MISSOURI BOTANICAL GARDEN
BULLETIN

VOLUME LVI NO. 1 JANUARY-FEBRUARY 1968

Q. F. F. Q. S.

DISSERTATIO BOTANICA

De

BETULA NANA,

Quam,

Conſenſu Ampliſſimæ Fac. Medicæ

in Reg. Acad. Upſaliensi,

PRÆSIDE

VIRO Experientiſſimo & Celeberrimo

D. D. CAROLO LINNÆO,

Med. & Botan. Prof. Reg. & Ord.

Publico Bonorum Examini modeſte ſubjicit

SÆ. RÆ. MTIS.

ALUMNUS

LAURENTIUS MAG. KLASE,

SMOLANDUS.

In Auditorio Guſtav. Maj. ad d. *30* Junii

An. MDCCXLIII.

Horis, ante meridiem, ſolitis.

STOCKHOLMIÆ

Typis Hiſtoriographi Regni

Dried plant material from the Climatron/Flower arranging accessories/A new selection of garden books! Begin your garden planning now/And always—a fine selection of gifts.

THE GARDEN GATE SHOP/at the main gate/Tower Grove and Flora

Missouri Botanical Garden Bulletin

VOLUME LVI NO. 1 JANUARY-FEBRUARY 1968

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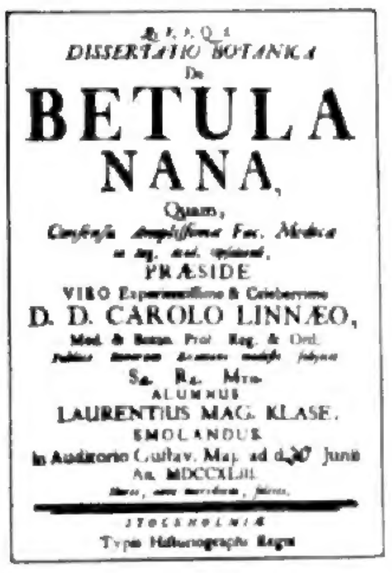
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on the cover

LINNAEAN DISSERTATIONS

George B. Van Schaack

The cover illustration shows the title page of the first Linnaean "dissertation". Translated it says: "Botanical dissertation concerning *Betula nana*, which Lawrence Magnus Klase modestly submits to the public examination of gentlemen, under the sponsorship of the Medical Faculty of the Royal Academy of Upsala, presided over by the learned master Dr. Carolus Linnaeus, in the hall of Gustavus the Great, on June 30, 1743, at the usual hour before noon." It is a slender pamphlet of twenty pages containing a description of the dwarf birch, in particular differentiating it from the common birch, listing previous references to it, discussing its uses, and, in general, 'monographing it' as we say today. The pamphlet has an engraving attached showing a branch as found in the Royal Academy's botanical garden.

Thus was launched the series of 186 "theses" directed by Linnaeus during the remaining thirty-three years of his life. It seems clear that a few of them were substantially the work of the students who studied with him; but equally likely most of them were largely his own, the student merely making a thorough study of the material, probably writing the initial draft of the text, and pretty surely paying for the publication of copies to be on hand for distribution at the examination.

The Garden's library contains an excellent collection of these 'Amoenitates', as they were called. It has all but one of the originals as prepared for the examination, and also most of the later collected editions. The latter often have some changes, many of them important for present day work. The depth of the Garden's library collections in this particular respect is typical, especially for the fields of plant taxonomy and distribution, botanical history, and botanical illustration.

The single original dissertation lacking from the Garden's collection is Anthropomorpha (animals of manlike form), in which Christian E. Hoppius of St. Petersburg, presented the history of the *Simia* genus (apes). Pretty certainly Linnaeus stuck his neck out further here than in any other of his publications, as he instructed his student to recognize four species: *Pygmaeus*, *Satyrus*, *Lucifer*, and *Troglodytes*, with documentation taken from tales of travel to distant lands, and to make an illustration showing four biped animals that were too manlike in appearance. The Garden's bound set of original dissertations shows only stubs where the leaves have been cut out; was it by some reader over-intrigued by the content, or by some former owner who could not tolerate such potentially heretical material in his library?

In Memorium

John S. Lehmann

January 18, 1886—October 26, 1967

A FEW OUTSTANDING MEN make an institution great. The Missouri Botanical Garden has been unusually fortunate in the men who have walked its paths and given it wise guidance. Few people have done so much for the Garden as did John S. Lehmann. In the manner of Henry Shaw, Mr. Lehmann not only provided financial support, but gave freely of his time and ideas for many years.

John Lehmann was educated at Harvard and went on to receive his law degree at Washington University in 1910. Like his father before him, he became an outstanding lawyer, respected for his effective legal ability and shrewd common sense. His interest in botany and the Garden was of long standing. In the spring of 1931, John and Nan Lehmann took Edgar Anderson's Saturday course of lectures and field trips centered around elementary botany and the local flora. Their estate became noted for its rare and beautiful shrubs, roses, and collection of fine apples.

He was a scholar as well as a gardener. Together the Lehmanns built an outstanding library of horticultural and botanical books about roses. For many years the Lehmanns judged all the roses at the flower shows. When Dr. William L. Brown began his pioneering work in Kentucky bluegrasses for the St. Louis area, he worked closely with the Lehmanns, who were among the first to cooperate with him in developing better management practices for St. Louis lawns.

Mr. Lehmann became a trustee of the Garden on December 18, 1940, was President of the Board of Trustees from February 18, 1953 to December, 1957, and became an Honorary Trustee in September, 1955. When Dr. George T. Moore, Director from 1922 to 1953 retired, Mr. Lehmann became Acting Director and dedicated himself tirelessly to the Garden, gradually initiating a broad integrated program of practical and theoretical work in both horticulture and botany. He encouraged the local garden clubs to bring the National Council of State Garden Clubs to St. Louis and gave generously to their drive for funds for the headquarters building which was built next to the Garden. He was a major contributor to the cost of the Climatron and endowed the new rose garden, which bears his name.

The Board of Trustees, the staff, and all of those who derive benefit from the Garden will be eternally grateful for this generous, wise, courteous gentleman who gave so much of his greatness to the Missouri Botanical Garden.

The Small Greenhouse

Harris Armstrong

EVENTUALLY the amateur gardener is forced, against his will, to the sad conclusion that the only reason his flowers and plants don't match the glowing colors and the purple prose of the seed catalogs is that he doesn't have a greenhouse. There are many and varied reasons why having a greenhouse is not the total answer, but by the time one has sent for a fine four-color greenhouse catalog, he has already invested a five-cent stamp and all the problems of greenhouse management are *not* revealed to him in the booklet. Instead, there are pretty smiling ladies, impeccably dressed, surrounded by blooming orchids, azaleas, and all manner of plants that don't ordinarily bloom at the same time of year.

The seed catalog men and the greenhouse catalog men are professionals, and we, the target of their skills, are self-confessed amateurs, even though we are "Friends of the Garden." Thus the vision of one's own wife, in a stylish frock, surrounded by exotic blooms, is just too enticing. We decide to take the plunge. We will get a greenhouse.

This is just the beginning of a number of interesting decisions one must face. Where will the greenhouse go? What orientation should it have? How will it fit the picture one wishes his garden to portray? Then there is the matter of heating, largely determined by the fuel you choose to burn. After this are the considerations of distances from the utilities. Perhaps the most difficult decision is that of how big the new "wonder" should be.

In my own case, it was impossible to have the greenhouse on the south side of our house. I was forced by existing structures to build separate from the house on the north side quite close to the Westborough Golf Course. Golfers and golf balls being what they are, I decided to use a lean-to greenhouse with a shingle roof toward the golf course. This, however, made it possible to see into the greenhouse from my bedroom window and so reminded me rather constantly that there were chores waiting for me out there.

Since my wife and I like to travel frequently, the modern, automatic, "care-free" greenhouses of the catalog appealed immensely. I felt that such a greenhouse would solve the problem of upkeep while we are gone. At least it would hold to a minimum the amount of work we felt must be done.

The pre-fabricated lean-to is made of glass and aluminum. It measures six feet, eight inches by eighteen feet. Below this glass and aluminum is a redwood wall three feet high which rests on a railroad tie foundation. The glass sides face east, west, and south. On the north side, I have a steeply pitched wood wall-roof sloping down to meet the redwood wall. This roof is handsome with its wood shingles. The heating plant and the evaporative cooler are located on this north wall, and so do not offend the view from my window.

Located outside our little greenhouse is a gas-fired boiler which supplies circulated hot water in copper fin tube radiators located under the plant trays and at the outside walls. The reason for having the boiler outside the house is to preclude the possibility of noxious flue gases escaping into the area with the plants. This would be very bad for them, to say nothing of the gardener himself.

The sequence of operation of the heating and cooling equipment is in the following order. Starting with night, we'll assume it is cool and the boiler is operating. When the sun comes up and warms the greenhouse to, let us say, sixty-five degrees, the thermostat shuts off the boiler. As the sun continues to shine, the temperature rises and another thermostat causes little motors at the ridge of the glass

We decided to take the plunge and get a greenhouse.

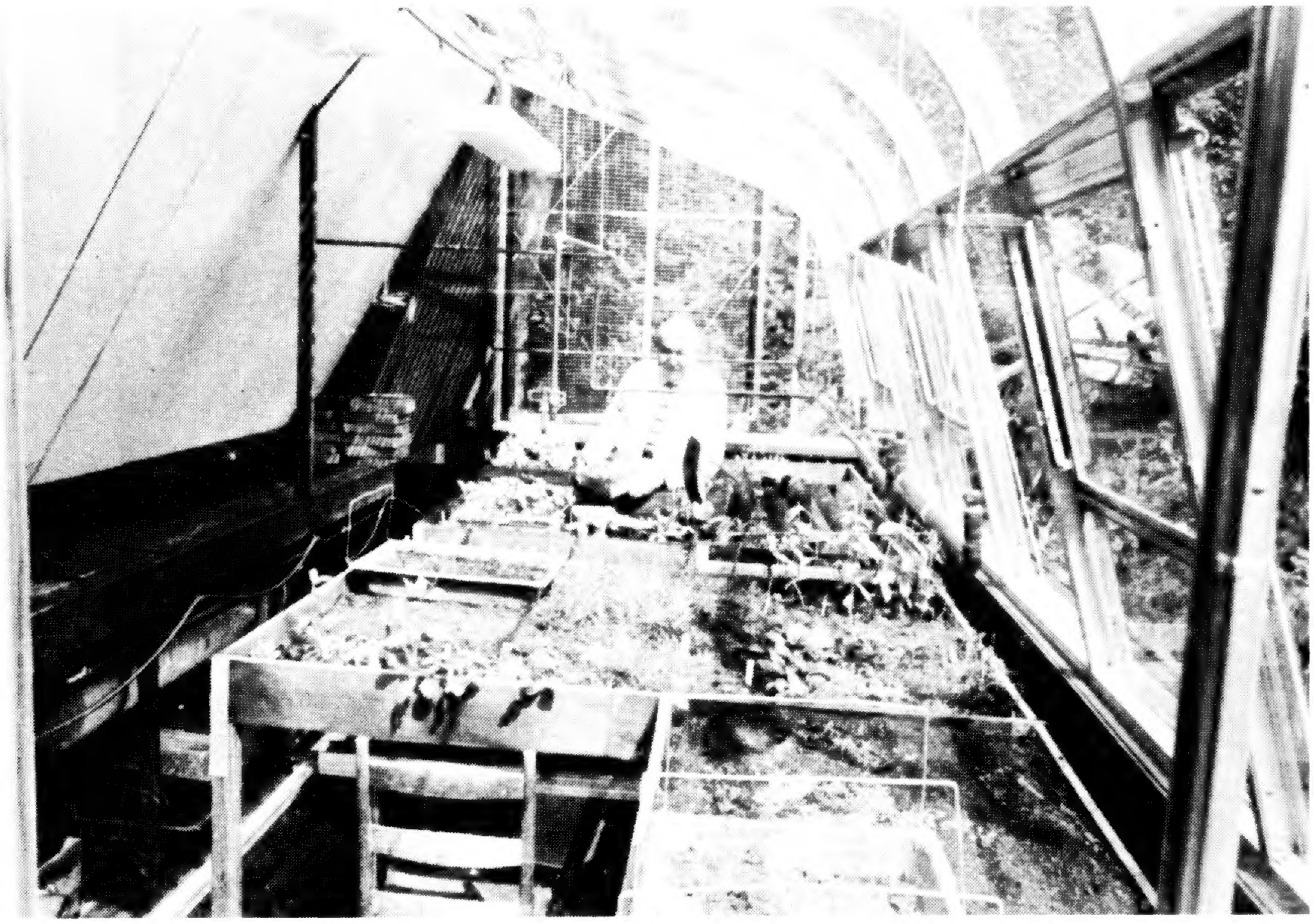


PHOTO BY HARRIS ARMSTRONG

roof to open a continuous row of ventilators. Since this is the highest location in the greenhouse, the warmest air is released and the cooler outside air enters, replacing it.

