustrious line of lily hybridizers, the family of de Graaff Brothers having been founded in 1723 in Holland. Active there for some years before coming to the United States, he bought the Oregon Bulb Farms in 1934. He is a director of the North American Lily Society, a former director of the American Horticulcultural Society and of the Northwest Bulb Grower's Association. He has received top awards from outstanding horticultural organizations around the world; including The American Horticultural Society and The Veitch Medal and Lyttel Cup from the Royal Horticultural Society. Oregon Bulb Farms, Box 529, Gresham, Oregon 97030. The hybrid lilies in our gardens and greenhouses are, relatively speaking, new plants. To speak of a new era in these hybrid lilies, then, is to admit that we are approaching, and maybe passing, another milestone. Let me dwell briefly on a few significant aspects of these new lilies.

To begin with, progress is being made in many places by many people; the work of earlier hybridizers provides us with the means of overcoming obstacles. All the hybridizer today can hope to be is the catalyst through whose fingers flow many small streams, from many sources, to be channeled by him into a major breakthrough.

There are other factors which have strongly contributed to the birth of this new era, but have nothing to do with lilies, and apply only indirectly to horticulture. They are the developments of modern science and technique, for instance, the advent of plastics in all their different forms and applications. Plastic liners enable us to store and ship lilies and deliver them safely all over the world. Plastic bags hold the bulbs in good condition when displayed on the shelves of garden stores and supermarkets. Vermiculite and perlite have been major factors in getting good results in propagating lilies from scales. New plywood-and-paper boxes have made shipping costs reasonable. Selective weedkillers, systemic insecticides, new fungicides have been introduced and proven effective. New mechanical grading machines have helped offset higher wages, and more efficient tractors and trucks also help us to control rising production costs.

All these advances have made possible

the new era in lily hybrids. I know of no other crop where such innovations have been brought to bear with such effect in so short a time. For remember, the new era in hybrid lilies is not a hobby for a few advanced amateur gardeners. This new era is different because its products are by now available in enormous quantities. When I first embarked on my program to improve the garden lily I saw the necessity for this development. I

knew that my work would be to no avail if these new lilies could not be made freely available to the gardeners of the world.

I have tried to make them available at low prices but what is a low price in horticulture? It is my conviction that all horticultural products are under-priced. The prices are too low to pay our workers wages comparable to those in other industries. They are too low to allow



PHOTO BY HERMAN V. WALL

L. hansonii. A most attractive, earlyflowering garden lily from Japan. It crosses readily with L. martagon and its variants; it is the parent of the popular Backhouse hybrid strain and cultivars. In recent years, working with fourth and fifth generation crosses between the best of these hybrids, a new strain has been developed which largely eliminates some of the faults (resistance to new condition; difficult to transplant; bad scent) of the earlier, so-called Backhouse hybrids. The new ones which are marketed as Paisley Strain have far more vigor and great beauty. Named cultivars are now available in entirely new colors, such as pink, white, yellow, and purple.



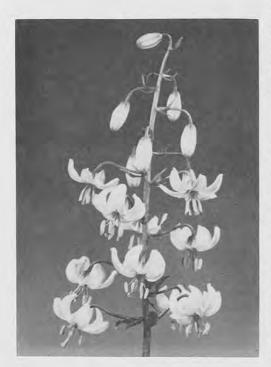
PHOTO BY HERMAN V. WALL

A typical plant of the new Paisley Strain lilies — the result of repeated crossing and selection of *L. martagonhansonii* hybrids. Not only are these lilies of very fine color, they also have enormous hybrid vigor and can thus be transplanted and be expected to flower the first year after such treatment. This could never be done with the older Backhouse hybrids.



L. speciosum 'Red Champion'. A clone of unusual hardiness, vigor and disease resistance. This is a greenhouse plant par excellence — free-flowering, early, and of good habit. 'Red Champion' has been used by us in many crosses, involving also L. auratum, L. rubellum, and L. japonicum.

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L. cernuum. A lovely little lily from Korea and Manchuria. This is one of the parents of the now popular Harlequin Strain and it has imparted to this strain some of the lovely new pastel colors, so much wanted in the Mid-Century and other Asiatic strains of garden lilies. L. cernuum, as received from collectors abroad, was a very insignificant and rather dull plant. When raised in Oregon from seed and in substantial quantities, it became apparent that very fine clear-colored types, varying from white to deep purple, were available in the true species and that also vigor could be attained without the introduction of other species in their production.

PHOTO BY HERMAN V. WALL

(Left) L. martagon 'Album'. An albino form of the dull purple-colored L. martagon. It has been raised in "captivity" since the 16th century and we believe that in the process of continuous production from seed some of the weakness has been eliminated. Yet, when we started out to raise new martagonhansonii hybrids and found among them some pure white-flowered plants, we noticed that they had far greater substance and reproduced more readily than the old L. martagon 'Album'. Our best new white seedling has been called 'Achievement'.

PHOTO BY HERMAN V. WALL



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L. × 'Buttercup'. A cultivar resulting from a cross between L. parryi and L. × 'Shuksan'. 'Buttercup' has the sweet scent and the lovely yellow coloring from the L. parryi parent and the enormous hybrid vigor that is also apparent in L. × 'Shuksan'. 'Buttercup' is a fine garden lily and also a striking new color in the Bellingham hybrid group, a fine cut flower that lasts until the very last bud has opened.



PHOTO BY HERMAN V. WALL

L. longiflorum var. alexandrae. A pure white trumpet lily species from the Ryukyu (Liukiu) Archipelago which may have a great future, first of all, in itself as a delightful, sweet-scented pot and garden plant and, secondly, since it will cross readily with the L. japonicum-rubellum complex and can thus be introduced into the L. auratum-speciosum-japonicum-rubellum group.

PHOTO BY HERMAN V. WALL

(Right)

L. × 'Enchantment'. The first and the most popular of the so-called Mid-Century hybrids. This fine new lily, of vibrant, blazing orange-red coloring, flowered for the first time in 1944 and is thus now exactly twenty-five years old. It has received the coveted First Class Certificates of the R.H.S. and the North American Lily Society.



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sufficient research work. They are far too low to offset the production risks, to permit a sound promotional program, or to enable us to have an apprentice system.

But to get on with my real subject. In Oregon, in the meadows on the lower slopes of Mount Hood, at about a 1200-foot altitude, we grow some of our finest lilies. We have a virgin soil, ample moisture, cool nights and hot summer days, and generally, the very exposure and drainage the lilies like. If you put lilies in the sun, give them perfect drainage and remember that they like moisture but are not water lilies, you will have success with them.

The fascinating part of our work is with the different species—what I could call building blocks. By combining two different ones and drawing on the characteristics of both we can raise hybrids that have not only more vigor but also new colors and forms and seasons of flowering. By adding other species to these earlier hybrids we can complicate the results; we already have some that have eight distinctly different species in their parentage. At this point the new era in lily hybrids begins.

Early Hybrids

The older lilies, like the $L. \times hollandicum$ or the $L. \times elegans$ or the lovely Bellingham group, are relatively simple hybrid plants. In the new era the hybrids are more complex, with not only new combinations of characteristics but also some entirely new, unexpected traits.

I mentioned the L. × hollandicum hybrids, which were based on crosses made first in Japan and later in Holland. The ancestors are L. bulbiferum or L. bulbiferum var. croceum and L. maculatum (elegans). We crossed them with a hybrid raised in New York—a rather ugly but strong-growing lily called 'Umbtig' (L. umbellatum × L. tigrinum) and the result was a group I then named our Mid-Century Hybrids, now grown in many parts of the world. Twenty years ago they were a great step forward.

As could be expected after this success, I wanted to know what else might be done with these lilies in the way of variations and improvements in color and form. So, with the express desire to get lilac, white and pink, of the general shape and type of the Mid-Centuries, we proceeded. We were greatly helped by the work of a man in Saskatchewan, Professor C. F. Patterson, who crossed a little lilac-colored, nodding lily, L. cernuum from Korea, with lilies of a totally different type. Besides new colors and forms he introduced great hardiness and enormous vigor in his seedlings. With that as example, I felt that the key to the new colors we sought might be in this L. cernuum. We tried it and in the first generation found our fondest hopes realized. The second generation of seedlings brought us even nearer to our goal and demonstrated that we were approaching what we wanted.

In this work I must constantly remember that this all must pay off, that the results of this work must please the average gardener. One could raise lovely dwarf lilies or some with delightful scent or unusual colors—but what does the public want? Strong-growing large plants? white, red, pink flowers? fewer yellow and orange or lilac and purple? If the examples of what we have achieved do not demonstrate a new era, they at least show the road that leads to it.

The story of our work with lilies based on the native West Coast species is simple but interesting. Dr. David Griffiths, who worked with these lilies from 1918 to 1934, received some seed from the famous old California plantsman, Carl Purdy of Ukiah. Carl had received the seed from a Los Angeles amateur. Griffiths raised the plants in Bellingham and named about a dozen of them.

Then the Bellingham station closed down and when I started to work, those plants had been dispersed and I had great trouble locating any of them. When I finally did I grew them in quantity and discovered that there was only one worth perpetuating—only one,

(Right)

A typical flower of the popular Jamboree strain, the result of crossing L. auratum × L. speciosum, using selected plants of each species and then again selecting the resulting hybrids. The recurved form indicates the affinity to L. speciosum; the size and width of the petals is derived from L. auratum characteristics and the hardiness and vigor is, of course, directly the results of the good qualities inherent in both parent species.

PHOTO BY HERMAN V. WALL



PHOTO BY HERMAN V. WALL

L. nobilissimum. A still rather rare species from the Ryukyu (Liukiu) Archipelago, it can be called an upright-flowering Easter lily. It is, apparently, fully hardy and with its attractive foliage of sturdy, small, almost oval leaves, the plant is most attractive even when not in flower. This may well have a future as a commercial pot plant, although we must work out production schedules and find how to grow it to best advantage.



(Below)

L. taliense. The pure white, except for its deep maroon-purple spots, is the counterpart of the lovely L. lankongense. In Oregon this has been an easy lily to raise from seed and it seems to multiply readily through divisions from the main bulb. Attempts to raise hybrids from this and similar species have, as yet, been unsuccessful but we are still trying.

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that is, which we might put on the market with a reasonable expectation that it could pay its way. I did more work with these fine lilies, added one of may own—'Buttercup' Bellingham hybrid)—and finally succeeded in selling them at a price commensurate with production costs; after this I decided to extend the range of the Bellingham hybrids.