If the temperature continues to rise in the greenhouse, the ventilating fan will start up, and then, in the hottest of weather, by means of a manually operated switch, a pump located in the ventilating fan box will start pumping water from a pan in the base of the box up to the top to moisten excelsior pads on three sides of the fan box. The air being drawn through these moist excelsior pads is cooled by evaporation and this naturally raises the humidity of the greenhouse.

The final hot weather operation must be manual; that is, to let down the roll shades on the window walls. These aluminum-painted shades are of wood slats. They provide about 70 percent shade as the slits of sunlight move across the plants with the sun's passage through the sky. So much for heat and light control.

Water, as it comes from the mains in the cold seasons, would shock the growing plants. This problem was solved by using a 30-gallon water tank, installed inside, so that the water passes through it, in at the bottom and out at the top. In this way, the water has a chance to warm up to the greenhouse temperature between waterings, which are not too frequent during winter. A single watering would scarcely deplete the tempered water.

The watering system is rather elaborate. In addition to the usual hose and faucet for a watering can, we have an overhead mist system. It can go on for a period of from two seconds to nine minutes every ten minutes, or alternatively one minute to fifty-five minutes every hour. This performance is master-clocked for daylight hours, again optionally adjustable for long summer days or short winter days. This system of overhead automatic watering consists of ten very fine nozzles that each spray a two-foot circle and two larger nozzles that each spray a four- to five-foot circle. This system may be operated in parts and in varying combinations by means of cut-off valves. It is obvious that the automatic "care-free" greenhouse takes a lot of engineering. But once the gardener has mastered and coordinated the various greenhouse systems, he is free to devote his time primarily to his plants, no matter what the weatherman may threaten.

The sloping north wall, made solid because of the golf ball menace, will eventually hold the orchid collection in suspended pots and watered by means of a number of jets controlled by a hand-operated valve. The plant tray below this sloping ceiling is also watered by a series of similar jets which are manually controlled.

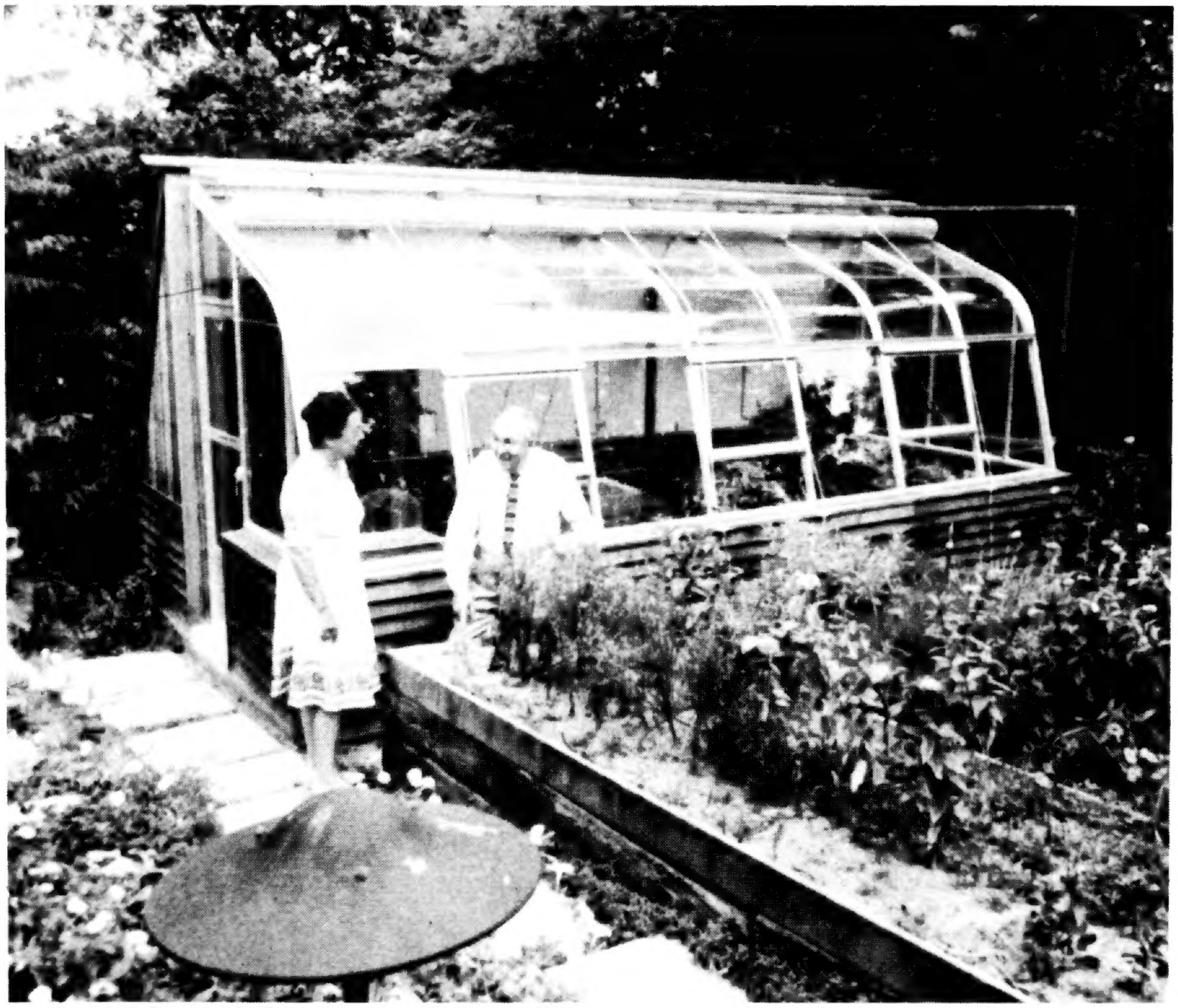


PHOTO BY HARRIS ARMSTRONG

We feel that the pre-fabricated lean-to of glass, aluminum, and redwood is admirably suited to both its site and our purposes.

The northwest corner of my little greenhouse has a cabinet with a counter and sink as well as drawers and shelves. The electric control clocks are all located in this cabinet behind folding doors so that they will not be in any of the spray patterns.

We have gone through the rather complicated business of building this elaborate machine. Now the time has come when I must buy my wife the stylish frock and place her among the exotic blooms which are to fill my small greenhouse.

Editor's Note: Harris Armstrong is an architect whose work has long been admired nationally as well as locally. He is of the school that believes good architecture should fit not only its purpose, but also its surroundings. Thus his interest and skill as a home gardener has been a natural outgrowth of his successful career. He has, in the field of gardening, been especially good in the propagation and use of alpine plants and succulents for the home garden.

the many sides of
GEORGE VAN SCHAACK

Erna Eisendrath

GEORGE VAN SCHAACK has for years been so vital a cog in the local machinery of botanical scholarship that it is difficult to realize he was not always associated with botany. He has achieved such recognition among librarians that it will surely surprise many of them to learn his professional training was in other fields. And he has become so familiar a part of the Missouri Botanical Garden community of staff and students that many of them undoubtedly feel this was always the arena of his activities.

Actually, Dr. Van Schaack's first contacts with botany resulted from a sort of hobby less than twenty-five years ago; he came to the Garden a few years later, and his close affiliation with its library started in 1954. It is only since then that this versatile and cultivated man began to leave his mark upon one of the greatest cultural assets of our city—the magnificent botanical library which ranks high among those of the entire world.

George Van Schaack did not, of course, build this great library himself; his contribution has been his conviction of its enormous importance, his dedicated devotion to its care, and his unceasing efforts to broadcast his conviction and to solicit help and support for the efforts that he has sustained, almost single-handedly, for a dozen years. The story of the library, its needs and its glories, was well told in the Globe Democrat Magazine of June 12, 1966, although Dr. Van Schaack had been telling this story for a number of years prior to that in his annual reports, and in an especially fine and moving article published in the Garden's Bulletin in November, 1964. Here, in An Epilogue on Two Exhibitions of Books, Dr. Van Schaack made loudly and clearly the point that we have in St. Louis a facility that is not only rare and valuable, but is also tragically unrecognized as such.

George's story cannot today be separated from that of the library, even though he has himself retired from his position as its librarian. We write sorrowfully since we hate to see him go, but we are happy for the opportunity to express to him the sincere thanks of the Garden's trustees and staff members, of the whole botanical community, especially of those students whom he has generously helped, and of those citizens of St. Louis acquainted with his untiring efforts to preserve

PHOTO BY CLAUDE JOHNSTON

Dr. George Van Schaack, closely affiliated with the Garden Library for thirteen years, has been a dedicated member of the Garden staff from 1947 until 1967.

for future generations a treasure accumulated largely (but not wholly, for George has bought wisely and well!) in the past.

When one "retires" these days, age is not a secret; you are not surprised to learn that George was born in 1903 in upstate New York, nor that he studied both at Syracuse University and at the University of Rochester. But from here on his *curriculum vitae* is full of surprises. Young Van Schaack concentrated in music, in theory and piano, for four years before moving on to Harvard in 1925. There he received B. S., M. A., and Ph.D. degrees in . . . guess what? . . . mathematics! It was in this field, then, that Dr. Van Schaack made his living as a university teacher until, in 1943, he enlisted in the U. S. Naval Reserve. Oddly, it was this move that eventually led to the quite new way of life and field of interest that he has pursued during most of his years in St. Louis.

George's association with botany began as a sort of avocational time-filler—a need that must certainly have been felt by many a young J. G. stationed in out-of-the-way areas of this earth. He found himself on Attu Island, the very tip of the chain of islands extending west from the Alaskan Peninsula; his job, to teach surface anti-submarine warfare. But you can't teach a subject like that fourteen hours a day! Even in later years he characteristically worked that long, six or seven days a week; back in the war years he must have been hard put to fill his time.

When the spring of 1944 came and the snow-bound island of Attu began to grow green, Lieutenant Van Schaack chose to fill his time by gathering and studying the many flowers which seemed to appear everywhere as if by magic. If you are at all acquainted with the problems of collecting and accurately identifying plants, even when working in a known area with adequate reference materials, including people acquainted with the local flora, you will have some idea of the challenge that he set for himself. A so-called *Flora of the Aleutian Islands* had been published in 1937 by the Swedish botanist, Eric Hulten, and this book was at hand. Dr. Hulten had not, however, included the almost essential crutch for a beginner—a key to the plants under discussion—nor did his book contain technical descriptions of them or illustrations of any kind! Aside from this book the available botanical library consisted of the seventh edition of Gray's *Manual of Botany* (which does not consider the flora of Alaska) and Homer House's popular *Wild Flowers of New York*. Perhaps it was the very poverty of his reference material at the point in his life when he was but a proto-botanist that has made George so sensitive to the value of a fine library; but it did not at that time prevent him from proceeding with his undertaking.

Since George's only sister, Eva, has her doctorate in botany, it was logical that he sent her the first plants he collected. She, realizing that such collections would be of significant value to the taxonomists, suggested that he send his further material to Dr. Egbert Walker at the Smithsonian Institution. Dr. Walker was so interested to receive them that he showed the plants to his colleague, Mrs. Agnes Chase, sometimes referred to as the Dean of Agrostologists, which simply means that she knew more about grasses than anybody else around. Quite naturally she was disappointed with George's collections which included mostly plants that had showy flowers.

"What's the matter with that island?" Mrs. Chase wrote to him. "Doesn't it have grasses on it? If you are fortunate [sic] enough to

remain on Attu another season, please collect all the grasses you can." Here then was another challenge for our friend. It's not too terribly difficult to recognize which plants belong in the enormous family of the *Gramineae*—but it takes knowledge, a lot of patience, and a sharp eye to tell one of them from another. George responded so enthusiastically to Mrs. Chase's request that the study he put into fulfilling it led directly to his first official position at the Missouri Botanical Garden; in 1947 he was appointed Honorary Curator of Grasses.

But I am jumping the gun, of course, while those of World War II are not yet silenced in our chronological biography. Dr. Van Schaack had the fortune, good or bad, to remain in the Aleutians long enough to collect some 400 flowering plant species, of which 150 had not previously been reported from Attu. One was a tiny cranberry, never before collected west of Juneau; another was a small Asiatic gentian, collected for the first time in North America! Meanwhile, in the winter of 1944-45, Dr. Walker published a key to the most important plants of the Aleutians; again there were no descriptions. Upon Van Schaack's objection to this omission, Dr. Walker suggested he prepare a manual of the plants collected in 1944. This was printed by the Welfare and Recreation Department of the Navy in an edition of 500 copies, cryptically called *Flowers of Island X*—a few going to botanically minded associates, most of them whisked away as souvenirs.

It is typical of George not only to respond with alacrity to challenges seemingly impossible to meet, but also to pursue the objectives that they raise far beyond the limits required. He had learned a lot about the plants of Attu by the time he returned to civilian life, but he spent several months thereafter at the Smithsonian in order to consolidate his information, and to make sure (he is a perfectionist of the first rank) that his plant identifications were correct. Then he returned to mathematics, becoming an assistant professor at Union College, Schenectady, for the academic year 1946-47.

Just before taking up this appointment, an event with unforeseen consequence occurred. Attending the AAAS meeting here in St. Louis, he ran into his old friend, Dr. Walter Leighton, newly appointed Chairman of the Department of Mathematics at Washington University, who asked him to join his department. A year later George was free to do so, by which time the position had acquired the very interesting and rather unusual adjunct that his contribution to research would be quite acceptable to the Department of Mathematics, even if it were carried on in the field of botany.

This very intriguing appointment, Dr. Van Schaack feels sure, resulted largely from Dr. Edgar Anderson's own interest in grasses. At that time he was deep in his work on the grass *Zea mays*, or corn, and welcomed the addition of a colleague whose interest was the classification of grasses in general. Besides, he knew George from Harvard days, when the mathematics student had helped the over-busy Bussey Institution professor with his calculus. Sixteen years later the tables were turned as the two of them worked together every Tuesday afternoon and evening for two years, reorganizing a section of the Garden's grass collections. During that time, Dr. Van Schaack reports, "Andy, disclaiming all knowledge of taxonomy, taught me all the taxonomy and a large part of the botany that I know." Typically, George tested his learning in a most ingenious way. Many a night before going home he would take down a volume of one of the Garden Library's great treasures, Curtis' *Botanical Magazine*, and thumbing through the handcolored illustrations try without peeking at the text to place each pictured plant in the family to which it belongs!

Such work, of course, brought Dr. Van Schaack into close contact with the library where, to use his own words, he was simultaneously "impressed with its enormous value, and overwhelmed by the neglect to which it was subject. . . . Not only were the books miserably shelved and many of them in wretched condition, but also a large part of the thousands of irreplaceable pamphlets were in covers so tattered and worn that often even the name of the author could not be read." He was so shocked by this that he "raised hell with the scientific staff" in an effort to rouse them to complaint. This bore results when, in 1954, Dr. Anderson, then Director of the Garden, appointed him Chairman of the Library Committee. A year later when Dr. Robert Woodson resigned as Curator of the Herbarium, Dr. Van Schaack was appointed Acting Curator in his place. George filled both positions at the Garden with efficiency and esprit, although he continued to carry a full teaching load at Washington University in mathematics!

But finally in 1958 this moonlighting existence came to an end. Dr. Woodson resumed curatorship of the Herbarium, while Dr. Van Schaack took leave of the University and became full-time librarian. During the time he held this position he greatly improved many of the conditions that had so shocked him when he came to town—several thousand books were rebound and many more placed on more adequate shelving. He himself "handled" in one way or another almost half of the 100,000 "objects" under his care; he made himself well acquainted

with material of all sorts that the library houses, and, not only able to locate any part of it in no time flat, he could often save you and himself ever so much trouble by telling you exactly what that part contained, and whether or not it would serve your needs. He became an authority on the history of botanical literature as well as on the illustration of botanical books. He is widely consulted and highly respected in these esoteric fields, although he claims that all such knowledge has accrued to him only since the challenge with which he presented himself when he organized an exhibit of flower books from the Garden's library at the City Art Museum in November, 1959. He also bought wisely to fill the gaps in certain categories of the Garden's collections, gaps left open during the years when the Library's book budget was even smaller. He has been sorely disappointed that, during his tenure, his charges have not been given the new home that is so sorely needed for them; but, whenever that home becomes a reality, it will owe to George the fact that the collection it houses is worthy of the best, and has survived the years of famine almost solely due to his devotion and efforts.

When we say good-bye to you, George, it is with our thanks; and our farewells are accompanied with some envy of the Morton Arboretum to which you now go with our best wishes.

Botany, Medicine, and the Mississippi Valley

James Maniotis

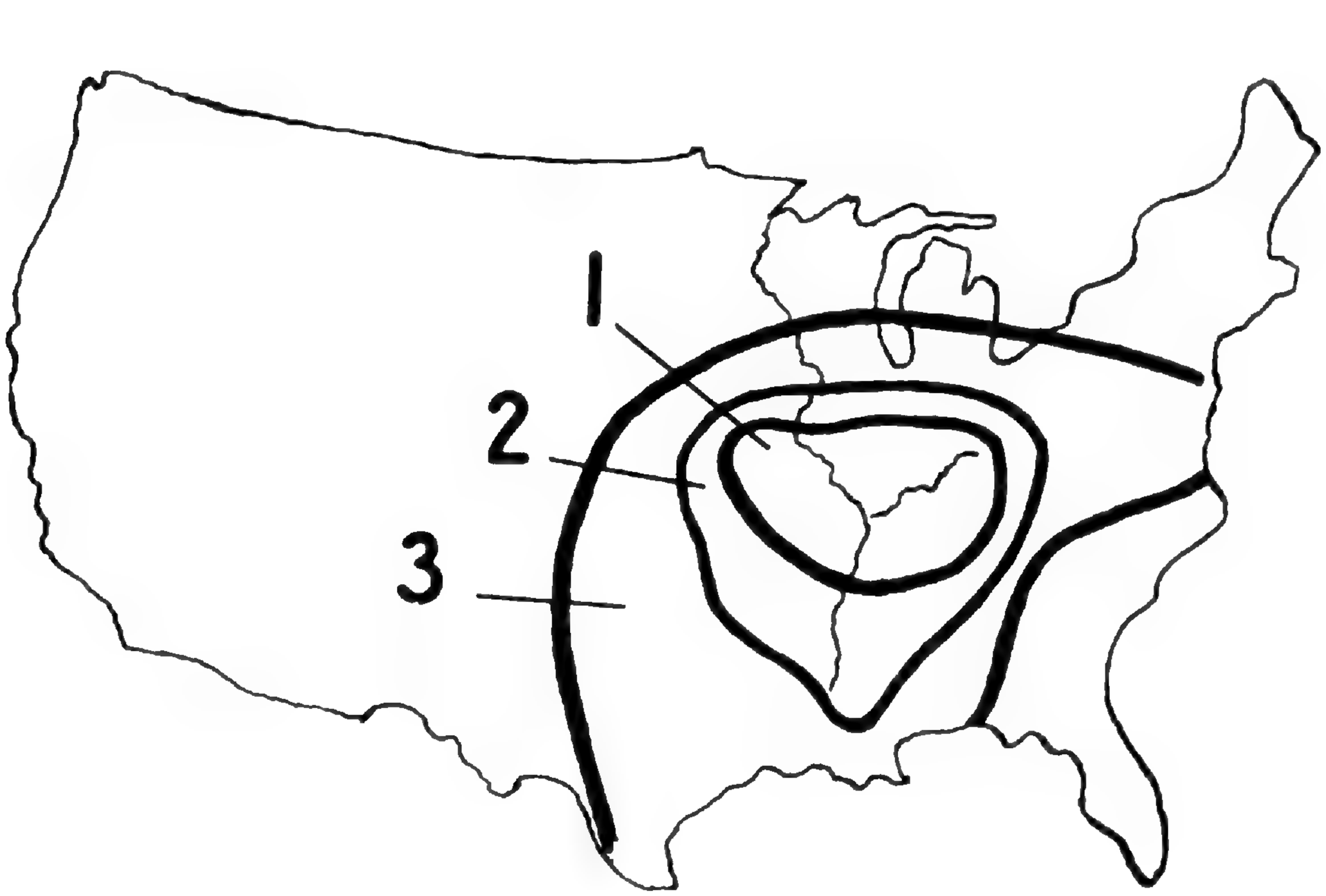
SOME YOUNGSTERS who explore a Missouri cave having bats come down with a chronic cough. A number of boys playing ball in the schoolyard get coughs, chest pains, and fever. A gardener spreads chicken manure on his flower beds and also gets chest pains and a cough and soon dies. "Bronchitis?" "Pleurisy?" "Atypical pneumonia?" Possibly—whatever these terms mean—but more and more, medical men are becoming aware of an insidious and widespread fungal infection attacking the lungs of human beings called histoplasmosis.

Fungi, a group of plant-like organisms, come in all sizes and shapes. Some are large, like the mushrooms and puffballs. A greater number are microscopic, however, like the molds and yeasts. Although the fungus causing histoplasmosis and the disease itself have been reported from many countries around the world, histoplasmosis is generally associated with the Mississippi Valley and its larger tributaries—the Missouri, the Ohio, and the Tennessee, and is commonly referred to as "St. Louis disease." Published reports tell us that 30 million people in the U.S. have had histoplasmosis infections. A great deal of interest has been engendered in histoplasmosis in the Missouri area, because surveys of the population here have indicated that up to 80 or 90% of the individuals tested show positive skin test reactions to histoplasmin, a preparation from the fungus causing histoplasmosis, *Histoplasma capsulatum*. It is commonly known that people who have a high sensitivity to certain materials foreign to the body show violent skin reactions when such materials are scratched or inoculated into the skin. Similarly, the occurrence of a past or a current diseased state in a human caused by a microbe may be determined by introducing chemical extracts of the microbe into the skin and observing the skin reaction of the patient. A positive skin test (a reddening or blistering) may indicate past or current infection by the micro-organism in question. Fig. 1 is a map of the U.S. showing the frequency of histoplasmin positive sensitivity. In region 1, 70-90% of the individuals sampled are positive, while regions outside this area show diminishing rates of sensitivity to histoplasmin. The highest region of sensitivity corresponds exactly to the Mississippi River Valley region.

Mycologists, botanists who specialize in the study of fungi, have

found that the fungus causing histoplasmosis occurs normally in soil, almost always associated with small animals or their activities. It is known that some infected animals, such as birds and bats, may excrete the fungus in their sputum, urine and feces, although some authorities insist that soil burdened with large amounts of excreta have a changed acidity which permits the abundant growth of the fungus which is normally present in the soil. Thus, the first U.S. soil isolation of *Histoplasma capsulatum* was made from material next to a rat burrow near a chicken house. Since that time, it has been isolated near old chicken houses, from bat caves, from river water, from barnyard soil, from hollow trees, from heavily manured soil, and from such unlikely places as the feather stuffings of baby pillows and unused attics which have harbored wild birds, squirrels, or bats. Tracing the origin of a case of histoplasmosis thus can become quite a detective story, involving the talents of many scientists such as botanists, zoologists, ecologists, veterinarians, and medical men.

The really insidious feature of the fungus is that it is often associated with institutions where children congregate, such as school buildings. Mycologists have found the fungus in the soil around such buildings, where numbers of starlings, pigeons, grackles and bats drop



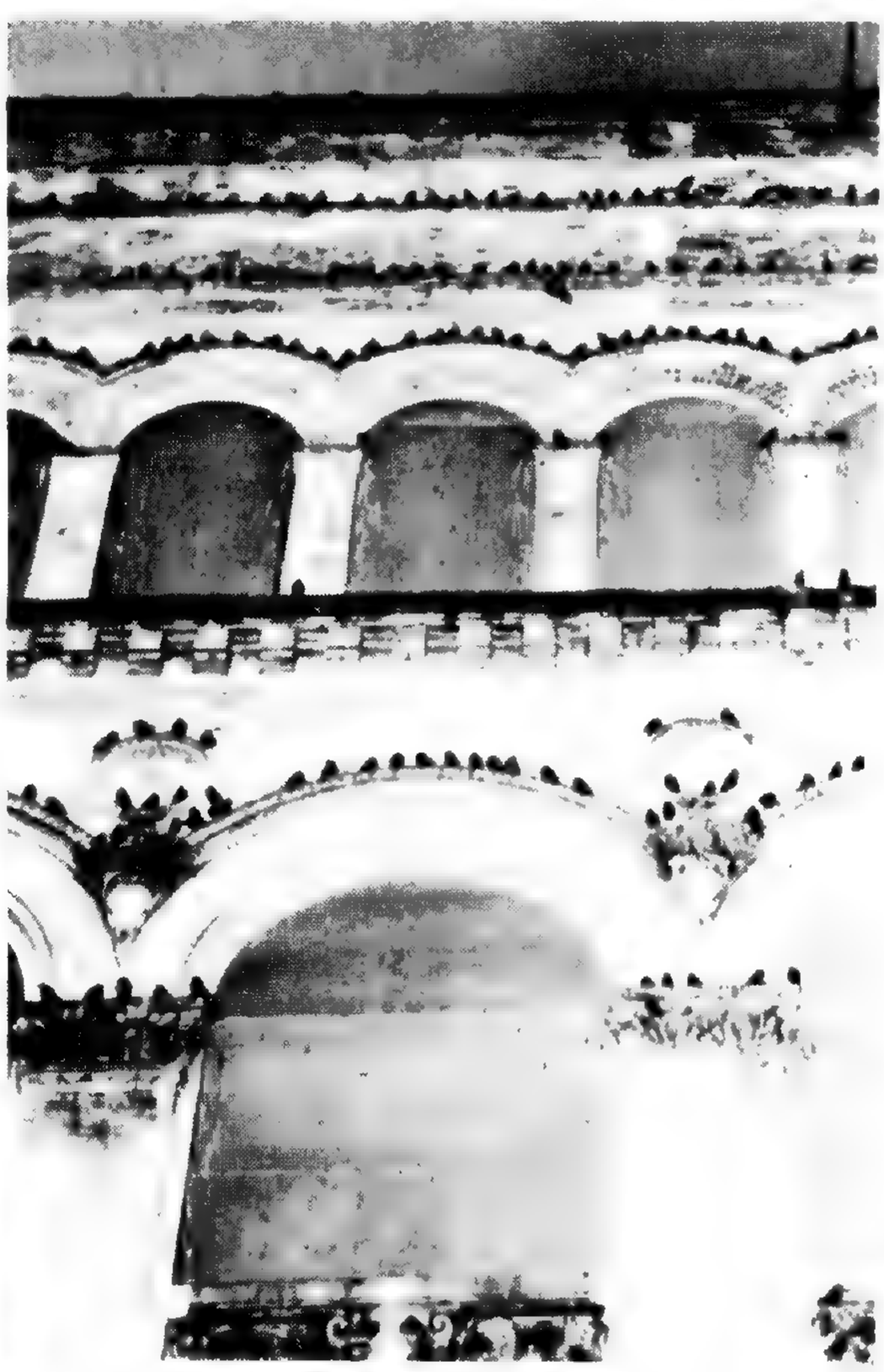
Map of the United States, showing geographic location of regions of high histoplasmin sensitivity. Region 1, 70-90% of individuals tested are sensitive; Region 2, 45-55% are sensitive; Region 3, 10-35% are sensitive.