Again, as in the new Mid-Century Hybrids, where Professor Patterson showed us the way, we had the guidance of several outstanding hybridizers: Jim Farrar in Sebastopol and Boyd Kline in Medford, Oregon; the late Eric Mayell of Monterey-all had done some work with various West Coast native species. The initial successes of these men showed clearly that far greater variations of color, form, season and scents were possible. I decided on two approaches. We wanted clear, clean, yellow and sweet-scented hybrids and therefore planned to use L. parryi from California. We also wanted new colors such as pink, white and lilac, and new forms. For this we used L. kelloggiiand we achieved success. These "new era" lilies are not only lovely but multiply well, grow easily and with great vigor. We shall soon have them by the thousands for all the gardens of our country.

Now for an entirely different type of lily—one that comes from Japan. Again I will mention some of the earlier workers who showed us the way and gave us the assurance that we could succeed.

Our American historian, Francis Parkman, in 1862 in his garden near Boston, made the first crosses between L. speciosum and L. auratum. The result was the handsome L. × parkmannii. This lily was lost but in Australia other people, inspired by Parkman's success, raised similar lilies more spectacular and exotic than any others to date. When we set out to surpass these fine Australian hybrids we met a real challenge. Lily hybridizing requires patient searching for building material and for the methods and the paths to follow. Then when results begin to show, courage is required

to destroy all that gives no definite promise, however pretty it may be.

For I contend that it is not enough to raise a new, pretty plant. It must also be prolific and disease-resistant or diseasetolerant. It must stand a variety of climates and conditions. It must have bulbs that look attractive and that are robust enough to withstand heavy handling, packing, shipping, and planting by inexperienced gardeners. There are obviously innumerable demanding conditions to which a lily is subject which have nothing to do with esthetics. Pretty it may be, but if the bulb cannot tolerate being squeezed by a lady determined to pick the toughest out of a batch of bulbs at the supermarket, we might as well discard it at the beginning-especially since marketing a new cultivar is a costly affair from start to finish.

Recent Progress

The answer, I am sure, is in raising reconstituted F_1 hybrids like the new petunias, marigolds, zinnias and vegetables now being grown. For the past twenty years I have been working in this direction and we are gradually approaching our ideals.

We now know some of our lilies so well that we can cross certain individuals and get only reds or whites or white with a golden stripe. We can raise them so that they have recurved petals or come flat like huge saucers. Then we go beyond elementary colors and types and mix in a little from the lovely dwarf pink L. rubellum and the taller pink L. japonicum and get hybrids that have some elements from these four different species. When I was getting well along with these lilies from Japanese growers, I received some new species with a pure white trumpet, related to the Easter lily but distinctly different, and another one with upright white flowers like tulips. These were of the species L. alexandrae and L. nobilissimum. These species, not newly discovered but re-introduced, can be crossed again with the four-way pink, and we thus are at the threshold of a totally new era in hybrid lilies.

There are other charming combina-

(Right)

L. szovitsianum. This shows the great variety that occurs in true intraspecific seedlings of this lily. Possibly our material, collected for us in the Soviet Union, is already of hybrid origin and it is possible that L. kesselringianum and L. monadelphum have been grown in some Russian nursery near this lily and that chance hybridization has taken place. However, from large quantities of seed sent to us from the U.S.S.R., we raise lilies that are as divergent as these samples show. From them, through selection and intercrossing of the best types, we have raised a uniform strain.

PHOTO BY HERMAN V. WALL



(Left)

L. papilliferum. The unique deep purple-brown coloring of this attractive little rock-garden lily has made it of interest to the hybridizer. To date, however, no hybrids from it have been reported. A native of northwestern Yunnan, China, on dry cliffs and stony pastures, ca. 10,000 ft. alt.

PHOTO BY HERMAN V. WALL

(Right)

L. nepalense. An easily raised species, which, when mature, will produce as many as five flowers on a four foot stem. Attempts to cross this lovely, sweet-scented lily with others have failed to date, but it remains a challenge to all hybridizers. A lovely plant for a semi-shaded location. Exceptionally pretty when grown, as we have done it here, with some of the new hardy hybrid ferns.

PHOTO BY HERMAN V. WALL



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tions of species, for example, the Backhouse Hybrids, named after the famous Mrs. R. O. Backhouse who raised the first good commercial pink daffodils. She grew these lilies around 1890 and there has been little further work with similar hybrids since. They are the result of crosses between the exquisite European L. martagon var. album and the Japanese L. hansonii. They especially interested me, for not only are they unusually beautiful in woodland settings, but they have a built-in defense against diseases and pests. They have a strange, rather bad scent, and rodents and deer do not bother them. The smell also seems to keep aphids away and thus they have hardly any virus problems. I have worked with the L. martagon hybrids for some thirty years and have at last named half a dozen cultivars which are particularly attractive. The new varieties are a pure white, a lovely yellow, and ivory and pink, a deep purple, and a golden-orange. All of them are maroonspotted.

The last group I will mention includes the marvelous Chinese trumpet lilies. The best known of these is L. regale, discovered in 1903 by E. H. Wilson. It was not recognized as a new species until 1912, and was not grown commercially until the early twenties. Other Chinese trumpet lilies found and later identified were the striking L. leucanthum var. centifolium, in 1914. Particularly fine specimens were sent to this country by an American missionary and distributed by Dr. Griffiths after 1934. From these trumpet lilies I raised a group of hybrids, the Olympic Hybrids. In later years I narrowed down the seed and pollen parents to only two cultivars and we now raise the Olympics as a uniform F1 strain.

Since July 1900 it has been known that these or similar trumpet lilies can be crossed with *L. henryi*. This cross was first made in 1897 at the Royal Botanic Gardens in Kew and later by a French postman, Monsieur Debras of Orleans. The resulting hybrids, the Aurelians, so named after the Latin name for Orleans, *Aurelia*, have unusual vigor and

great resistance to pests and diseases. They come in many colors and various forms. There is considerable variation in stem length, in flowering season and in habit of growth. L. henryi has, of course. a uniform orange color and apparently no color-restricting factor. The trumpet lilies have a narrow or broad stripe of deep maroon limited to the outside of each petal. When we cross them with L. henryi, the absence of a color-restricting factor allows the maroon to suffuse the entire flower and we get lovely plumpurple and almost fuchsia-red. We also get intensified orange, every possible color combination among yellow, pink, and orange, and every variation in form, from the strongly recurved to almost flat, as well as true bowl-shaped and trumpet flowers.

Altogether, these Aurelians have been a real breakthrough in lily breeding. The possibilities inherent in these hybrids are by no means exhausted. By introducing other trumpet species, such as L. sulphureum, we again get a totally different color scheme and a new shape. The use of L. sargentiae, another Chinese trumpet species, produces delightful green shades and beautiful bowl-shaped flowers. But even more exciting is the fact that L. henryi can be crossed with L. speciosum to produce plants intermediate between the Oriental and the Aurelian strains. 'Black Beauty' illustrates this cross, with its unusual vigor and high bud count; though the flower is small, it has a future as a garden and greenhouse plant.

In New Zealand, crosses have been made between the pure white *L. auratum var. virginale* and *L. henryi*, which opens up other avenues to explore. So we can say that although we are in a New Era in Lily Hybrids, this is really just a turn in the road toward still better lilies. We know a great deal more than we did even ten years ago about culture and production, storing and shipping, and about the potentials of the various species. The next few years should bring us many exciting new combinations of colors, forms, scents, and seasons.

Horticultural Opportunities in Rudbeckia

ROBERT E. PERDUE, JR.

Rudbeckia deserves the attention of the plant breeder. Aside from a single species, R. hirta, little or nothing has been done to improve members of the genus. All of the species occur largely, if not exclusively, within the continental limits of the United States and breeding material is readily available. Many of the species are sufficiently attractive in nature to have encouraged their use to a limited degree as ornamentals.

The species of Rudbeckia fall into two very natural groups or subgenera, the laciniata group and the hirta group. The sub-genera are readily distinguished by an array of technical characters that need not be considered here. Species of the R. laciniata group are mostly large plants with very coarse stems, pale green leaves, and inflorescences with paleyellow rays and large yellowish or brownish-green disks. Plants of this group grow naturally in the mountains of the western United States and in the area east of the Great Plains. All are perennials.

Species of the R. hirta groups are, in comparison, plants of small to medium stature with less-coarse stems, deeper green leaves, inflorescences of deep yellow to reddish brown rays and smaller dark reddish purple disks that superficially may appear brown or almost black. Plants of this group are native largely to the area east of the Great Plains. A single species, R. hirta, also

occurs in the West. The species are long-lived perennials except for one annual and one species that may behave in nature as an annual or short-lived perennial.

The two subgeneric groups are well differentiated cytologically. They are distinguished by different chromosome numbers and distinct differences in chromosome morphology. The laciniata group has a haploid chromosome number of 18. Polyploidy is known in one species. Half of the chromosomes are short and medianly constricted. The other half are comparatively long and sub-medianly to sub-terminally constricted. The hirta group has a haploid chromosome number of 19. Polyploidy is known to occur in two species. Species of this group have chromosomes of medium length as well as those that are distinctly short and those that are distinctly long. They are medianly or submedianly constricted; none are subterminally constricted as in the laciniata group.

Cytological differentiation in *Rudbechia* suggests that it will be difficult, if not impossible, to hybridize species of the two sub-generic groups.

Laciniata Group

The *laciniata* group includes six species. Two are monotypic (without described variants); the other four species include 13 taxonomic varieties, many of which have been regarded as distinct species. In general this group is morphologically quite homogeneous; most

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of the species appear to be closely related. On the other hand, the species do not intergrade morphologically. There is very little overlap in their geographic distribution.

Natural hybridization in the *laciniata* group is rare. However, one variety appears to have originated from interspecific hybridization and this variety appears to have back-crossed to one of the parent species. The lack of hybridization in nature between species of this group is probably due more to discontinuity in geographic distribution than to genetical isolation.

The presumed hybrid involves two of the most strikingly different species in the *laciniata* group. This, and morphological patterns in the group, suggest that any of the species can be hybridized with all or most of the other species. Favorable ornamental properties can probably be transferred from one species to another with relative ease.

Species in laciniata group

The laciniata group includes R. californica and R. occidentalis of the western states, R. maxima of eastern Texas and adjacent states, R. nitida of the Gulf coast and R. mohri of Georgia and western Florida. The most attractive plants in this group are R. californica, R. laciniata, R. maxima, and R. nitida. Rudbeckia occidentalis is rayless and rather unattractive. R. mohri is an unattractive plant with small inflorescences and narrow grass-like leaves.

Species of the *laciniata* group occupy mesic to very moist environments, often seeps or creek banks. They occur in a broad range of climate from warm to very cold, from such extreme areas as middle peninsular Florida to elevations of 9000 feet or more in the Rocky Mountains. While they prefer abundant soil moisture and a relatively loose light soil that permits the development of an extensive root system, they can thrive in areas of low atmospheric humidity. Horticulturally desirable strains can probably be bred that are suited to almost any climatic area of the United States.

Rudbeckia occidentalis is a coarse plant to about 6 feet tall, with large ovate leaves. The most widespread of three taxonomic varieties occurs from rentral Utah north and northwest to Montana and eastern Washington, then south to northern California. A second variety occurs in central Washington and a third in west-central Colorado. Although the plant has attractive foliage, without rays it has little direct ornamental value. It does, however, have a single attribute that will make it of value in the improvement of other species. Rudbeckia occidentalis has a deep reddish brown disk that, on casual observation, appears almost black in contrast with other species-especially R. laciniata—with greenish or brownish disks. It is most likely that this character can be transferred to other species, especially to R. laciniata. Indeed, it appears that this has occurred in nature. An apparent hybrid between R, occidentalis and R. laciniata is documented from westcentral Colorado, The apparent hybrid most closely resembles R. laciniata but has the deep reddish brown disks of R. occidentalis. It was growing among plants typical of R. occidentalis and those typical of R. laciniata. Such a well-colored disk set upon a background of large yellow rays will prove an asset to any Rudbeckia.

R. laciniata

Rudbeckia laciniata is the only species of this group that has been cultivated to any extent, at least within the United States. It is best known as golden glow, R. laciniata 'Hortensia', a large coarse plant with "double flowers" in which all or most of the disk florets are replaced by rays. As an ornamental, R. laciniata suffers especially from its awkward, overpowering size and weak stems.

Rudbeckia laciniata is the most variable species in the genus. Plants may be large and coarse with stems up to 9 feet tall, or small and slender with stems 3 feet or less. Rays vary in length from 5/8-21/4 inches, disks in length from 1/4-11/2 inches. The range of variation in size of rays and disks produces plants

that are extremely conspicuous in flower and also those that go almost unnoticed. The leaves are characteristically pinnately divided but the degree to which they are divided varies from those that are merely lobed to those that are highly divided, with very narrow ultimate segments.

Rudbeckia laciniata is widely distributed in eastern North America, from southern Canada south to Florida and Arkansas and west to eastern North Dakota and eastern Oklahoma. It is also common in the mountains of the west from Arizona and New Mexico northeast to the Black Hills of South Dakota, then westward to western Montana.

Most plants in the eastern United States have very slender stems while those of the west characteristically have very stout stems. Inflorescences of eastern plants are commonly supported by peduncles 1/16 inch or less in diameter, while those of the west are typically supported by peduncles 1/4 inch in diameter. Plants with stout stems occur to a limited degree in the northern states and lower Canada, with decreasing frequency east to the Atlantic. One can be almost certain that the weak-stemmed R. laciniata, as it is known in American gardens, originated in an eastern population of this species.

While most plants of R, laciniata are large and coarse, plants of smaller stature are locally available. The smaller stature of these plants appears to be a genetical factor rather than a decrease in vigor due to site or other factors. On the average, the western plants are but one-half to two-thirds the size of those of the East. Plants of small stature, about 3 feet tall, grow in the Sante Fe area of New Mexico. These bear the stout stems typical of western plants. Other shortstatured varieties occur in the Appalachians from Virginia to Georgia and on the upper Atlantic Coastal Plain, especially in eastern Virginia and North Carolina. These bear the slender stems typical of eastern races.

The leaves of the western plants are characteristically very coarsely divided. Those of the eastern plants are highly variable in this character and display a range of variation, including extremes of the species. Plants with the most completely divided leaves are especially abundant on the Atlantic Coastal Plain in Virginia and North Carolina.

Western plants usually produce a few inflorescences with large rays and disks. Eastern plants are highly variable but commonly produce many inflorescences with considerably smaller rays and disks.

The great degree of variability in R. laciniata is due to a complex evolutionary history that has led to the development of polyploid and apomictic races. Patterns in morphological variation, information on cytology and embryology, and the geographic distribution of apparent pollen sterility, suggest that the western representatives and those of the southeastern states are largely diploid and sexual while those of the northeastern states are commonly polyploid and apomictic. The northeastern populations are highly complex and variable. and probably are the direct result of hybridization between three well-defined morphological extremes of the species.

Much can be done to improve R. laciniata as it is now known in American horticulture. The most important qualities toward which breeding should be guided are shorter stature, stronger stems, and larger, more attractive flowers. In my opinion, the breeder, with the wealth of variability available, could devote his attention to the development of two distinct types: (I) a short stoutstemmed plant with large doubled inflorescences, and (2) a short stoutstemmed plant with deeply colored disks set upon a background of a single circle of large showy rays. Either type could be endowed with a choice of leaf types from a wide range. The two extreme leaf forms are the most attractive.

R. maxima

Rudbeckia maxima occurs largely in southeastern Oklahoma and northeastern Texas. It is restricted to areas of sandy or somewhat heavier loam, and is never present on the heavy clays of that region. This is a very coarse plant



PHOTO BY AUTHOR

Rudbeckia maxima. Native of southeastern Oklahoma and northeastern Texas.

with simple or sparingly branched stems 6-12 feet tall. It has large glaucous, elliptical or fiddle-shaped leaves that are rather unattractive. Its principal attribute is a massive inflorescence, a light reddish brown disk 1½-3¼ inches high set upon a background of yellow rays 1½-2¼ inches long and up to about 1 inch broad. In every respect this is the largest Rudbeckia, and its inflorescence is one of the more attractive. The large inflorescence will be a valuable character if it can be transferred to other species without being accompanied by comparable overall plant size.

This plant usually bears a single head, but stems with two heads are fairly common. In such instances a side branch, curving gently outward and upward, extends from the main stem 3/4-4 inches below the terminal head and terminates in a small head that rises above the terminal head. This character is a distinct liability, for the small head on the branch stem detracts from the balance of the terminal inflorescence.

Rudbeckia nitida is closely related to R. maxima. It occurs in southeastern Texas and southwestern Louisiana, well separated from R. maxima, and in Georgia and Florida. This is a very attractive plant with stout stems 1½-4 feet tall. It produces an abundance of coriaceous, broadly elliptical or spatulate leaves. The stem is simple or sparingly branched, terminated by one to four, occasionally more, inflorescences with reddish brown disks 5/8-13/4 inches high, and yellow rays 3/4-11/2 inches long.

This species, especially in southeastern Texas, produces very luxuriant clusters of basal leaves that are fresh and green and attractive even in the absence of flowers. These dense clumps of leaves are made up of many individual rosettes that will give rise to future flowering stems. In a large clump of leaves, only a few of the basal rosettes produce flowering

stems in a single season.

The western populations of R. nitida are considerably more attractive than those of the east. Western plants have broader leaves and considerably larger inflorescences.

Considerable improvement can be gained in this species by selecting for large inflorescences, many inflorescences per stem, and somewhat shorter stems. The deeply colored disk of *R. occidentalis* can probably be transferred to this species to advantage even though the disks of *R. nitida* are not so lacking in color as to be unattractive.

Rudbeckia californica grows in the Sierra Nevada of California and in the Klamath Mountains of northern California and southwestern Oregon. I have not seen this species in the field and have been unable to maintain it to best advantage in either greenhouse or garden in the East. It has a stout stem of medium stature and bears inflorescences of pale greenish brown disks up to 21/2 inches high, with rays up to 21/2 inches long. From herbarium material it appears that the leaves may not be particularly attractive. In general, the useful characters present in this species are more easily found elsewhere.

Hirta Group

The hirta group includes nine species. Five are monotypic; the other four include 18 taxonomic varieties. In contrast to the laciniata group, this assemblage is morphologically quite diverse. While the morphological and cytological characteristics of all the species place them without question in a single subgeneric group within Rudbeckia, most of the species do not appear to be closely related to one another.

There are five independent species or groups of species. Four of the species form a natural assemblage because they are more closely related to one another than they are to any other species of the hirta group. These are R. grandiflora, R. subtomentosa, R. heliopsidis, and R. mollis. These four species are geographically isolated from one another. A second natural group is R. fulgida and R. missouriensis. The remaining three species, R. hirta, R. triloba, and R. graminifolia are not closely related nor do they appear closely related to any of the other six species. There is no morphological intergradation between any of the species.

In the *hirta* group, discontinuity in geographic distribution is the exception rather than the rule. Six of the species occupy restricted or relatively restricted geographic areas. The remaining three species are wide spread and occupy areas that overlap most of the species in the group. It is not unusual to find two or three species in the same vicinity. Indeed, they commonly grow side by side.

There is no evidence of natural hybridization between any species of the hirta group even though the plants commonly occur together in the same habitat and overlap in flowering period as well. The lack of hybridization between species in this group is probably due largely to genetical isolation. Morphological patterns in the group suggest that, as a rule, it will be difficult if not impossible, to accomplish interspecific hybridization. Any breeding effort directed toward the improvement of species of the hirta group must depend largely on hybridization of diverse ele-



Black-eyed Susan (Rudbeckia hirta). Close-up of flower head; ray flowers orange-yellow, 2 in. long, darker at base; head purple-brown, 3/4 in. across.

Black-eyed Susan (Rudbeckia hirta). Plant in field at Beltsville, Maryland.

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ments within the individual species.

The species that will prove of greatest interest to the horticulturist are R. triloba, R. fulgida, R. missouriensis, and, to a lesser degree, R. grandiflora and R. subtomentosa. Rudbeckia heliopsidis is a rare species of slender stature with sparsely leaved stems, and small inflorescences that are better developed in its close relatives. Rudbeckia mollis, with nearly prostrate rosettes and small stem leaves of uniform length, has a fairly large inflorescence but otherwise little to recommend it. Rudbeckia graminifolia is an ecological companion of R. mohri of the laciniata group, and like it, has narrow grass-like leaves. Although it is almost totally without eye appeal, R. graminifolia is unique in that it is the only Rudbeckia in nature with totally reddish brown rays. Unfortunately, it is the most extreme morphologically of the hirta group and it is very unlikely that it can be hybridized with any other species. The remaining species, R. hirta, has been subjected to intensive breeding and selection culminating in many cultivars and the well-known "Gloriosa Daisy." Although additional cultivars can undoubtedly be achieved, greater rewards will be attained with other species that so far have not received the attention of the breeder.

Rudbeckia Triloba

In my opinion the species with the greatest potential as an ornamental, but rarely seen in gardens, is R. triloba. As commonly seen in nature R. triloba has little to recommend it. This species occurs in the wild as three very distinct botanical varieties. One is unimpressive with small inflorescences and highly divided leaves. It comes from a small area in western Florida and a single mountain top in North Carolina. A second variety, with leaves 3-lobed or merely toothed and inflorescences large for this species, has been recorded from only two to three adjacent high mountains along the North Carolina-Tennessee border. The third variety is more or less intermediate between the first two. It is widely distributed from Massachusetts to

Michigan and Iowa, south to Georgia and Texas.