their excreta from building ledges onto the usually dry and powdery soil of the playground below. It happens that children are particularly susceptible to the disease, showing the greatest infection and mortality rate of any other age group, and their play activities, in creating dust clouds of the spores, simply insure the possibility of infection through inhalation of spores. One mycologist has found an effective way to combat this occurrence in such situations—simply lay down some new soil, plant grass, and keep a good lawn by watering regularly! Other authorities routinely insist on blacktopping play areas where infection has been traced. It is interesting to note that small children also show a high frequency of oral infections—which may be related to the placing of dirty fingers in the mouth.

Faced with these facts, one can readily understand the recent concern of state and federal health officials over the Dexter, Missouri, area, where a number of histoplasmosis cases were reported. For the last 17 years millions of blackbirds have overwintered in a 20 acre tract in the center of town. It was estimated that 15 million birds were

Starlings defy man's efforts to remove them in both city and country. Flocks shown here are (left) near Dexter, Missouri (1965), and (right) perched upon a building in St. Louis (1961).

PHOTOS COURTESY THE POST-DISPATCH



in roost there during the early part of 1965. Since it would have been an enormous health problem to dispose of 15 million poisoned birds, the birds were displaced from the town to an area a mile away by the use of flashing red lights and sirens. Similar histoplasmosis outbreaks, traced to the presence of flocks of birds, have been reported in other places in Missouri and nearby states. In Milan, Michigan, a recent outbreak of histoplasmosis in junior high school children was traced to starlings in the trees around the school playground. To eliminate the source of infection, the trees were removed to remove the bird roosts. It is interesting to note that the starling, introduced from England, is now the most numerous bird in America.

Significantly, domestic dogs and cats show a 50% rate of infection in areas where human positive histoplasmin reactions are high. No one, however, has shown that these pets play significant roles in distributing the fungus in the environment or transmitting it to man or other animals—although the possibility exists. Nor has anyone ever shown an infected human to transmit the disease to other people. Other mammals which can be infected are: rats, mice, skunks, opossums, cattle, and horses. Chickens have not been shown to carry the fungus. The high frequency of isolation of the fungus in association with chickens may be due to the acid nature of the heavily manured soil where chickens are kept.

As for the causative agent of histoplasmosis, it is a microscopic fungus which looks different depending on where it grows. In the soil, or when grown on corn meal agar medium at room temperature in the laboratory, *Histoplasma capsulatum* looks like any other mold. It produces fine filaments or threads which turn a brownish color as the filaments produce spores. These spores are light, are easily airborne, and constitute the highly infective phase of the fungus when breathed into the lungs. When grown on agar containing blood at 37°C (the temperature of the body), or when grown within an experimentally inoculated mammal, or when found in an infected human, the fungus grows much like the common baker's yeast, producing oval, yeast-like cells which may be carried by the lymph or bloodstream throughout the body of the animal or human. All evidence to date indicates that the usual route of infection of histoplasma is through the lungs. If, for example, some farmer working his soil or some workman leveling land for an airfield repeatedly inhales dust clouds containing spores of the soil form of the fungus, chances are good that such individuals will come down with a benign (non-fatal)

form of the disease, which, from most symptoms, may be diagnosed as some (unknown) respiratory ailment. Common symptoms are dry cough, shortness of breath, chest pain, and hoarseness. Sometimes "fever of unknown origin," night sweats, weight loss, aches in the muscles and joints, and a general feeling of malaise are associated with this respiratory form of the disease. Chest Xrays taken some time after initial inhalation of spore clouds may show nodules or other findings resembling tuberculosis, and it is known that in areas where histoplasmosis is widespread, up to 2,000 patients having histoplasmosis are hospitalized inadvertantly each year in T.B. sanitoriums. Histoplasmosis is a great imitator not only of T.B. but of other diseases, simulating influenza, pneumonia, leukemia, Hodgkin's disease, carcinoma, and other fungal diseases. Primary or initial lung infections of histoplasma generally are not severe. Most people show a rapid and often medically unobserved recovery.

PHOTO COURTESY THE POST-DISPATCH

The war on these nuisances is not new, as can be seen in this 1940 photo of south St. Louis residents waging a losing fight against a large flock of starlings by beating on pots and pans. More recent efforts with sound devices proved just as ineffectual.

In some cases of histoplasmosis, and this is found only in a very small minority of individuals exposed to the fungus, the disease may advance to a severe or fatal form as the fungus is carried throughout the body. In these severe cases the lung manifestations usually are less prominent, but severe changes of the internal organs are found, such as enlargement of the liver and spleen. Other manifestations include: endocarditis; meningitis; Adinsonian Disease; ulcers of the mouth, the pharynx, the stomach, the larynx, and the bowels. Some 80% of the individuals with the severe form of the disease will die if it is not treated medically. Statistics tell us that probably upwards of 50 (known) deaths each year in the U.S. is due to severe histoplasmosis. Until recently, no single antibiotic or chemotherapeutic agent was known which was of any value in treatment of the severe form of the disease. There are two new antibiotics, however, Amphotericin B and X-5079C, which appear to be really effective in the early treatment of human histoplasmosis and offer hope to the unfortunate few who develop the severe form of "St. Louis disease."

As our technology advances and our cities become more populated, our soil, water, and air more disturbed and polluted, and the delicate biological balances which nature evolved over millions of years are overthrown, we become faced with hazards the magnitude of which is enormous. Face them we can, and temporary answers may be provided. But any biologist reading the story of histoplasmosis would wonder, among other things, if there were any awareness of the chains of circumstances which would permit huge flocks of undesirable starlings to congregate in cities. Who destroyed the forests, who killed the songbirds, who introduced the starling and the sparrow to America? And shall we now kill the starlings and blacktop everything?

With increasing frequency, many of the basic problems confronting us today are there because we have ignored the capabilities of our own environment.

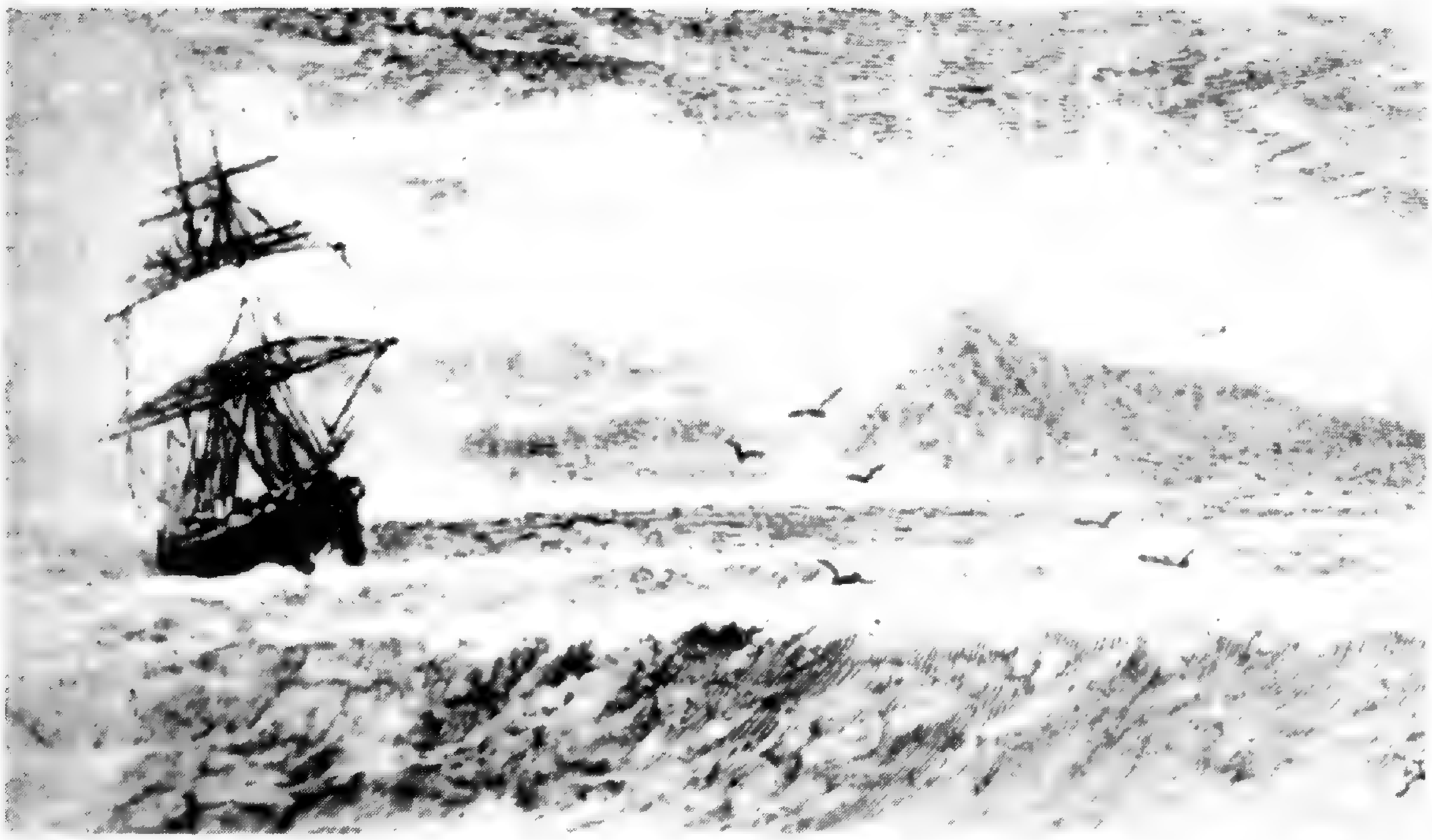


PHOTO BY CLAUDE JOHNSTON

The *Beagle*, shown here in the waters off Cape Horn, took Charles Darwin on his first major collecting trip.

History Lurks in the Herbarium

Susan Verhoek

THE HERBARIUM MAY SEEM a forbidding place to those who are not acquainted with it. Inside the cases repose more than two million plants, carefully tucked away in the dark amid moth ball fumes until a botanist has need of them. To some these plants are just "hay," to others they are an important scientific record, and to those with a sense of history and adventure they mark a time, a place, and a person in an adventuresome journey. Throughout the herbarium there are specimens which are tangible proofs brought back from exploring expeditions all over the world. Several of the specimens in the Missouri Botanical Garden Herbarium have their history well described and a few in particular have a great deal of historical as well as botanical interest.

When many parts of the world were being discovered and colonized it became the project of men of science to explore and document the face of the earth much as the scientific men of today are attempting to explore the space around it. One such exploring program was under-

taken by the British Admiralty in 1768. The primary purpose of the sea voyage was to travel to Tahiti and there observe the transit of Venus which was to occur in 1769. The Admiralty assigned James Cook to captain the *Endeavour* in the two-year trip around the world. Lord Sandwich, head of the Admiralty, also permitted two naturalists to join the expedition in order to record the climatological and "natural curiosities" of the journey. Joseph Banks (later Sir Joseph) was the senior naturalist. Banks was born in London and sent to Harrow and Eton to study after the fashion of education of the day. However, he found that he was more interested in botany than in Greek and Latin and became a primarily self-taught naturalist. At the time of the expedition Banks was 25 years old and had already explored Newfoundland and been elected a Fellow in the Royal Society.