The common widespread variety of R. triloba is highly variable. There are two extreme morphological forms between which intergradation is complete. One form is especially abundant in the southern states; it is also common in the North. This southern form is a comparatively slender plant, commonly 3-4 feet tall with small disks and pale yellow rays. This form most commonly displays relatively pale green stems and leaves. It appears to behave in nature, at least in many cases, as an annual or biennial. As the plants come into flower the basal and lower stem leaves dry up. In late flower there is rarely any evidence of new basal growth. However, in the garden under favorable conditions, plants fairly similar to this extreme form have been perennial. This plant is very weedy and highly competitive with other weedy species. Where the plant is present, along roads, along ditch banks, in old fields it is normally very abundant.

The second form of R. triloba is rare in the south but fairly common in the north, especially eastward from Michigan and Indiana. It is a comparatively short plant with stout stems 1-11/2 feet tall. This form has large disks and dark orange-yellow rays. Stems and foliage are normally dark green. The plant behaves as a perennial. As it comes into flower a few of the lower stem leaves may wither but the basal leaves remain fresh and green and during most of the growing season form a dense cluster at the base of the stem. This form is perhaps a weed but certainly less weedy than that previously described. It does not appear to be highly competitive and usually occurs as a few scattered but well developed plants. I have grown plants fairly typical of these two extremes and their garden appearance parallels their performance in nature. In the garden the short plant with larger inflorescences behaves as a strong perennial, remaining year after year with a dense cluster of basal leaves. The taller plant with small inflorescences tends to behave in the garden as a shortlived perennial. It readily escaped from

the garden and for several years persisted nearby. From these garden plants it is evident that these two forms are basically different and that they are not different expressions of a single genetical type in response to different environments.

Some wild specimens of the northern form of *R. triloba* are sufficiently attractive to encourage their use in the garden. The flowering stems are short and in good balance with the size of the basal clumps of leaves. Inflorescences are fairly abundant with deep reddish brown disks up to about 5/8 inch broad surrounded by 8 well-colored rays up to about 5/8 inch long, providing an inflorescence nearly 2 inches in diameter. A special search in nature may well lead to plants with somewhat larger inflorescences.

It is difficult to predict the degree to which this interesting northern form of R. triloba is adaptable to intensive breeding. Three plants grown from seed from two separate localities in Tennessee are diploid with 38 chromosomes. Both of these plants are very typical of the southern form, Seven plants grown from seed from four localities in Indiana, Ohio, and Massachusetts proved to be triploid with 57 chromosomes. All of these plants are fairly typical of the northern form. If, as these data suggest, the northern form is triploid, it must be assumed that this form reproduces apomictically and it seems that it would be impossible to hybridize different individuals. On the other hand, this northern form is sufficiently variable to suggest that all of its representatives cannot be of a single strain; if apomixis is involved in the reproduction of all of the representatives then a fairly large number of strains must have arisen independently of each other. It may be a coincidence that only triploid populations were sampled for cytological study and that an additional search will yield diploid sexually reproducing populations better suited to a breeding effort. It is also possible that this attractive form of R. triloba originated from hybridization involving the high mountain variety of R. triloba, to be discussed in later paragraphs, a possibility that makes its triploidy more logical.

If hybridization can be accomplished between different representatives of this interesting form it may be possible to improve the plant somewhat by selection for increased flower size and deeper flower coloration. However, I feel that nature has largely achieved what might be expected from this plant and that we need only select the best that nature has to offer. The multitude of intergrades between the northern and southern forms display a wide array of plant habit. Some of these of medium height that branch freely and are highly floriferous would be extremely attractive if endowed with the larger colorful inflorescences of the northern form. The basal half of the rays of R. triloba is commonly more darkly colored than the terminal half. It may be possible to improve this species by selecting for plants with rays having an expanded area of the deeper coloration or with rays that are deeply colored throughout.

High-mountain Variety

The high-mountain relic variety of R. triloba has, in my opinion, the greatest ornamental potential of all the rudbeckias. There are very few specimens of this in American herbaria, too few to provide an independent assessment of the ornamental potential of this plant. However, given a close familiarity with related elements of the species it is not difficult to picture the appearance of this plant in the garden. Some plants of this variety bear the typical trilobed leaves of its relatives, but others have leaves merely toothed. Although John Kunkel Small's Manual of the Southeastern Flora indicates that the plant ranges from 11/2-41/2 feet in height herbarium specimens indicate a height range of 16-36 inches. Basal leaves appear abundant and the stems are very leafy. The rays range up to 11/4-13/8 inches in length and surround a hemispherical to somewhat globose, darkly colored disk up to about 3/4 inch broad. In some of the living plants the diameter of the inflorescence must have reached 31/2 inches. This plant in the garden probably would

be very similar in general appearance to the northern form of the widespread variety of *R. triloba*, differing primarily in a lesser tendency toward lobing of the leaves and the much larger inflorescences.

The high mountain variety of R. triloba was first collected on Little Roan Mountain, North Carolina, July 19, 1880. A second collection was made on Roan Mountain, North Carolina, on August 1 of the same year. The plant was collected on "rocky slopes of Elkhorn Mt., 6 mi. e. from Roan Mt., alt. 6100 ft." in September 1884. Three additional collections were made from these same three mountain tops, the last in 1885.

This plant has apparently not been collected for more than 75 years. It probably no longer exists on Roan Mountain. I have been unable to find it during two brief visits to this locality, and a local collector who has explored Roan Mountain extensively for many years has never seen the plant. This is such a striking plant that it is unlikely to be ignored by any collector when encountered. With the paucity of collections that have been made and the absence of collections during the past 75 years, there seems little doubt that it is extremely rare, if indeed it still exists.

It is impossible to determine the geographic location of the other sites from which this plant was collected. The Board of Geographic Names of the U.S. Geological Survey has no record of either "Elkhorn Mt." or "Little Roan Mt." The name "Little Roan Mt." may have been applied to a ridge of Roan Mountain or to a smaller nearby mountain. According to the collector's notation, "Elkhorn Mt." lies 6 miles east of Roan Mountain and his collection was recorded from an altitude of 6100 feet. According to topographic maps of the area there are no mountains east of Roan that reach this altitude. This collection probably came from one of the higher mountains to the north or south of Roan or from a lower mountain to the east. I have questioned many local residents of the Roan Mountain area and none have heard of Elkhorn Mountain. One local resident, however, mentioned that one mountain just east of Roan Mountain has been referred to as Elk Mountain.

Rare plants are occasionally rediscovered in the mountains of western North Carolina and adjacent Tennessee and possibly this will be the case with the high mountain variety of *R. triloba*. The potential value of this plant is sufficient to justify some effort toward its rediscovery. There is probably little to be gained by searching Roan Mountain but it would be well worth while to explore the upper reaches of other mountains in the area, especially those that are likely to have been overlooked by collectors.

R. fulgida

Rudbechia fulgida is a highly variable species of wide distribution in the eastern United States, extending from southern New England west to Illinois and south to Texas and Florida. It includes 8 taxonomic varieties. Seven of these have well-defined or reasonably well-defined geographic ranges; the eighth overlaps all of the others. Of the four varieties for which chromosome counts were made, only a single variety was exclusively diploid, and this is the only variety that approaches complete geographic isolation from all the others.

Rudbeckia fulgida is a stoloniferous perennial with leafy tufts terminating the very slender horizontal stolons. Relatively few leaves appear at the base of a flowering stem, a characteristic that detracts from the overall appearance of this species, in comparison with others of this genus. Stems range from short and slender to tall and stout; some bear a single inflorescence, others many. The rays are deep yellow, often with an orange base, from 7/16-11/2 inches long. Disks are deep reddish brown, almost black, when fully mature, and 1/2-3/4 inch broad. This species most commonly grows in mesic to wet areas.

Aside from the large, well-colored inflorescence present in some varieties, this species is generally rather coarse and has little to recommend it. However, there is a wealth of variability in habit and leaf form in the species and its

strongly stoloniferous habit makes it useful for some informal situations. In any effort to improve this species attention should focus on plants in the general area of Indiana and Ohio to eastern Tennessee and northern Alabama. The full variability of interest to the horticulturist is available within that area. The five varieties that occur and intergrade completely within this fairly limited area include those with the larger inflorescences.

R. missouriensis

Rudbeckia missouriensis is closely related to R. fulgida and is probably the only species capable of being hybridized with it. Rudbeckia missouriensis, unlike R. fulgida, is never stoloniferous; the basal leafy tufts originate at the base of the stem. This species is rather coarse, with freely branching stems up to about 30 inches tall. The branches of the stem are sharply ascending and terminated by fulgida-like inflorescences with rays up to 1 inch long and disks up to ½ inch broad. Rudbeckia missouriensis occurs from east-central Missouri to eastern

Texas. Its area of distribution is completely overlapped by a single variety of R. fulgida, partly overlapped by a second, but there is no indication that these have hybridized in nature. Rudbeckia missouriensis usually grows in dry areas, commonly on limestone.

R. grandiflora

Rudbeckia grandiflora is a coarse plant with an unbranched, stiff, erect, stem 2-3 feet tall. A stem usually bears a single, long-peduncled inflorescence with drooping or strongly reflexed yellow rays up to 23/8 inches long, and a reddish brown disk up to 1 3/16 inches broad. The larger inflorescences are very showy. Plants develop from a horizontal, branching underground rootstock. Rosettes of a few ovate to broadly lanceolate leaves occur at the base of the flowering stem and at intervals over the nearby soil surface. The esthetic appeal of this species suffers from the relatively small amount of basal foliage but the striking inflorescence with unusually broad disks and long reflexed rays, borne singly on stiffly erect stems, gives this



Риото ву Аптис

R. grandiflora. Native of eastern Texas, to central Arkansas and Louisiana.

species an unusually majestic aspect which should make it a valuable addition to any garden. Rudbeckia grandiflora is distributed from central Arkansas to Louisiana and eastern Texas.

R. subtomentosa

Rudbeckia subtomentosa produces an abundance of stout or slender stems, 11/2-4 feet tall, from a stout woody rhizome. Stems usually branch above and terminate in as many as 20 inflorescences with yellow rays up to 2 inches long and brownish disks up to 1/9 inch wide. The inflorescences are similar to those of R. grandiflora and the rays are not reflexed. Basal foliage is relatively meager but the stems are well-clothed with ovate 3-lobed leaves. In shape the leaves closely resemble those of R. triloba, but the two species are not closely related. The mass of large colorful inflorescences and the leafy stems should encourage wider planting of this species, especially if selections of consistently lower stature can be developed.

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Excerpt from Peter J. Van Melle

On Shrubs Introduced by Ernest H. Wilson (1948)

Who is to say which are "the best"? Are not the best those that hold out to each gardener the greatest enjoyment, interest and usefulness? And are we not gardeners, a diverse assortment of creatures-some stirred the most readily by the sheer beauty of plants, some by their challenge to our skills, others by their amenability to our intentions with them?