The other naturalist was Daniel Solander. Solander had been a pupil of Linnaeus and perhaps was persuaded to go along on this trip because his curiosity had been aroused by the collections of foreign plants sent back to Linnaeus by friends and students. Whatever the reason, Solander was on board the *Endeavour* as it set sail on the two-year (August 1768 to July 1771) voyage which was to take it from England to Madeira and from there past an unfriendly Portuguese Rio de Janiero, to Tierra del Fuego where three men froze to death, to Tahiti, New Zealand and Australia, and finally around the tip of Africa and back to England. One of Captain Cook's biographers has said that this journey was "to the English nation the most momentous voyage of discovery that has ever taken place."

When the *Endeavour* stopped at Funchiale on the island of Madeira, Banks and Solander stayed in the home of the English consul; going out to collect in the morning, returning for dinner, and going out again in the evening. On these trips they explored the countryside within three miles of the town. Banks describes the town and the island in his Journal:

"As much of the island as we saw showed evident signs of a volcano having some time or other possibly produced the whole, for we saw no one piece of stone which did not clearly show signs of having been burnt, some very much, specially the sand, which was absolutely cinders. Indeed, we did not see much of the country, but we were told that the whole resembled the specimen we saw of it.

"When first approached from seaward the land has a very beautiful appearance, the sides of the hills being entirely covered with vineyards almost as high as the eye can distinguish. This gives a constant appear-

ance of verdure, although at this time [of the year] nothing but the vines remain green, the grass and herbs being entirely burnt up, except near the rills by which the vines are watered and under the shade of the vines themselves." Here by the rills in the vineyards the two men collected our specimens of *Medicago lappacea* L. (an alfalfa relative), *Trifolium angustifolium* L. (a clover), and *Hypericum perforatum* L. (St. John's-wort).

Thirty-four years later, a similar exploring voyage was undertaken by the *Beagle* under the command of Captain Robert FitzRoy. On the trip, the scientist was a young man just beginning his career, Charles Darwin. Although Darwin accompanied the expedition in the capacity of a geologist, he collected and made observations on the plants and animals along the way. In December of 1834, he collected a fern, *Asplenium magellianicum* Klf. He was at that time at Cape Tres Montes, a projection from the dissected southern coast of Chile. In the process of charting the coast of South America, the *Beagle* had taken refuge from a storm. Darwin and Captain FitzRoy went ashore but found the rugged cliffs too inhospitable to climb and the woods impenetrable. Charles may have picked this fern from a crag in the rock as he attempted to climb. The specimen was taken to the Royal Botanic Gardens at Kew and subsequently purchased by the Missouri Botanical Garden in 1897.

PHOTOS BY CLAUDE JOHNSTON

Banks and Solander collected this specimen (left) by a stream on the island of Madeira, the first stop on Captain Cook's momentous voyage of discovery. This gentian (center) was growing by the banks of the Little Sandy when Fremont's party camped there to dry out the baggage and take some astronomical readings. When the *Beagle* took refuge from a storm in a bay along the coast of Chile, Charles Darwin picked this fern (right) from the seaside cliffs.

PHOTO BY CLAUDE JOHNSTON

Fremont's expeditions travelled through the Wind River Mountains to explore the American West and return with samples of the plants which grew there.

While the explorations of the European countries were concentrating on the coast lines of the globe, the young countries of the New World were concerned with explorations of their frontiers. In the United States in the first half of the 19th century there was a need to survey the land and to find supply routes westward to Fort Laramie and beyond. With this objective in mind Captain J. C. Fremont set out from St. Louis on several expeditions. All of these expeditions collected plants as well as topographical and astronomical data.

Fremont's first expedition was to the North Central Plains. Fremont, his guide Kit Carson and his party (many of them Creole and French Canadians recruited in St. Louis) traveled up the Kansas River to the Platte and up the North Fork of the Platte to South Pass in the Wind River Mountains. Once through the Pass, Fremont and his men were on the other side of the Continental Divide. Fremont describes the occasion in his report:

"Approaching it [South Pass] from the mouth of the Sweet Water, a sandy plain, one hundred and twenty miles long, conducts, by a gradual and regular ascent, to the summit, about seven thousand feet above the sea; and the traveller, without being reminded of any

change by toilsome ascents, suddenly finds himself on the waters which flow to the Pacific Ocean. By the route we had travelled, the distance from Fort Laramie is three hundred and twenty miles, or nine hundred and fifty from the mouth of the Kansas.

"Continuing our march, we reached, in eight miles from the Pass, the Little Sandy, one of the tributaries of the Colorado, or Green River of the Gulf of California. The weather had grown fine during the morning, and we remained here the rest of the day to dry our baggage and take some astronomical observations. The stream was about forty feet wide, and two or three deep, with clear water and a full swift current, over a sandy bed. It was timbered with a growth of low bushy and dense willows, among which were little verdant spots, which gave our animals fine grass, and where I found a number of interesting plants." One of the plants collected here at Camp Little Sandy was *Gentiana affinis* Griseb (a gentian). This specimen was turned over to Dr. Asa Gray. From there it came into the possession of Dr. George Engelmann of St. Louis and through him into the hands of Henry Shaw.

The second expedition, 1843-44, was beset by bad luck. On the seventh of March, after having crossed the Sierra Nevada in spite of snow and starvation, Fremont, who had taken a part of the group ahead, retraced his steps to meet the rest of the party. He found an emaciated group of horses and men that had experienced great difficulty in descending the mountains. The paths had been slippery with rain and melting snow and fourteen horses and mules had fallen over precipices and been lost. One of the hapless animals was the mule loaded with the plants collected over 2,000 miles of travel.

On the return trip, the party camped for the night by the Kansas River, only to be awakened in the night by a flash flood that ruined the baggage and nearly the entire collection of plants.

Fremont's third expedition became involved in the Bear Flag Rebellion in California in 1845. However, despite these disturbing influences, Fremont's last two expeditions managed to send back some specimens from various points along the roads into the wilderness of the American frontier. There is a phlox from beside the North Fork of the Platte and a milkweed and an evening primrose among the species collected in the vicinity of Fort Bent on the Arkansas River.

These specimens, as well as those collected by Darwin, Banks, Solander, and hundreds of other collectors form the collection in the Herbarium which gives evidence that men have explored unknown places and brought back a record of what they found there.

PHOTOS COURTESY ALL-AMERICA ROSE SOCIETY

Europeana (on the left) is a brilliant cardinal red everblooming floribunda. This rose won its 1968 award on all-around perfection. Miss All-American Beauty (on the right) is the 1968 All-America award winning pink hybrid tea rose.

Roses in January

Barbara Lawton

JANUARY MAY SEEM to be the wrong month to think about buying roses for your garden, but it just isn't so. Gardeners would be wise to order rose plants, especially the more popular varieties, as soon as possible so as to get top quality plants. Potted roses may be set in until June or thereabouts, but bare-rooted stock should be planted by the last of March.

The All-America Rose Selections for 1968 include Miss All-American Beauty, a true pink hybrid tea; Scarlet Knight, a scarlet-red grandiflora; and Europeana, a cardinal-red floribunda.

Al Saxdal, the Garden's expert rose grower, has found that Miss All-American Beauty and Europeana have done exceptionally well and promise to be truly outstanding. Miss All-American Beauty, excellent for both cutting and display, has an added bonus in its delightful tea fragrance. Europeana remains of a manageable size for the home garden; its handsome full foliage and profuse beautiful blooms constantly draw admiring visitors in the Rose Garden. Both varieties are unusually productive and worthy of a place of honor in any garden.

GARDENING IN ST. LOUIS

JANUARY and FEBRUARY

IN JANUARY, an indoor month and the first month of the new year, begin your garden log or notebook. In the long run, records of plantings, plans, and other garden items will save you time.

Catalog time is here again. It is easy to get carried away by seed catalog visions, so plan carefully, keeping in mind color, blooming periods, and your capacity for garden work. Place orders for seeds and plants early.

Feed the birds and provide water for them, too. In addition to seed and suet, they will enjoy things such as apples and leftover pancakes, muffins, or toast.

Press down frost-heaved soil around plants. If the plant has been heaved with the soil, mulch the exposed roots and reset the plant after the soil thaws. Water evergreens when ground is dry and not frozen.

Indoor plants: Keep soil moist, but well-drained. Proper care will minimize pest and disease problems.

Most trees can be pruned now, except maples and of course spring flowering species. Brush snow off evergreens as they are brittle in winter and will break easily. Don't let unseasonable warm spells fool you into removing winter mulches.

Save fireplace wood ashes to spread under shrubs and in beds as this is a valuable source of potash.

Dormant spray to combat scale can be applied in February if day temperatures stay above 40 degrees. Apply arsenical pre-emergent crab grass killer if weather permits. Non-arsenical crab grass killers should be applied later.

Dormant shrubs and plants can be planted if ground is unfrozen.

Salt will injure or kill plants, so use sand or cinders in icy weather if there's any chance of the salt being shoveled or swept into garden beds or lawn.

Friends of the Garden

We would like to voice our thanks to Mrs. John Wagner and Mrs. A. Lee Shapleigh, working with Mrs. Thomas Collins and Mrs. Tom K. Smith, for their wonderful job in running the Garden Gate Shop sale at the Chrysanthemum Show. The three-day sale was a great financial success due to your patronage and your assistance. All the volunteers who manned the booths, as well as our regular Garden Gate Shop volunteers, are to be commended for the time they so graciously devoted to the project. Was Mr. Kohl's beautifully designed show more breath-taking than ever, or does it just seem that way each successive year?

Further accolades are in order for Mrs. Edwin Stuessie and Mrs. Leslie Gleason. Both ladies have been working here at the Garden for three years, Mrs. Stuessie in the Garden Gate Shop and Mrs. Gleason as secretary of our Friends. Mrs. Stuessie willingly shares her horticultural knowledge with our many visitors, and her warm support of the Shop Volunteers makes a "working day" a pleasure. With changes in the Shop Committee, she provides a continuity of knowledge about sources of supply and bookkeeping procedures without which it would be impossible to operate the Shop so successfully. Mrs. Gleason is our primary contact with the Garden's professional personnel as well as the Friends' office. She even provided transportation for Stix, Baer and Fuller's lovely models and their exciting clothes, which were shown at the Preview.

Keep working on new members for our Friends. Be sure that the Friends' office has your name on record for each new member you enlist. Mrs. George Stemmler is gathering exciting prizes for the Friend who brings in the most new members—150 joined our ranks in October.

The Poinsettia Show in December was truly striking, and epitomized the holiday spirit with its vivid reds and whites. Again the Garden Shop had a table, with some of their special Christmas merchandise to tempt you. This will be a practice at all the Previews for the Friends in the future.

The Orchid Show will open with a party for the Friends on Friday, February 9, with clothes from Pappagallo, 9202 Clayton Road.

St. Fiacre, the patron saint of gardeners and herbalists.

A New Course on Herb Culture

Kenneth Peck

THOUGHTS OF NEW and different courses are always on my mind and I was highly pleased when the St. Louis Herb Society approached me with the offer to give a course on herbs. And give it they will!

Meeting with Mrs. M. L. Holekamp and Mrs. D. Goodrich Gamble, it was decided that the new course would meet on two Wednesdays from 11:00 am to 2:00 pm. The dates set are April 24 and May 1, directly on the heels of the seed-sowing course. Lectures will be given by various members of the Herb Society and will deal with the history, use, and general culture of herbs in the Midwest. Participants will have the opportunity of planting and taking home herb plants of their own. If you have been tempted to have an herb garden, here's where you can get a running start.

Students should bring a sandwich; the Garden will supply coffee. The fee is $10.00 for Friends of the Garden, and $12.00 for others. Both meetings will be held in the Experimental Greenhouse. An absolute upper limit of 30 students has been set, so sign up early.

WHO, WHAT, WHERE, WHEN

A Man Who Cared—Dr. William Harrison Emig studied botany at the Missouri Botanical Garden and was awarded a Ph.D. from Washington University in 1915. Dr. Emig recently passed away in Colorado Springs, and left an insurance bequest to the Garden. In this way Dr. Emig was strengthening the Garden so that future generations also may receive training in botany at this venerable institution. As with hundreds of other alumni, the Missouri Botanical Garden gave Dr. Emig the substance for his lifetime career in Botany, and he returned this favor with generosity when he determined the destiny of his modest estate. For this consideration we are deeply grateful.

Dr. William Harrison Emig.

Mr. and Mrs. J. B. Fox (he is Lord Mayor of Leeds, Yorkshire, England) paid an unexpected visit to the Garden in October. Mr. Fox is a graduate of Mill Hill, the school which Henry Shaw attended in the second decade of the nineteenth century. Mr. Fox is this year's head of the Old Millhillians, the school's alumni association, and was in this country on textile business. He was reminded of Shaw's importance to St. Louis while on a sightseeing tour of the Garden, and this led to a delightful chat in the Director's office with Mrs. Gates, Edgar Anderson, and Mark Paddock.

Kudos to All the many people who helped make the Garden's Annual Fall Picnic on October 7 such a success. An unusually gay note was added this year—the Mellow Fellows, a trio of musicians playing the musical saw (almost a lost art nowadays), piano and drums. We had this treat because of Frank McCready at the Main Gate—his brother plays the saw. Leslie Gleason lent her own piano for the occasion, and Bill Walker set up tables in the new greenhouse.

The day started out gray and damp but the foot-tapping music of the Mellow Fellows with Joe Hood keeping time soon brightened it up, while Al Saxdal and Roy Esters made sure everyone had a glass of good cheer from the beer barrel. By one o'clock Jimmy Hampton and Jack Pavia, who had been working since sun-up barbecuing chicken, pork steaks, and ham, cheered on by Paul Richards and Joe Baker, were ready and so were we! Jimmy and Jack are really barbecue chefs! The meat was delicious and combined with all the many homemade dishes the ladies brought, it was truly a finger-lickin' day.

After lunch Lad Cutak took care of the adult games and prizes, as he so ably

does every year, while Mark Paddock took some of the children fishing at the lake where prizes were given for the biggest fish, the smallest, etc. Some children ran sack races and relay races with the help of Melanie Brown and Julie Gates; others preferred a hayride with Kenny Skaags pulling the wagon with the Garden's tractor. All in all it was a memorable day!

DR. AND MRS. THOMAS F. FUJIWARA of Honolulu, Hawaii, visited the Garden on November 7 for the express purpose of looking over our *Cypripedium* or Lady's-slipper orchid collection. Shaw's Garden is noted for its Lady's-slippers and these are featured each year in the annual Orchid Show held in February. The Garden amassed its fine collection in 1918, when it acquired the D. S. Brown Collection along with hundreds of other exotics.

The Fujiwaras have been growing and collecting *Cypripediums* for the last 20 years. Today they have one of the finest collections in our fiftieth state, and have won many awards for their fine specimens. Originally Thomas and Henrietta Fujiwara started out with Vandas, the islands' most grown orchid, but when a *Cypripedium Leeanum* was given them in 1947 they were so impressed with the flowers and the ease with which it could be flowered again that they purchased a few seedlings from Massachusetts and decided to concentrate on this interesting group. Since that year they have become confirmed *Cypripedium* enthusiasts, and the Fujiwara camera and notebook were put to good use in our *Cypripedium* house.

DR. RUSSELL J. SEIBERT, Director, Longwood Gardens, Kennett Square, Pennsylvania, made a three-day visit to St. Louis recently, stopping off at the Garden to renew acquaintances with the staff, utilize the Herbarium, and check plants which have possibly been damaged by air pollutants in this area. Dr. Seibert received his botanical training at Shaw's Garden working on the taxonomy of *Bignoniaceae* (a family of woody, tropical, climbing plants) collected with Dr. Robert E. Woodson, Jr., in Panama, and did research on rubber-producing plants, particularly *Hevea*, during the war years. Dr. Seibert is greatly concerned with air pollution which is definitely hurting the lilacs in the Atlantic states. Even the Maidenhair tree (*Ginkgo Biloba*), considered one of the most resistant trees to insects and disease, is showing susceptibility to pollutants in the air. While inspecting the greenhouses here, Dr. Seibert also pointed out possible damage that air pollution is causing to some of the exotic plants.

THE 25¢ MAIN GATE admission fee at Missouri Botanical Garden will be increased to 50¢, effective Friday, December 1, while the 25¢ admission fee to the Climatron inside the Garden will be eliminated. The number of visitors has been increasing, Dr. Gates said, and a 150-car landscaped parking lot has been opened at the corner of Shaw and Tower Grove avenues at the northeast end of the Garden. The entrance is on Tower Grove. There will be no charge for parking. With the Climatron admission eliminated, annual passes to the Garden and Climatron are now priced at $2.00 and a special 25¢ admission fee has been established for students 13 through 17 years of age. Children under 13 are admitted free if accompanied by an adult.

TOGETHER . . . FOR THE FULL LIFE

PHOTO BY MARK PADDOCK

THE ARTS AND EDUCATION COUNCIL recently made a special grant to the Education Department of the Garden to bring children from the inner city to its Saturday morning classes. Many of the children had never been to the Garden before. In the Saturday morning classes they are learning to plant their first bulbs, to build bird feeders and to grow their own winter vegetable gardens. Most of the children attending under the Arts and Education Council grant have come from the Peabody-Darst-Webbe public housing developments under arrangements made with the president of the joint Tenants Councils, Mrs. Evelyn Glenn. The Council's grant to the Garden also made possible the printing of new booklets for use in the Saturday classes together with the preparation of plant materials for the children to take home.

The Missouri Botanical Garden Calendar

(JANUARY AND FEBRUARY, 1968)

January 6	CHILDREN'S SATURDAY NATURE PROGRAM. "Winter Puzzles." Identification of trees in winter. Admission is free. 10:00-11:30 a.m.
January 13	CHILDREN'S SATURDAY NATURE PROGRAM. "Jungle Plants." Admission is free. 10:00-11:30 a.m.
January 14 thru Feb. 4	PRIMROSE AND CYCLAMEN SHOW.
January 20	CHILDREN'S SATURDAY NATURE PROGRAM. "Building Blocks of Life." Microscopic study of cell structure. Admission is free. 10:00-11:30 a.m
January 27	CHILDREN'S SATURDAY NATURE PROGRAM. "Table Top Greenhouse." (Bring a 1 lb. coffee container and plastic bag large enough to cover.) Admission is free. 10:00-11:30 a.m.
February 3	CHILDREN'S SATURDAY NATURE PROGRAM. "The North Woods." Illustrated talk on Michigan and Wisconsin woods. Admission is free. 10:00-11:30 a.m.
February 9	ORCHID SHOW: PREVIEW PARTY for Friends of the Garden. 5:30-7:30 p.m. in the Floral Display House.
February 10	CHILDREN'S SATURDAY NATURE PROGRAM. "Mystery of the Orchid." Admission is free. 10:00-11:30 a.m.
February 11 thru Mar. 24	ORCHID SHOW.
February 17	CHILDREN'S SATURDAY NATURE PROGRAM. "Nature Movies." Admission is free. 10:00-11:30 a.m.
February 20	BUDDING AND GRAFTING. Techniques helpful to the home gardener will be taught by James I. McCaskill in the Museum Building, from 7:30-10:00 p.m. Friends of the Garden, $6.00; $8.00 to others.
February 24	CHILDREN'S SATURDAY NATURE PROGRAM. "Pin Cushion Forest." The life story of mosses. Admission is free. 10:00-11:30 a.m.

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PATRICIA PUTNAM, Editorial Assistant to Annals
JOHN RIDGWAY, Curator of Bryophytes
ANDRE ROBYNS, Visiting Curator, Flora of Panama
ALFRED SAXDAL, Rose Grower
OWEN J. SEXTON, Research Ecologist
FRANK STEINBERG, Superintendent of the Arboretum, Gray Summit
SUSAN VERHOEK, Senior Herbarium Assistant

Visit Your Missouri Botanical Garden

(SHAW'S GARDEN)

THE Missouri Botanical Garden's main entrance is at Tower Grove and Flora Place. The Garden is served by both the Sarah (No. 42) and the Southhampton (No. 80) city bus lines.

The Missouri Botanical Garden Arboretum—1600 acres—established at Gray Summit, Missouri, in 1926, is open to the public.

The Garden—70 acres—is open every day except Christmas and New Year's. For the main entrance, grounds, Climatron, display greenhouses, and Floral Display House:

May 1 through October 31.....9:00 a.m. to 6:00 p.m.
November 1 through April 30.....9:00 a.m. to 5:00 p.m.
Sundays and Holidays.....9:00 a.m. to 7:00 p.m.

For Tower Grove House:

May 1 through October 31.....9:00 a.m. to 5:00 p.m.
November 1 through April 30.....10:00 a.m. to 4:00 p.m.

The Display House presents four major shows: November, Chrysanthemums; December, Poinsettias; February, Orchids; April, Spring Flower Show. During the year other shows, competitions, and festivals are sponsored by various garden clubs and flower societies.

Courses in botany and horticulture for adults are conducted by the Garden staff. Children's nature classes are provided free on Saturdays from mid-September to early June. The Pitzman Nature Program is held for children during the summer. The Garden is world famous for its scientific research program. The scientists of the Garden hold teaching appointments on the staff of Washington University.

The Missouri Botanical Garden was established for the public's benefit in 1859 by Henry Shaw. The Garden, a non-profit institution, relies for support solely upon contributions from the public, the Arts and Education Council, and income from the Shaw estate. The Garden receives no city or state tax support.

Support your Garden and take part in Garden activities through the Friends of the Garden. Information may be obtained from the Main Gate or by mail or phone (TO 5-0440).

MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME LVI NO. 2 MARCH-APRIL 1968

NARCISSVS V.

Books Dog-Eared? Tools Rusty? Patio Accessories Worn Out? Don't Panic ! !

We have what you need.

THE GARDEN GATE SHOP/at the main gate/Tower Grove and Flora

Missouri Botanical Garden Bulletin

VOLUME LVI NO. 2 MARCH-APRIL 1968

EDITORIAL & PUBLICATION OFFICE
Missouri Botanical Garden
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COVER PHOTO BY TODD STUDIOS

FROM THE DIRECTOR

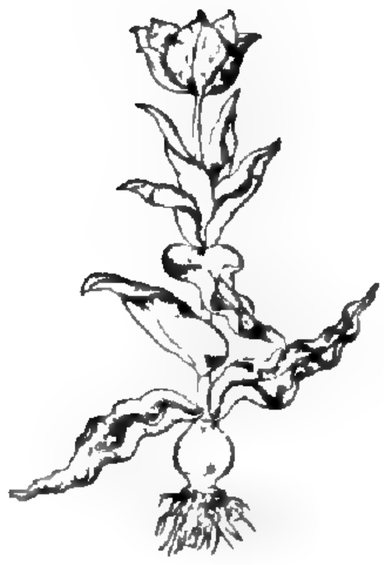
WE TAKE plants for granted because they are so common, and we only begin to realize their vast importance when they are absent.

I have seen people without plants on the hot dusty plains of Pakistan and India, in the Dust Bowl of America, and, of course, within the concrete canyons of our metropolitan areas, and they desperately missed the presence of living green plants.

Last summer I visited a new volcanic island called Surtsey in the North Atlantic Ocean off Iceland. Surtsey was barren, wind-blown, and dusty and yet the first plants of *Cakile edula*, the sea rocket, had already arrived on the beach. Even in the cold short summer of the far north, Surtsey will be green in 10 years; plants, vital to the existence of all animals, may colonize areas that seem overwhelmingly barren and forbidding.

Within this bulletin is the report of 1967 for this institution dedicated to plants. Our great Herbarium of nearly two million preserved plants added 66,000 specimens; our famous botanical library added 1000 volumes, and the institution was bustling with research, teaching, maintenance, and horticultural activities. The Garden made many physical improvements during the year: New fronts on the desert display houses; a new pool and fountain in the rose garden; a fine new parking area for 150 cars; painting of buildings, fences and greenhouses; redecoration of laboratories and offices; renovation of our heating plant, and continued improvement of flower displays and living collections throughout conservatories and grounds. Perhaps best of all is the fact that the number of new professional staff members and graduate students of botany has increased from 26 to 39 during the year. "Better plants for better living through botany" might well be the slogan of this institution!

NARCISSUS V



George B. Van Schaack

NARCISSUS V (cover illustration) portrays, of course, our common garden tulip, *Tulipa gesneriana*, of which there is only one earlier printed representation. Considering the vast complexity of the group which forms this horticultural species, the picture does a good job of recalling to us these colorful spring flowers. The illustration is found in Mattioli's *Commentaries on Dioscorides' De Medica Materia*, the Venice edition of 1565 in Latin.

Dioscorides had written his pharmacopoeia in Greek, when he lived on the shores of the eastern Mediterranean in the first century A. D. He included over 300 plants native to the region. His work was copied and recopied for nearly 1500 years and translated into Arabic and Latin. A Latin edition appeared in the earliest days of printing (1478). Soon several noted physicians began publishing their own remarks on the virtues of the Dioscoridean plants, which they did not always correctly identify. In 1544 Mattioli published a work with Dioscorides' text in Italian, supplemented with compilations from these earlier commentators, to which he added some remarks of his own.

His *Commentarii* had a long and distinguished career, appearing for 200 years in well over 60 editions in several languages. As early as 1554 he provided his work with illustrations of playing-card size; a decade later came new ones of nearly full-page size like the one on the cover (here somewhat reduced). In each new edition he added all the natural history he had learned since the previous one. For new plants he provided a description and usually a discussion of their habitats and virtues, as well as illustrations of them. But Narcissus V appeared in 1565 without comment, nor did Mattioli give it any for the rest of his life—he never even called it *Tulipa*, the name by which most of his contemporaries knew it.