A dozen fine shrubs to remind us of a great plantsman and explorer; of the era in horticulture that produced him; men like Veitch and Sargent; men moved by an intensely human, profound, and simple delight in the diversity of plants in this world, which is the life-blood of horticulture. May that blood run red again, one of these days, as it did then.

Berberis gagnepainii Berberis verna Berberis verruculosa Cotoneaster divaricata Cotoneaster racemiflora var. soongorica Cotoneaster salicifolia var. floccosa

Kolkwitzia amabilis Malus hupehenis (theifera) Neillia sinensis Rhododendron micranthum Sorbaria arborea Spiraea trichocarpa

Advances in Horticulture

Ornamental Horticulture in Prairie Canada

W. A. CUMMING*

(Adapted from a talk delivered at the 21st Annual Horticultural Conference, Alumni Association of the Niagara Parks Commission School of Horticulture, Niagara Falls, Ontario, Jan. 18, 1968. A portion of this talk was published in the May 1968 issue of the Canadian Nurseryman)

Since the main effort of the Canada Department of Agriculture in horticultural research for the prairies is centered at the Morden Research Station, and because I am most familiar with our own program, I chose to make this the starting point for my discussion on Ornamental Horticulture in Prairie Canada.

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Fig. 1. 'Prince of Wales' creeping juniper at Morden.

According to the new Zonation Map of Canada, prepared by Ouellet and Sherk and published by the Canada Department of Agriculture in 1967, Morden is in Zone 3b. The climate at Morden is atypical of that in the remainder of the three prairie provinces with the exception of one small location in the extreme southwest corner of Alberta in the vicinity of Waterton National Park. Elevation of Morden is 970 feet above sea level; the lowest temperature recorded is -41.5°F, the highest 111.2°F; the average frost-free period is 122 days and this, on the average, is from May 23rd to September 22nd; the average yearly precipitation is 20.6 inches, consisting of 15.23 inches of rain and 53.7 inches of

Research with ornamental plants at Morden has three main goals: 1) the breeding of new cultivars; 2) the evaluation of ornamental plant material from other sources; and 3) studies directed towards finding the best methods of propagation under our climatic conditions.

We can, I think, justly claim a reasonable amount of success in the field of breeding and selection; from 1929 to date 71 new cultivars have been introduced. Some of these have gained wide recognition; e.g., 'Almey' crabapple, 'Morden Pink' and 'Morden Gleam' lythrums, 'Toba' hawthorn, 'Prairie Youth' and 'Prairie Dawn' roses, 'Coral', 'Redwine', and 'Royalty' lilacs and 'Morden' blue spruce. Others, such as 'Morden Cupid' and 'Morden Fay' asters, 'Muckle' plum, 'Snowbird' hawthorn, 'Prince of Wales' creeping juniper (Fig. 1), 'Miss Canada' lilac, 'Centennial' weigela, 'Aubrey' mockorange, 'Garry' and 'Selkirk' rosybloom crabapples and 'Stockton' pincherry, will gain in popularity. It sometimes takes years for a new variety to gain recognition. The exquisitely beautiful, double-flowered 'Stockton' pincherry was named and introduced in 1929 and is only now gaining the interest of plantsmen on this continent and in Europe. Still another group have only local adaptation, such as the hardy garden chrysanthemums of which we have named and introduced 27 new cultivars. Very few of the Eastern-bred outdoor mums flower early enough for our area and they generally lack hardiness. We, along with several other prairie plant breeders, have developed and made it possible for gardeners on the Canadian prairies to grow and enjoy this popular autumn-flowering herbaceous perennial. Because most of the popular, presentday perennial asters (or, as they are sometimes called Michaelmas daisies) bloom too late in the season for us, we are producing earlier-flowering cultivars. To date six have been named, including the two dwarfs that I mentioned earlier. Several selections are decidedly promising; two will probably be named and introduced in 1969.

The arboretum at the Morden Station contains just over 1,600 species and cultivars of woody ornamentals, representing 116 genera, and occupies about 45 acres. In it we are regrouping the plants into generic groups and now have designated areas for 26 genera.

Besides evaluation of trees and shrubs, the arboretum serves as a gene pool for present and future breeding in woody ornamentals and as a basis for taxonomic investigations. At present, in conjunction with other institutions, we are cooperating in chemotaxonomic studies in *Populus* and *Syringa* and morphological taxonomy of *Potentilla fruticosa*, its varieties, forms, and cultivars.

Space is reserved in the arboretum for the Merit Trials for new introductions. This project is sponsored by the Western Canadian Society for Horticulture, and since its inception in 1959 a total of 73 candidates for these awards have been voluntarily sent in by plant breeders on the Canadian prairies and adjacent North-central States. To date, four awards have been made: Rosa 'Assiniboine' and Heuchera 'Brandon Pink' won awards for Henry H. Marshall of

the Brandon Research Station in 1965; Potentilla fruticosa 'Coronation Triumph' and Juniperus horizontalis 'Dunvegan Blue' won awards for Professor John Walker of the University of Manitoba and John Wallace of Beaver Lodge, Alberta in 1967; Malus 'Royalty', an introduction by W. L. Kerr of Saskatoon, received an award of merit at the Society's meetings in February 1968.

The Prairie Regional Trials for woody ornamentals, another project of the Western Canadian Society for Horticulture, is coordinated from Morden and most of the material for these trials is supplied by us. Besides Morden, seven prairie institutions are involved: University of Manitoba at Winnipeg, University of Saskatchewan at Saskatoon; the Tree Nursery, P.F.R.A. at Indian Head, Saskatchewan; two separate departments of the University of Alberta (Botany at the arboretum at Devon, Alberta, and Horticulture at Edmonton); the Provincial Horticultural Station at Brooks, Alberta; and the Canada Department of Agriculture Research Station at Lethbridge, Alberta.

A special card is supplied on which hardiness data for 5 years is recorded. At the end of the 5 years these cards are sent to Morden to be compiled into a composite report which is published in the Proceedings of the annual meeting of the Western Canadian Society for Horticulture.

This program started in 1959 and was the result of a feeling that inadequate data were available for the zoning of trees and shrubs on the prairies. Results for three 5-year periods are now being compiled and will be published in the Proceedings of the 1968 meeting. This list contains at least partial hardiness data on 242 different trees and shrubs. Each year in future the data will become more complete and additional species and cultivars will be added.

The landscaped grounds at the Morden Research Station occupy about 30 acres and give us the opportunity of displaying some of the woody material in a landscaped setting. The hedge collection is in this area and has provided us with valuable information on the use of trees and shrubs as hedges on the prairies (Fig. 2). The rose garden, containing the tender garden roses such as Hybrid Teas, Floribundas, Grandifloras, Hybrid Perpetuals, and Polyanthas, makes up part of the grounds display. Herbaceous perennial and annual flower trials are also worked into the landscape plan. A mimeographed check list of the herbaceous perennials tested at Morden from 1920 to 1965 is available.

So far, I have only briefly dealt with our own work in ornamentals with passing references to some of the others who are cooperating in our endeavors. I would like now to deal briefly with a few of the people and institutions that have had a profound effect on ornamental horticulture on the Canadian prairies.

Foremost among the plant breeders was the late Dr. F. L. Skinner of

Dropmore, Manitoba. The work that he carried on as a private individual on his own resources for almost 60 years will not easily be duplicated. There is no doubt that he was a genius among the plantsmen, and that his many introductions have added greatly to the wealth of plant material available to Canadians, their American neighbors, and to countries of northern Europe. A listing of awards received by Frank Skinner in his lifetime is alone impressive and indicates the esteem in which he was held both nationally and internationally. It was indeed fortunate that he was able, with some help from both the Federal Government and the Province of Manitoba, to publish the results of his work in his book Horticultural Horizons. The first copies became available in February 1967. Dr. Skinner died in August at the age of 85. His work in the hybridizing of forest trees is not nearly so well known







Fig. 2. Hedge trials at Morden include a wide variety of plant material.

PHOTO CREDIT: RESEARCH STATION, RESEARCH BRANCH, CANADA AGRI-CULTURE, MORDEN, CANADA as his work with ornamentals. He collected spruce, pine, larch, poplars, and willows from many sources, and crossed them. The resulting hybrids will undoubtedly play an important role in the future development of the forest industry in Canada.

Mention is here made of several other prairie plant breeders who have gained wide recognition: R. Simonet of double petunia fame now spends all of his time in his greenhouse and small acreage at Edmonton in plant breeding, mostly ornamentals; Georges Bugnet of Legal, Alberta has given us several new ornamentals including the rose 'Therese Bugnet'; the late Dr. C. F. Patterson of the University of Saskatchewan will long be remembered for his lily cultivars; A. J. Porter of Parkside, Saskatchewan is widely known for his lilies; Percy H. Wright of Saskatoon for his roses and lilies, perhaps better known as a horticultural writer; W. L. Kerr, also of Saskatoon, for his 'Royalty' crabapple and the part he played in his earlier years as a plant breeder par excellence at Morden. 'Almey' crabapple, 'Toba' hawthorn and the 'Prairie' almond series are products of his skill and vision as a plant breeder; H. H. Marshall of the Research Station at Brandon, Manitoba, for his work in hybridizing native species with more showy, but tender cultivars in Rosa, Heuchera, Monarda and Geum; the late William Godfrey, for many years head gardener at Morden, whose work in the hybridization of roses led to the introduction of 'Prairie Youth' and played an important role in the Morden rose breeding project; H. F. Harp, who followed Mr. Godfrey at Morden, for his roses, mockoranges, lythrums, chrysanthemums and asters, and for his untiring effort in producing a weekly radio script for the C.B.C. Prairie Gardener for the past 7 years; and lastly, Dr. W. R. Leslie who for 35 years directed the plant breeding at Morden in both ornamentals and fruits.

You will be interested, as horticulturists, in a list of the more important places to visit, in the three Prairie Provinces, other than civic, provincial and

national parks. Starting at the most distant point. Edmonton, the landscaped grounds of the University of Alberta where Professor R. H. Knowles directs the landscaping; traveling south to Calgary, you should see the conservatory and adjacent plantings at the Zoological Gardens where credit for inspiration and guidance goes to Lars Willumsen; the Provincial Horticultural Station at Brooks, Alberta is next, where, with the aid of irrigation and under the supervision of P. D. Hargrave, a horticultural oasis has been created; at Regina, Saskatchewan, Wascana Centre, a 1,500 acre site in the center of the city, is an example of enlightened landscape planning for this continent-P, J. Moran is the director; about 40 miles east of Regina is the Canada Department of Agriculture's Tree Nursery at Indian Head where millions of trees for farm shelterbelts are produced and distributed under the Prairie Farm Rehabilitation Act. Dr. W. H. Cram directs these modern, large-scale nursery operations; the next stop of horticultural interest is the International Peace Garden* 50 miles south of Brandon, Manitoba. Here, in the geographical center of North America, is a garden dedicated to peace. Its formal grounds are impressive although not yet completed, and in it natural beauty abounds; 100 miles to the east is Morden and I have already dealt sufficiently with our work here. On your way to Winnipeg, I am sure you will wish to call in at Carman to visit a distinguished member of your Alumni Association, Lawrence Aubin, who owns and operates one of the leading commercial nurseries on the prairies; the last official port of call on this tour is a developing arboretum under the direction of Professor Louis Lenz at the University of Manitoba in Winnipeg. From Edmonton to Winnipeg you will have covered approximately 1,200 miles and spent 7 to 10 days enroute. On your next visit, start at Morden and we will be delighted to outline an equally interesting tour of horticultural interests for you.

^{*}See AHS Magazine, Winter 1969, p. 20.

Pilot Garden of Roxbury/Dorchester

The Pilot Garden of the Roxbury/ Dorchester Community Beautification Committee. Carlton B. Lees, Executive Director, Massachusetts Horticultural Society. The following is from the 1967 Yearbook of the Massachusetts Horticultural Society.

Advances in horticulture arise from experimentation and observation in the garden, the test plot, and the laboratory. They start as ideas awaiting recognition and application. Thus it is a significant "advance" in the horticultural world when man is taught and comes to realize that, ". . . he has within himself the power to improve his environment and the responsibility to maintain it." The words are Carlton Lees's, Executive Director of the Massachusetts Horticultural Society. Writing in the 1967 Yearbook of the Society, he noted, "... we ... can look to 1966 as the year in which a program was launched which promises to have far reaching results. It all began when a member of the Society, who was

attending a Tuesday evening series of lectures on landscaping, came up to me after one of the classes and said, 'Mr. Lees, I wish we could do something about a neighborhood gardening program in Roxbury.' From this beginning came the establishment of the Pilot Garden at Erie and Ellington Streets, Dorchester, and, for the first time, the establishment of the 4-H program within the city of Boston."

The Society brought the necessary coordinating agencies together, such as the Massachusetts 4-H Foundation, and the Cooperative Extension Service of the University of Massachusetts, and subsidized a course in practical gardening for potential leaders from Roxbury. It also provided the design for the garden, helped find materials and plants, and gave support through lectures and meetings with leaders (Figure 1).

"The potential of this program can make your head spin," Mr. Lees said, "teaching, as it does, man's obligations to himself and to those who will come after him, how to preserve and create the surroundings for a better life. The future of the American landscape de-

pends on so simple a lesson."



PHOTO FROM THE MASSA-CHUSETTS HORTICULTURAL SOCIETY

Fig. 1. Planting day in Dorchester, Massachusetts, August 4, 1966.

This section on weeds is a new feature of the American Horticultural Society's journal. Its editor is Dr. Loran L. Danielson, Leader, Weed Investigations, Horticultural Crops, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland 20705.

The purpose of this new service is to help Society members become knowledgeable about weeds and their control.

CONTROLLING MUGWORT IN WOODY ORNAMENTAL PLANTINGS

L. L. DANIELSON

Mugwort, Artemisia vulgaris, a member of the sunflower family, is one of the most serious weed pests in homesite and public landscape plantings and in nursery plant production. It is also commonly known as wormwood and wild chrysanthemum. It is native to the United States and is most widespread in Northeastern States and along the Pacific Coastal region.

The foliage and stems are in general quite similar in shape and size to chrysanthemum plants. This has led to the name "wild chrysanthemum." Its flowers are very small and inconspicuous, and clearly distinguish it from chrysanthemums. The numerous small flowering heads occur in terminal or axillary clusters. Mugwort grows best in well-limed and fertilized soils.

Reproduction is by rhizomes and seeds. On being introduced to a new area and left undisturbed, it spreads rapidly by means of numerous proliferating rhizomes. The spread is even more rapid if the soil is hoed or cultivated and the rhizomes cut into many short lengths which are distributed throughout the area. Hoeing also reduces competing vegetation. Each piece of rhizome may produce one or more new plants.

Rhizome segments and seed may also be introduced in topsoil and soil accompanying balled ornamental plants.

A number of scientists have studied the life history and physiology of mugwort as a basis for developing control methods. These studies have shown that mugwort not only competes with ornamentals for nutrients, light, and water, but also inhibits growth of other plants by merely growing adjacent to them. Chemical analyses have shown that mugwort roots secrete substances that inhibit the growth of other plants, and thus assist in domination of the plant community.

Hand-weeding, including hoeing and weed pulling, is not effective in controlling mugwort and is of little benefit for the weeder aside from healthful exercise. This is largely counteracted by the frustration caused by the ineffectiveness of such efforts! Mulching with organic materials or plastic sheeting is also ineffective in controlling mugwort because of its vigorous spreading growth and extensive root reserves.

Controlling mugwort is an especially complex problem, but several control measures that may be used separately or in various combinations have been developed. To begin with, the soil in new areas to be planted should always be fumigated. So should the new top soil as it is brought in. This will kill mugwort seed and rhizomes. Buy high-quality.

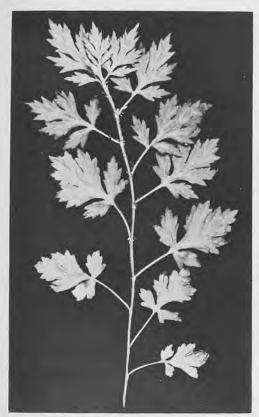


Fig. 1. A typical mugwort stem and leaves showing the resemblance to chrysanthemum.



Fig. 3. Flowering mugwort plants in early fall. Notice that flowers are very small and not similar in arrangement and distribution to chrysanthemums.



Fig. 2. Vegetative growth of mugwort in early spring. This is an ideal stage for treatment with amitrole.

weed-free nursery stock and carefully remove any weeds as they appear.

Established mugwort in woody ornamentals can be safely controlled by carefully directing the spray of the herbicide 3-amino-s-triazole [amitrole] to the new mugwort foliage in early spring. Mugwort foliage usually appears in early spring before the foliage of most deciduous woody ornamental plants expands. Thus, spraying at this time reduces the possibility of injury to the ornamentals. The weeds should be sprayed a second time after 6 to 8 weeks. Use an aluminum, plywood, or cardboard shield between the spray nozzle and ornamentals to protect the valuable plants from the spray. Use a spray solution containing two level tablespoons of the formulated 50% amitrole wettable powder, or equivalent of other formulations, per gallon, plus a tablespoon of liquid household detergent. Completely wet the weed foliage but do not waste spray solutions by making excessively heavy applications that drip off the leaves. Spray when the weather is calm to prevent spray drift. Do not spray when rain is imminent within 24 hours.

Mugwort in plantings of some species of woody ornamentals can be safely controlled by application of granular 2,- 6-dichlorobenzonitrile [dichlobenil] herbicide to the soil in late fall when daytime temperatures average about 60°F. Tolerant ornamental species and rates of application are given on the manufacturer's label. Carefully restrict use to plantings of the tolerant ornamental species listed on the label.

All agricultural chemicals recommended for use in this report have been registered by the U.S. Department of Agriculture. They should be applied in accordance with the directions on the manufacturer's label as registered under the Federal Insecticide, Fungicide, and Rodenticide Act.



Fig. 4. Effects of amitrole herbicide on mugwort plants. Treatments left to right are, respectively: untreated; and amitrole 2 lb/A, 4 lb/A, and 8 lb/A applied as a spray on the foliage.

The first sign of amitrole injury is the white appearance of new foliage. This is followed by the drying up of all of the foliage and death of the plants in 2 to 3 weeks.



Fig. 5. Effects of dichlobenil herbicide on mugwort plants. Treatments left to right are, respectively: untreated; and dichlobenil $\frac{3}{8}$ lb/A, $\frac{3}{4}$ lb/A, $\frac{11}{2}$ lb/A, and 3 lb/A applied to the soil and covered lightly with soil. Notice

that the lower rate of treatment greatly reduces plant vigor resulting in very thin stems with many lateral shoots. Higher rates halt plant growth, cause severe foliage burn, and eventually kill the plants.

Metasequoia Produces Male Flowers in Williamsburg, Virginia

In June 1948 I visited the Jardin Botanique de l'Etat in Brussels and saw in a greenhouse there many seedlings of Metasequoia glyptostroboides, from seed distributed by the Arnold Arboretum. I sent a small packet of the same lot of seed by airmail to Dr. Bernice M. Speese at the College of William and Mary, and she planted them immediately. Germination was in a matter of days. We might well date the seedlings from July 1, 1948.

Five of the young plants were established on the grounds of the College and another given to a resident of the city. They all thrived. Later however, two

PHOTO COL. DONALD W. NOAKE

Fig. 1. Metasequoia glyptostroboides tree on left, 57 feet high; on right 69.3 feet high. Planted in 1948.

big individuals had to be moved; growth of one of the trees was seriously retarded. My recollection is that these six trees have produced female cones for at least ten years. Dr. Speese harvested 1968 seed from which she has a number of vigorous seedlings.

Data on two of our trees are recorded via photographs made by Col. Donald W. Noake on March 25, 1969. Sets of the photographs are at Kew, the Arnold Arboretum, the Missouri Botanical Garden, and the U.S. National Arboretum, and specimens (Baldwin 17019) are in the herbarium of the National Arboretum.

One of the photographs shows trees with heights of 57 and 69.3 feet respectively and with corresponding girths of 10.3 and ca. 9.5 feet at ground level. The picturesque bases are buttressed and fluted, as shown in the second photo-



PHOTO COL. DONALD W. NOAKE

Fig. 2. Base of 57-foot tree. Circumference at ground level, 10 feet 4 inches.



PHOTO COL. DONALD W. NOAKE

Fig. 3. Male cones (just prior to flowering) on lower side of branch from 69.3 foot specimen; female cones at end of the branch.

graph. A branch with male and female cones constitutes the third photograph. Dr. Kenneth F. Bick determined the heights of the trees.

These are among the largest representatives of dawn redwood in cultivation; they are likewise among the first to have male cones and to produce viable seed.

This note supplements Wyman's report on Metasequoia in cultivation (Arnoldia 28:113-123. 1968.)

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RARE ORCHID ON DISPLAY AT LONGWOOD GARDENS

Today, few people apart from mountaineers in South Africa have seen a red *Disa uniflora*, Pride of Table Mountain, growing in its natural habitat along streams and furrows of clear running

mountain water. Through the efforts of Dr. Russell J. Seibert, Director of Longwood Gardens, and the diligent greenhouse expertise of Mr. Clarence Deckman, orchid section head, visitors at Longwood Gardens could view a mass display of this rare orchid, a first in this country, during May and June.