The illustration he uses is so lifelike we wonder what its source may have been. At least it is certain it was not copied from the single earlier one which had appeared in 1561, in a work by the famous Swiss naturalist, Conrad Gesner. In April of 1559 Gesner had seen tulips for the first time, growing in a garden in Augsburg. Excellent delineator though he was, he failed to make a drawing at the time. When he came

to publish his book, having no plant at hand, he used an inferior drawing sent to him by a friend. It shows a plant with four basal leaves, two of them with very wavy edges and nearly flat on the ground, the others smooth-edged and ascending, but the stem bearing no leaves at all. Moreover, the flower is much less open, and its "petals" are quite sharply pointed. It is clear, however, from what Gesner says, that he had seen one form of our common garden tulip. He remarks that it had been lately introduced by seed from Byzantium, and he names it *Tulipa turca*. Two hundred years later, in 1753, when Linnaeus gave binomial names to all the plants he knew, he named this very variable, non-wild species for Gesner and referred to Gesner's description of 1561.

One further remark of Gesner is of interest. He notes that *Tulipa turca* has eight "leaves" (that is, petals as we loosely call them), four on the outside and four on the inside, and that also there are eight stamens. Although we should expect the flower parts in threes or sixes (for the tulip is a hexandrian plant), what Gesner had examined in Augsburg was a particularly sturdy specimen! Sir A. Daniel Hall in his work *The Genus Tulipa* notes on page 19: "occasionally extra vigour may give rise to a flower arranged in fours, with eight perianth segments and stamens, and a four-celled ovary." This earliest illustration, however, shows only six petals and a three-parted stigma; not often did Gesner permit himself such scientific laxity.

Paul Kohl

A white redbud in the North American tract.

The Story of the White Redbud

Edgar Anderson

MISSOURI'S greatest gift to springtime gardens is the white redbud. It is beautiful by day, but only those who have seen it in the light of a full moon know the magic it can bring to a garden. Its introduction and dispersal by the Missouri Botanical Garden is one of our outstanding achievements horticulturally.

The story begins in 1903 with a small plant purchased from the nursery of John Teas and Son in Carthage, Missouri. It was planted about 100 feet south of the Main Gate. In 1920 when the Teas nursery sold its Missouri holdings, the Garden purchased the entire original stock of white redbuds, seven plants in all, one of which was a light pink, the other six being pure white.

When the Garden acquired an arboretum at Gray Summit, Missouri (as told in last autumn's Bulletin, Vol. LV, No. 7, pp. 12-15), it also acquired the services of Martin Bagby, a skillful propagator from a

Paul Kohl

The beauty of the white redbud is even more apparent in closeup.

nursery in New Haven, Missouri, with years of experience at budding and grafting peaches and other woody plants. Though the white redbuds, being albinos, were not as sturdy as the normal red ones, they did set some seed in the Garden, though not as heavily as did the others. Mr. Bagby was able to grow a number of seedlings from them but about half of them bore bright red flowers and none of the rest were a clear attractive white.

Accordingly, Bagby budded and grafted the white variety successfully on sturdy redbud understock. They were brought to the Garden and were also distributed to other botanical gardens and arboretums around the country. Those brought into St. Louis were mostly planted just west of the Administration Building, where they grew well even though planted close to two big old sycamores. The latter were eventually cut down, but too late to cure the permanent "curvature of the spine" the white redbuds acquired from this over-shadowing.

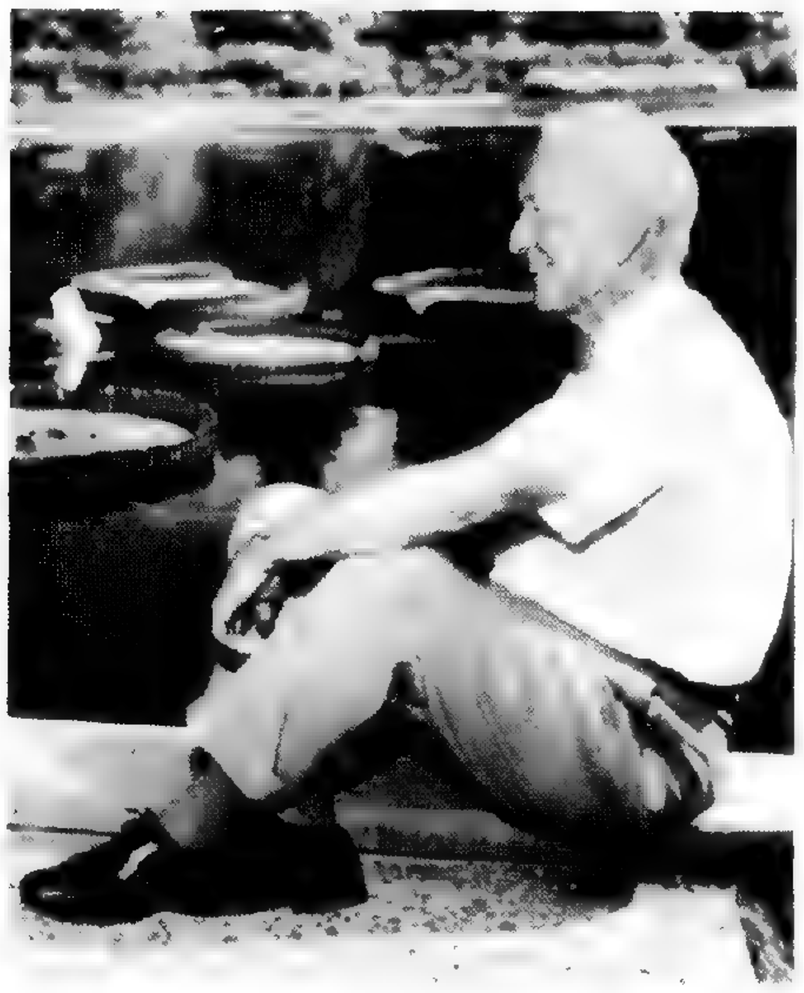
The success of those sent to other gardens is best described in Mr. Pring's own words:

"I was invited to judge at the International Flower Show in New York. While there I was asked to do a radio program with two friends, one from the Brooklyn Botanic Garden and one from the New York Botanical Garden. The latter was proudly promoting their special ex-

hibit of a new plant, forced into bloom for the show. It was the white redbud! I told the commentator that I would very much like to give the rest of the story. I said, 'I was very gratified to hear the white redbud mentioned by my friend. But he did forget to mention that we at the Missouri Botanical Garden sent the New York Botanical Garden that plant he was speaking of. It's always interesting to catch up on these plants that we had such a part in starting.' "

When in the late 1940's Mr. Pring lectured in Houson, Texas, he showed pictures of the white redbuds and explained their history. Quite unknown to him, old Mr. Teas was in the audience. "After the lecture," said Mr. Pring, "one of his sons came up and said, 'My brother and I thought it would be nice to bring Dad to the lecture. When you showed the picture of the white redbud, tears came into his eyes.' "

Mr. Pring then got the whole story of its discovery straight from the old gentleman. "Being a nurseryman," said Mr. Teas, "I was naturally interested in trees. I used to go through the woods in and around Carthage doing some botanizing. One year in the redbud season, I could see some white. I knew it wasn't the native plum; it was too late for that. So I made my way over towards it and as I got closer I saw a most gorgeous white, the purest white you've ever seen on a plant! It was a form of redbud. Immediately I knew it *must* be saved for posterity."



courtesy Post-Dispatch

PRING FOUNTAIN

GEORGE H. PRING arrived at the Missouri Botanical Garden on March 13, 1906. Only 20 years old, he was the youngest person to graduate from the famous Queen's School of the Royal Botanic Gardens at Kew in England. During the next 57 years, he was an indispensable member of the Garden staff, making a great many horticultural contributions, the finest of these in the field of hybridization of water lilies. He rose from his first position as foreman of the orchid department to become the Garden's superintendent. Although he "retired" in 1963, Mr. Pring has remained active, answering telephone questions from the public about gardening and plants, and giving a regular series of radio talks plus appearing on television. Mr. Pring to many people *is* Shaw's Garden and to some young minds he seems to be Mr. Shaw himself.

The heritage of beautiful and new varieties of water lilies which George Pring has given the world will last forever. The "Mrs. G. H. Pring", "Director George T. Moore", "Aviator Pring", "Missouri" and many others are a glory in any pool and a tribute to Mr. Pring's perseverence and skill.

What more fitting recognition of Mr. Pring's many fine contributions to the Missouri Botanical Garden than a splendid fountain at the center of the main lily pool in front of the Climatron! A fountain would add a point of focus to the promenade from the main gate to the Climatron, spraying forth in delightful display when water lilies are not on the pool and accenting the lilies during the growing season.

(Please send your contribution to "Pring Fountain", Director's Office, Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, Missouri 63110.)

GARDENING IN ST. LOUIS

March and April

Spring, the busiest time of the year for the home gardener, is almost here. Sow hardy annuals and vegetables outdoors, including herbs such as basil, dill, marjoram, parsley, and savory, when the red leaves appear on maples and the soil is dry enough to be workable.

Prepare and plant seed flats in late March, using as a planting medium a mixture such as two parts soil, one part peat, and one part perlite or sand.

Uncover roses and perennial beds about April 1, when chances of winter weather are gone and remove any weak or winter-killed growth. Work cover material into soil if compost or sawdust was used. Set out perennials and rose bushes as soon as they appear in the nurseries. Divide hardy perennials such as phlox and chrysanthemums (but NOT iris) as soon as you can easily work the soil.

Prune the fall-blooming shrubs now, and prune evergreens before new growth starts. Weeding in those difficult places such as iris beds is most easy to do early in the season when the ground is quite damp.

Fertilizer such as 5-10-5 is good for general use in vegetable and flower beds. Azaleas should be fed with an acid fertilizer and cottonseed meal. All those wood ashes from winter fires are excellent for such plants as columbine, chrysanthemums, and lilacs.

Start a conservative spraying program. Know what you wish to accomplish and obtain reliable advice from your nursery or other expert sources. Pre-emergence crabgrass killer should be applied before the apple trees bloom. Proper use of chlordane can solve the problem of ant hills, grubs, and cutworms.

Make sure that hand and power tools and equipment are in top working order. Repair shops will do better and faster work if you beat the rush.

Use a complete fertilizer on your house plants, including cacti and succulents, and transplant if necessary. Begin to acclimatize those house plants you wish to move outdoors for the summer by giving them a spot with strong light.

WHO, WHAT, WHERE, WHEN

SPRING AT THE GARDEN is always a notable event with bulbs in bloom, the Linnaean Garden coming alive once again, the Herb Garden greening-up, fruit trees and ornamental shrubs beginning to bloom.

THE JESSE M. GREENMAN AWARD of the Missouri Botanical Garden will be given to a botanical systematist for the best thesis paper published during the preceding calendar year. The award of $100 is sponsored by the Missouri Botanical Garden Alumni Association. The first award will be presented during the American Botanical Society Banquet at the 1968 AIBS meetings. Papers submitted should have been published during calendar year 1967 and result from M.S. or Ph.D. thesis research in plant systematics. Papers submitted for consideration should reach the Garden's Director before May 1, 1968.

WELCOME TO: James J. Allman, St. Louisan with a B.A. and M.A. in English from Washington University. Mr. Allman joins our staff as a Research Technician to manage experimental equipment and to help Dr. Gates with his ecological projects. Before coming to the Garden, he worked with the Naval Air Service, the Boy Scouts of America, and was Director of Community Relations in the St. Louis Police Department. He is interested in science writing and hopes to eventually do that or teach.

Carol King, another St. Louisan, works in the Library. She was a Kelly Girl before joining our staff but before that worked in the Webster Groves Trust Company. Carol has done volunteer work for the Red Cross and has taught swimming. Carol is married and has an 8-year-old daughter.

Hyrum B. Johnson, Research Associate from Utah, took his B.S. and M.S. from Brigham Young University. He hopes to have his doctorate in the spring from Columbia University in New York City. Before coming to the Garden, Mr. Johnson was working at the New York Botanical Garden under a fellowship, and with a research assistantship, under Dr. Pierre Dansereau, a well-known ecologist. Here at the Garden, he is continuing his work in ecology under Dr. Gates. Mr. Johnson is married and has a year-old son.

Miss Sandra Thornton joined the staff in November as Assistant in Education. She received her bachelor's degree in education from Southeast Missouri State College. Sandy enjoys music, playing both the guitar and piano.