To start from the beginning, on June 24, 1964, a small number of off-shoots of Disa uniflora, after passing quarantine inspection at the U. S. Department of Agriculture's Inspection House in Washington, D.C., arrived at Longwood Gardens from faraway Cape Town, South Africa. They were in poor shape and dehydrated. From this shaky start, Mr. Deckman flowered four plants, pollinated them and collected the seeds. He now has close to 300 plants from this first generation. A second and third generation are being produced.

Through experimentation the dread-



LONGWOOD GARDENS PHOTOGRAPH

Disa uniflora, rare orchid from Table Mountain, South Africa, on display in orchid cases at Longwood Gardens, Kennett Square, Pennsylvania. ed fungus on the soft stem has been eliminated. Thanks to up-to-date airconditioning, a moist, cool atmosphere is maintained during the hot summer months.

After five years, the story is far from being told. More crosses will be made. The results in the horticultural world may compare to the ventures the sailors have had in charting their courses around Table Mountain, Cape Town, South Africa.

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THE DOUBLE BLOODROOT*

Sanguinaria Canadensis 'Multiplex'

Mr. Guido von Webern had a perceptive eye and a love of nature. In 1916 he was attracted by a seven acre tract of land at the corner of North Main Street and Turner Road in Dayton, Ohio, about four miles north of the center of the city. He bought the property because of the beauty of the terrain, which included a steep slope covered with splendid trees; the site seemed likely to be the setting for wild flowers, a particular delight of his.

In spring when he inspected what he had purchased, he discovered to his joy, among a clump of Sanguinaria canadensis, a solitary plant with a fully doubled blossom. Because of his acquaintance with the native flora and his amateur knowledge of botany, he realized that he had spotted an unusual mutation. It was a small spindly plant; so, without disturbing it, he marked its location and protected it. By 1919 the plant had increased to a vigorous clump, large enough to divide. Mr. von Webern sent a division of the plant to the Arnold Arboretum in the autumn of that year.

In the Gardeners Chronicle, series 3, vol. 73, p. 283, May 1923, E. H. Wilson,

vol. 73, p. 283, May 1923, E. H. Wilson,

In his article Wilson mentioned that Dillenius in 1732 had illustrated a "Sanguinaria major flore pleno" in his Hortus Elthamensis, vol. 2, p. 334, plate 252, fig. 326. This plant had 14-16 petals, only double the normal number, whereas Mr. von Webern's plant had the multiplication of the petals carried to a greater extent so that even the stamens and carpels were transformed into petals. Wilson also says that the plant named S. canadensis (var.) plena by Weston in The Universal Botanist & Nurseryman 3; 610, 1772 is the same as Dillenius's plant, since Weston cited the Dillenius reference in synonymy when he coined the name plena.

Mr. von Webern's plant is no longer growing at the Arnold Arboretum, nor was the plant accessioned in the Arboretum collections, apparently. But Mr. von Webern's widow, presently Mrs. Thomas, has preserved the letter of acknowledgement from the Arboretum. She reported recently that the original plant on the Dayton property suffered either from neglect or depredations of one kind or another until it ceased to exist in 1966.

After his gift to the Arnold Arboretum and before the demise of the plant in Dayton, Mr. von Webern gave divisions to two friends. One soon died and the fate of the other has not been traced, but from neither source is it likely that the plant got into general horticulture.

The Arnold Arboretum has no record of having distributed the plant, but this seems the most likely origin of the completely double-blossomed form of the bloodroot that is found here and there in connoisseurs' gardens. No record exists of its having been found in the wild either before or since Mr. von Webern's discovery on his newly purchased property in Dayton, Ohio, in 1916.

Occasionally the plant is offered in

director of the Arnold Arboretum, described this plant, the double bloodroot, as Sanguinaria canadensis var. multiplex. In 1931 Weatherby made it a form rather than a variety, and in botanical literature today it would be listed: Sanguinaria canadensis Linnaeus forma multiplex (Wilson) Weatherby.

^{*}For an earlier article see The American Horticultural Magazine, 47 (4):361, 1968.

nursery catalogs or written about in garden books or magazines. In these publications it is usually referred to either as Sanguinaria canadensis flore pleno or 'Flora Plena', or 'Flore Pleno',

or plena.

Since, so far as can be determined, all the fully double specimens in cultivation ultimately derive from Mr. Webern's original plant, they should properly be designated Sanguinaria canadensis forma multiplex, a name which would cover any fully double forms similar to von Webern's that may have been, or might still be discovered. Or, by grace of horticultural literature, they may be called Sanguinaria canadensis 'Flore Pleno' indicating a cultivar, with all existing plants derived by vegetative means from von Webern's original.

Because Dillenius used the name flore pleno to describe a form with only some extra petals and because such forms are sometimes found in the wild and may be introduced, confusion might be avoided if horticulturists would consistently use the Wilson name Sanguinaria canadensis 'Multiplex' as a cultivar for the fully

double-flowered blood root.

The double-flowered blood root is a handsome plant with an advantage for garden purposes because it holds its petals for many days longer than the single-flowered form. The single or even many-petalled forms quickly drop their petals as soon as the blossom is fertilized. The 'Multiplex' cultivar has no sexually functioning organs; hence the blossoms are infertile and the petals more persistent.

That it cannot set seed and hence reproduce itself by self-sowing as the fertile forms do readily, does mean that its distribution depends on gardeners. Fortunately the thick prostrate rhizomes, which are just beneath ground surface, naturally divide and produce new growing points. A single rhizome planted in rich humus soil, preferably not strongly acid, in an area lightly shaded, never parched, nor soggy, will in a few years produce a sizable clump of flowering shoots. Because the rhizomes do tend to double back and old rhizomes

decay, it is wise to divide the clumps and replant about every three years to insure vigor and avoid excessive rotting.

Division is most satisfactorily carried out late in the summer when leaves have either completely disappeared or have obviously performed their function and the new white growing tips have formed at the ends of the advancing rhizomes. The plant should be carefully lifted to disturb as little as possible the short fleshy feeding roots which grow from the sides and lower surface of the rhizomes. The cluster of rhizomes may be broken apart and each segment with a growing tip replanted shallowly to form the nucleus of another yearly enlarging clump. The "bleeding" of reddish orange acrid juice from the broken rhizome appears not to lessen its vigor, but the divisions should be promptly replanted to prevent dessication, especially of the feeding roots.

A clump of Mr. Guido von Webern's Sanguinaria canadensis 'Multiplex' with its glistening white globes is an object of real beauty in a woodland garden. To his perceptive eye and to his generous sharing of the unique wild flower gardeners owe a real debt of gratitude.

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TOYON

Heteromeles arbutifolia

If any single evergreen shrub native to California had to be chosen as the most useful, ornamental and perhaps best known, it would be Toyon, also known as California Holly, or Christmas-berry, and botanically *Heteromeles arbutifolia*. It is not a true holly, but of the rose family, and is closely related to the hawthornes. Very early its outstanding features were recognized by gardeners and it became a popular subject both for home gardens and for large scale landscaping.

Description

Toyon is a large shrub which may become a small tree under certain condi-



RANCHO SANTA ANA BOTANIC GARDEN



RANCHO SANTA ANA BOTANIC GARDEN

Heteromeles arbutifolia (above), and Heteromeles arbutifolia (Christmas Berry), (below). Both are common on semi-dry brushy slopes and in canyons, below 4,000 ft.; mountains of southern California to Humboldt County, and in foothills of Sierra Nevada from Shasta County to Tulare County; northern Lower California.

tions. Evergreen leaves are thick, almost leathery, serrate on the margins, rich green, and up to four inches long. A wealth of cream-white flowers in rounded clusters blooms in June, followed by bright red berries, generally well-colored by October, remaining intact for most of the winter. These large berry clusters are unequalled for holiday decoration, and gardeners are encouraged to grow toyon for this purpose, as well as for its other pleasing features.

Distribution

Toyon grows in a number of habitats and is well distributed in foothill regions over most of California, and into Lower California. It is to be found in lightly wooded places, brushy slopes, and in chaparral communities, from the coastal area to 3500-foot elevation. As a chaparral plant it is a dense, plant of four to six feet. In lightly wooded areas it is apt to become a slender, open small tree up to twenty feet or more in height. Frequently it occurs in scattered colonies of hilly regions, and may be companioned by dwarf or tree oaks, buckeye, garrya, poison-oak, redbud, and other typical foothill natives. A form which inhabits cool, moist slopes of the Channel Islands is known as Heteromeles arbutifolia var. macrocarpa, a handsome variety with exceptionally large and heavy fruit clusters.

Uses

Toyon is a satisfactory garden subject, and with well-drained soil will accept more water than do most native shrubs. It is also tolerant of high shade, and in this situation is easily trained into a single trunked specimen. In gardens it is suitable for background, screen, informal hedge, or mingling with other shrubs or trees, where it is outstanding during its flowering and fruiting periods. Also drouth-tolerant, toyon is recommended as a bank or slope cover to aid in erosion control. I have used toyon as part of a mixed border, and where crowded by other plants, it attained about fifteen feet, producing a full crown of flowers and fruits. In a drier section of my garden plants grew to more dense proportions, of four to six feet in height. Its companions here included Prunus ilicifolia, species of Fremontia, Ceanothus, Arctostaphylos and the rare alderleaf-mahogany, Cerocarpus alnifolius. Gardeners in England have cultivated toyon for many years, calling it maybush because of its relationship to hawthorn.

When tovon becomes established in a garden, volunteer seedlings are apt to appear. If this does not happen, it may be grown from seed planted in a coarse soil mixture in pots or flats. Fresh seed germinates readily; for stored seed, three months' stratification is recommended. Plants may be held in containers for the first year to insure a good root system, and then planted out the second autumn. Toyon generally begins to flower and set berries by the third year.

Along with other materials, toyon is now used in great quantities for freeway beautification. In one area it has been planted in solid masses to become dense and hedge-like, the firm foliage always clean, showing off the immense clusters of glowing berries. Elsewhere it is used in mixed plantings with such natives as redbud, selected forms of *Ceanothus*, or exotic materials including hard leaf acacias, or oleander, *Nerium oleander*.

It is a well known fact in California that the famous town of Hollywood was so named because of the masses of *Heteromeles arbutifolia* which originally grew in that area, and was commonly called California-holly. This fact is apt to be forgotten however in the welter of sensational news coming from the movie capital. Some plants have been retained in gardens, along streets, even in vacant places, but to see toyon in its former abundance one must go into the surrounding foothills and arroyos.

Along with our state flower, the California poppy, (Eschscholzia californica), the toyon holds a place of affection as a typical native confined almost entirely to this state. Everywhere it grows it is striking for its large leaves of crisp quality, and its large clusters of glowing red berries.

Marjorie G. Schmidt Box 325 Hayfork, California, 96041

Liquidambar styraciflua. A typical branch of the unusually corky sweet gum described in Professor J. T. Baldwin's article, The American Horticultural Magazine, Vol. 48, No. 2 (Spring 1969), Gardeners' Notebook section, pages 88-89. This photograph should have appeared in order to clearly identify the plant described in his note, "An Unusually Corky Sweet Gum." The editors regret the omission.

PHOTO DELMORE WENZEL



Bamboos, A Gardener's Guide to Their Cultivation in Temperate Climates

Alexander High Lawson. Taplinger Publishing Co., Inc., 29 East 10th Street, New York, N.Y. 10003, 1968, 192 pages. Illustrated, \$12.00 (Library)

Bamboos are among the most elegant of plants and the giants of the grass family. Bamboo can provide a whole new dimension to the garden landscape. The lush evergreen foliage of many provides a soft background summer and winter, and affords an ideal wind screen and a refuge to birds. If we were to recommend one hardy bamboo, a good choice would be *Pseudosasa japonica* (Arundinaria japonica) for its enduring beauty throughout the year.

This book is the most comprehensive horticultural treatment on hardy temperate bambookinds and culture—to appear in this century. It was written in England and the information applies specifically to British and Continental gardens. The book is divided into six parts: 1. The Bamboo Garden, 2. How the Bamboo Grows, 3. Care and Cultivation, 4. The Propagation of the Hardy Bamboo, 5. Commercial uses of the Bamboo, and 6. Descriptive Classification of the Species, Varieties, and Cultivars. Altogether, over 90 kinds of bamboo are listed and described.

Mr. Lawson knows bamboo well from the collection at Pitt White in East Devon where he is head gardener and keeper of one of the most comprehensive bamboo collections in Europe. The horticultural uses and cultural recommendations are based upon long experience with each kind as to its own special merits and requirements. The nomenclature of bamboo is another matter. Names continue to be in a state of change and for this reason a conservative concept of genera prevails in this account. Well known bamboos, which in the United States are grown as Pseudosasa japonica, Semiarundinaria fastuosa, and Sinarundinaria nitida, are left in Arundinaria in this book. But problems of nomenclature are not a major fault. Synonyms are listed for each species for clarity and convenience of reference, For further reading, one should consult F. A. McClure's book, The Bamboos, A Fresh Perspective (1966), which was reviewed in this Magazine in July 1966, as the latest scientific account on bamboo.

The excellent line drawings are by Mr. R. E. Browne, and a scattering of photographs of living bamboo fills out the illustrations. A list of Chinese and Japanese names of bamboo and a glossary are found at the end of the book.

FREDERICK G. MEYER

Miniature Trees in the Japanese Style

Gillian E, Severn, Taplinger Publishing Co., 29 East 10th St., New York, N.Y. 10003, 1968, 104 pages, Illustrated, \$4.50 (Library).

Although this volume was written primarily for the British market, it contains considerable information which would be of use to the American bonsai enthusiast. There is much practical information on soil requirements, potting and re-potting; and although the nomenclature is based on W. J. Bean's Trees and Shrubs Hardy in the British Isles, the list of the plant material, both evergreen and deciduous, with the Latin and common names appear, with descriptive notes—all of which is helpful. Useful guides are also given on the choice of containers, the size, shape, color and glaze being fully discussed.

There are chapters on training and dwarfing bonsai and mame bonsai (these may be only two inches tall!). The book contains a number of line drawings, depicting clearly the points covered in raising bonsai, and a goodly number of black and white photographs showing the various styles, the upright, slanting, clasped to stone, and other styles which make the growing of miniature trees in the Japanese style so challenging,

MRS. FRANCIS PATTESON-KNIGHT

Natural Dyes in the United States

Rita J. Adrosko. Smithsonian Institution Press, U.S. National Museum Bulletin 281, Washington D.C. 1968, 160 pages. Illustrated. \$3.25 (Library).

If you have ever wondered exactly how plants can be or have been used as dyes, this is the book that will answer most of your questions, since the terms "natural dye" and "plant dye" are almost synonomous. It includes some fifty tested recipes for dyeing textiles, with specific instructions for handling the fabrics, mordants, temperatures, and dyestuffs. We are told whether to use the bark, twigs, leaves, roots, or flowers of the plant, at what stage of development or time of the year they are to be gathered, and whether they should be used fresh or dried for the greatest potency. Even if you have no intention of ever coloring so much as a handkerchief, the recipes make fascinating reading, containing as they do ingredients such as 7 quarts dry crushed camomile flowers (buff), 11/2 pecks shredded fresh tulip tree leaves (gold), and I peck of finely chopped Norway maple bark (rose-tan).

The book has several useful appendices, the most interesting of which is a list of indigenous plants that can be used as dyes, including such startling plant parts as celery stalks and artichoke leaves.

Miss Adrosko also gives us a brief history of the textile-dycing industry in general and more detailed histories of the most important dyes used in the United States until the end of the 19th century, at which time organic dyes were replaced by mineral elements in commercial usage.

MADELINE L. LOVETT

Successful Gardening—in the Greater Washington Area

Anthony R. Gould, Ed. The Men's Garden Club of Montgomery County, 6309 Valley Road, Bethesda, Md. 20034, 1969, 128 pages, Illustrated. \$1.75.

Successful Gardening is the product of some two dozen gardening amateurs living in the greater Washington area who have tried a little of almost everything and pass on their experiences, good and bad. It describes most of the garden plants that will do well in the Maryland-District of Columbia-Virginia area, and some that won't.

This book is included in these reviews as an example of a gardening guide written for a local area by practical, experienced gardeners familiar with local conditions and with kinds and varieties of plants that will give satisfaction. It is the type of project that a local garden club can produce to further successful gardening in their locality.

Successful Gardening represents the third such publication of the Men's Garden Club of Montgomery County, 23 years old, with 150 members who meet regularly the first Thursday each month to discuss plants and gardens, doing this, incidently, without the benefit of constitution or by-laws.

CONRAD B. LINK

The Complete Book of Growing Plants From Seed

Elda Haring, Hawthorn Books, 70 Fifth Ave., New York, N.Y. 10010, 1967, 240 pages. Illustrated, \$7.95. (Library)

This second edition of Elda Haring's well-written and beautifully presented volume from Hawthorn Books is one that does all that its title claims for it. Its text answers all the questions that the novice gardener might wish to ask, and Walter Haring's step-by-step photo-

graphs show in graphic form how each phase of the work should be handled.

Mrs. Haring's articles in *The Floral Magazine*, to which she is a contributing editor, are always pleasant reading. This is also true of the book, which goes far beyond the scope of the articles in its systematic presentation of her thorough knowledge of her subject, gained from 25 years of practical experience.

There are chapters on how to prepare suitable soil mixtures and how to build cold frames. With the exception of lilies, other chapters include comprehensive "encyclopedias" on all types of horticultural material from annuals and house plants to trees and shrubbery. There are always specific details on germination and transplanting. The conservationists will be especially pleased with the information on starting our fast-disappearing native beauties from seed. The full page illustration of trillium by the artist Kathleen Boinke is outstanding.

From the line drawings of seedlings, at the front of the book, to the lists of seedsmen and government experiment stations, at the end, this is a worthwhile book for gardeners of all ages and degrees of experience.

MRS. A. THOMAS BENZINGER

Greenhorn's Guide to Gardening

D. X. Fenten. Grosset & Dunlap, Inc., 51 Madison Ave., New York, N.Y. 10010, 1969. 246 pages. Illustrated. \$5.95. (Library)

This book is exactly what its title indicates: a gardening book for the beginning gardener. The author has done an excellent job of fulfilling the purpose for which he intended the book.

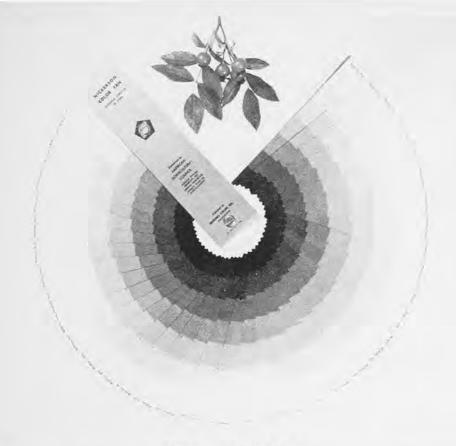
Various methods are explained in detail and the writing is done in an enjoyable and humorous style. Almost all phases of gardening are covered, and the "how to" photographs and sketches are a real asset.

Perhaps the most prominent theme throughout is "Plan ahead"—one which it would be well for all gardeners, experienced or otherwise, to heed.

The book should be extremely helpful to the novice, as the author suggests types and brands of equipment, chemicals, and other aids which would be most appropriate for a small home owner. Excellent charts on disease and pest dangers and their controls, and specific planting instructions for a variety of crops are discussed here.

This work is, of necessity, very general in nature. There are no regional suggestions but it seems most appropriate for the northeast. It would be a good buy for anyone just beginning his gardening experiences.

MRS. PATRICIA L. COLLINS



Nickerson Color Fan

The American Horticultural Society has for many years been interested in making available to the horticultural public a popularly priced color chart that could be used as a standard in all phases of horticulture.

No color chart except those with a thousand colors or more can obtain all the colors needed by the various horticultural groups, but the Nickerson Color Fan, which has been approved by America's outstanding color foundation, can well become standard. The Fan is composed of 40 separate leaves fastened between a front and back cover of heavier stock in such a way

that any one leaf, any group of leaves, or all of them can be fanned or pivoted out for use. Each leaf has seven color chips ranging from the palest to the deepest hue of a single color. In its closed position the Fan measures one and a half inches by seven and a half inches and is one-half inch thick. Fully opened it measures fourteen and a half inches in diameter.

Included with the chart is a twelve page booklet explaining the use of the Fan in detail. Printed in small type on each color chip is the descriptive designation in the Munsell sys-

tem of Color Notation which is fast becoming accepted as standard by many industries and so-cieties dealing with color systems in America. The chart uses color names that have been selected as standard by the Inter-Society Color Council and by the National Bureau of Standards.

Judges who have used the Fan report that the color chips are so easy to handle, particularly when working with color classes, that they prefer it to any other color reference. Its handy, compact form makes it exceptionally convenient to use out-of-doors by gardeners, hybridizers, and growers interested in color.

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The American HORTICULTURAL Magazine

Members will recognize below the color illustration which appeared on the Spring 1969 issue, Volume 48, Number 2. It is the Carmine-Rose Hybrid Polyanthus, one of the Pacific Strain of Polyanthus Primroses developed by Mr. Frank Reinelt of Vetterle and Reinelt.

The Monumental Printing Company, which takes pride in its color work, was not entirely happy with the quality of the Spring cover. It has kindly contributed this reprinting as more compatible with its own and the Society's color standards.