CHRISTMAS DECORATIONS. Many compliments were over-heard from visitors to the Garden during the holidays about the Christmas decorations on the Climatron. Strung up on the framework of the building was a red candle with yellow flame flanked by two smaller candles. Junipers on either side of the entrance were effectively hung with colored lights. The display could be seen at night from any high building in the city or through the main gate of the Garden. Henry Shaw's country home, Tower Grove House, was an attraction in the best Currier and Ives' tradition, lacking only a snowfall to make it complete.

DR. AND MRS. GATES gave the holiday season an early and joyful start with the annual staff Christmas Party at their home. Delicious punch and hors d'oeuvres were served, graciously presided over as in other years by the whole family. This is an event always thoroughly enjoyed by all—students, scientists, gardeners, volunteers, and administrative personnel.

Friends of the Garden

NINE HUNDRED Friends turned out for the Poinsettia Show Preview Party in December! We were all doubly rewarded—by the lovely Christmas music and the magnificent floral display.

Lad Cutak's lecture on January 9 showed us an aspect of the French Riviera's Gardens that is not widely known. Lad's enthusiasm for his subject and the excellent quality of his slides made this a memorable evening.

Pappagallo, 9202 Clayton Road, provided us with a delightful preview of their resort and spring fashions at the Preview of the Orchid Show on February 9. The masses of exotic blooms should have tempted every one of us to join the Friends' trip to South America, (page 4), in order to see similar floral magnificence in its native environment.

On March 29 we are all invited to the Preview of the Spring Flower Show. We will be treated to a special showing of jewelry by St. Louis' eminent gemologist, Elleard Heffern. Mr. Heffern will show us his company's latest creations in gems and precious metals, which will be modelled by our own Friends.

The Garden Gate Shop committee has been on a buying trip to New York, and the report is that the Shop is completely restocked with new and exciting merchandise for gifts and gardens. The patio—a gift to the Garden from the Weeders and Seeders—is being built in back of the Shop and will display, to great advantage, the Shop's outdoor items.

Daffodil time at the Arboretum, Gray Summit, is perhaps the loveliest time of the year. There will be a Friends of the Garden picnic there on Sunday, April 22. The walking trails will be open to expose you to Spring at its finest! We're to have beer, food, and a German band. Do plan to spend the day with Friends; $3 for adults, $1.50 for children. (Call Leslie Gleason at the Friends' office for reservations: TO 5-0440.)

Spring Flower Show

Paul Kohl

In the current spring flower show there will be masses of colorful azaleas and yellow genistas. Spring-blooming potted annuals of browallias, schizanthus (butterfly flowers), snapdragons and stocks will add variety to the show. Fragrant hyacinths, lilies, narcissi and tulips, calceolarias, marguerites, nasturtiums and the vivid-colored cinerarias all will add to the gaiety of the spring display.

Now is the Time

MARCH IS ARTS and Education month—the *one* time during the year when you and your fellow St. Louisans are asked to give to this united campaign to support ten of our vital cultural and educational institutions.

Shaw's Garden is one of the ten agencies which will benefit from the 1968 Arts and Education Fund. When this year's campaign to raise $825,000 is successful, the Garden will receive $90,000 from the Fund to meet necessary operating expenses.

The Fund can only succeed if it receives support from those who care about the agencies. Ask yourself: If we who love the Garden do not support the Arts and Education Fund, who in St. Louis will?

Give generously when a Fund solicitor calls on you. If you are not called on, send your contribution to ARTS AND EDUCATION FUND, P.O. Box 1968, St. Louis, Missouri 63118.

TOGETHER . . . FOR THE FULL LIFE

Good News for Herb Gardeners . . .

The St. Louis Herb Society Plant Sale May 3 and 4

Mary A. Gamble

ONCE AGAIN the Greenhouse Concourse will be crowded with more than 50 varieties of the most-wanted culinary and household herbs; thrifty plants ready to add flavor and fragrance to herb gardens, perennial beds and borders. The plants have been nurtured in the Garden greenhouses. Many were propagated from specimen plants in the Society's herb garden at the kitchen door of Tower Grove House. There will be annuals, perennials, and biennials, but the emphasis is on those plants which do not come readily from seed. Although it will have these plants available, the Herb Society stands convinced that most gardeners would profit from raising such annuals as dill, basil, and borage from seed.

Whether a gardener is replacing old stock, expanding an herb collection, or starting from scratch, he will find plants of interest. The Society will have a "starter garden" of perennial herbs planned to get the beginner off on the right foot. There will be an informative display where each herb on sale will be described. Society members, in keeping with their motto which is to "further the use and knowledge of herbs," will be glad to answer any questions.

Right now, on March 1, there are hundreds of herbs in the greenhouses, potted and growing happily, looking ahead to that first week-end in May when green thumb gardners will buy them and set them out in some fair-to-good garden soil where they'll receive ample sun and a modicum of care. Of course, gardening is like the weather—fickle—but if all continues well, the plant sale collection will be superb.

The 1968 plant sale will include good quantities of the following herbs: basil, burnet, chives, dill, fennel, garlic chives, scented geraniums, lavender, lemon balm, lemon verbena, sweet marjoram, mints,

Eli Strassner

The Herb Society's Plant Sale of 1967.

monarda, Greek oregano, parsley, rosemary, culinary sage, pineapple sage, winter savory, grey and green santolina, French tarragon, sweet woodruff, and creeping, upright and lemon thymes. In addition, there will be limited quantities (50 or less) of many other herbs, some so old-fashioned they're rare in gardens these days.

Sale hours will be from 9:30 a.m. to 4 p.m. on Friday and from 9:30 a.m. to 1 p.m. on Saturday. Customers will find it convenient to enter from Alfred Avenue and park on the lot adjacent to the greenhouses. Sorry, but no advance mail or phone orders can be filled.

Members of the Herb Society made the first cuttings for the sale in August. They've been working hard ever since with the greenhouse staff, under the supervision of Mr. Paul A. Kohl and Dr. Derek G. Burch. Their goal has been to produce the greatest possible number of healthy plants for the sale which again will benefit the Garden's greenhouses. They're confident and enthusiastic but, as herbers, tend to be a little superstitious; so all have had their fingers crossed that seeds will germinate, cuttings root, transplants thrive, and that the sun will shine and soft winds blow throughout that first week-end in May.

ANNUAL REPORT
1967

THE PREPARATION of an Annual Report for an institution can be a tedious task if the preceding year was one of status quo or decline. The preparation of this report has been interesting and far from tedious since there has been fine progress on all fronts at the Garden in 1967: horticultural, scientific, educational, financial, administrative, and physical facilities. For the second straight year the budget was balanced. Operating income for the fiscal year was $502,000, while expenses were $501,000! It is our intention to continue a balanced budget operation at the Garden, but with operating expenses rising rapidly, due to needed activities plus the inflationary spiral, we must strive to increase income. Thus far we have been partially successful and a limited expansion of services financed by the Garden's income has been possible.

On 1 December 1967 the 25¢ admission fee to the Climatron was eliminated and the admission fee to enter the Garden was increased to 50¢ for adults. It was determined that over 75% of adult visitors to the Garden had been including the Climatron on their tour and were therefore already paying a total of 50¢ prior to the change. The elimination of charging at the Climatron immediately enabled us to apply the salary expenses of the Climatron gate attendant towards horticulture. Simultaneous with the admission fee change, a new free visitors' parking area was opened. The lot will hold 150 cars, so that even on busy weekends and holidays, visitors to the Garden will have to walk no more than one block to the Main Gate and automobiles will be off the street.

A related problem which confronts us every day is the difficulty visitors have in finding their way to the Garden. The fact that we are located away from the main hub of St. Louis activities is a handicap, but even more of a problem is the lack of directional signs, no-left-turns, and one-way streets. Hopefully, in cooperation with the City of St. Louis, we will overcome at least some of these barriers.

Shaw's Garden has always benefited from a strong community spirit by local citizens. We would like to take this occasion to give special heartfelt thanks to volunteers that work at the Garden. Volunteers unselfishly donate tens of thousands of hours to the Garden

Hedrich-Belssing

The new fronts of the Desert Houses add much to the appearance of the Garden.

each year! It originally was our intention to list each volunteer worker in the Bulletin, but when the list climbed to over 200 names we reluctantly decided to delete the list. For example, Tower Grove House and the Garden Gate Shop depend very heavily upon volunteers to carry on operations—over 170 different ladies to be exact. The Friends of the Garden membership office has a corps of dedicated volunteers; several from the Junior League regularly assist in the children's education programs and a group of men from the Men's Garden Clubs have been devoted helpers to Ken Peck for years as well as providing for the complete maintenance of the cutting garden. The St. Louis Herb Society assumes complete responsibility for the Herb Garden each year and other horticultural societies work with us on various plantings, projects, and displays. Some volunteers help in the greenhouses, others in the Herbarium, the Director's office and on the *Bulletin*. We even have a volunteer for precise woodworking tasks and one who fixes old clocks!

The Women's Executive Board of the Friends of the Garden is an entirely volunteer organization and each of their special projects requires hundreds of volunteer hours of extra effort. Tower Grove House and the Garden Gate Shop are efficiently supervised by committees of volunteers.

Finally we must not forget the entire institution is dependent upon a purely volunteer group of civic minded men to whom Henry Shaw entrusted his gift to St. Louis—The Board of Trustees.

Horticulture

THE HORTICULTURAL program for 1967 emphasized consolidation, inventorying and labeling of specimens, acquisition and replanting —all activities required as first steps along the path toward bringing the institution back to a leading position in the horticultural world.

Since Derek Burch's appointment as Chief Horticulturist in late 1966, there has been increased cooperation of all growing sections at the Garden. Section heads are working closely together and as a result the Garden's horticultural program is growing in strength and efficiency with each passing month.

Claude Johnston

The fine new growing ranges together with the new concourse provide efficient facilities for our Floral Display Section. Three of these greenhouses were constructed through generous donations by Leicester B. Faust in memory of Anna Busch Faust; Mrs. Edward J. Mallinckrodt in memory of Georgie Elliot; and Mrs. Robert C. Corley, Mrs. Charles S. Lamy, and Edward J. Walsh in memory of Winifred Erwin Walsh.

TROPICAL GROWING

Staffing problems have continued to be severe. The position of Tropical Horticulturist is unfortunately vacant, which has curtailed the training program for gardeners in this section. Fortunately we have had the services of two good growers who took over many duties beyond what would normally be expected of them.

Pruning and tree removal in the Climatron has taken out much of the fast-growing, weedy material that was crowding choice plants. The extra light now reaches the lower levels, giving more bloom and healthier growth at a level which the visitor may see at close quarters. The new pruning system is showing good results in developing trees that look natural for their species throughout the year. In all cases cuttings were struck so that if the trees are ever needed again, they will be available as small plants.

A good deal of replanting to a new plan has been done and over the next four or five years the look of the Climatron will change so that the type of plants being grown in specific areas will reflect the different

climatic conditions of this unusual greenhouse.

While replanting, soil has been improved by adding peat, sand, and rice hulls to the poor-draining Missouri silt. In addition, a heavy layer of mulch is being built up in many parts of the house giving striking improvements in growth, particularly of the bamboo and some of the foliage plants.

The Climatron pool algae problem has settled down, but every mistake that lets water out of it and necessitates refilling shows that the problems could immediately recur if control is relaxed. There is still a strong need for underwater landscaping.

The Desert House plants were pruned and some of the most scarred big plants were removed. Sections of these are being propagated in tubs and will be ready for replanting as mature plants when needed again. The new fronts on these houses have improved their appearance tremendously, and the addition of appropriate flowering plants in each house adds a little color so that people attracted by the new fronts are not disappointed upon entering.

The Growing Range is now starting to produce good-looking vigorous plants for use in the Climatron. Not only is material being grown for permanent planting, but several lots of attractive foliage or flowering plants are now being displayed in the Climatron while in show, then taken out to be replaced by another group as they become dowdy.

Claude Johnston

The new pool and fountain donated by the Schoenberg Foundation adds much to the Rose Garden.

Checking of actual stock against records has shown just how our collections stand, and each group of plants is being inventoried to obtain a better picture of the strength of our collections.

Plants have been sent on exchange to a number of Gardens and individuals both inside and outside the continental United States. A good deal of material has been received from other botanical gardens and from expeditions to Central and South America. These plants, including families not previously represented here, and those whose exact provenance is known, are particularly valuable since they are usable in research projects as well as for display.

An accurate list of our orchid species has been prepared to replace that done in 1962, and was well received by the orchid community outside the Garden. The work on making this list indicated that it may be advisable to gain growing space for more valuable orchids by judiciously reducing the number of plants blooming at seasons when we have no great call for them.

TEMPERATE GROWING

The second year of using the new range of houses has taught the growers more about their characteristics. Moderate weather conditions together with new cooling and ventilating equipment, bought with funds generously provided by the St. Louis Herb Society, has made the year less harrowing for the growers.

Mr. Charles Kreher, Grower, has had complete charge of water lily growing this year, planning the planting as well as carrying through all propagation of the tubers that are carried over winter. Most important, the stock has been thoroughly checked so that it is once again true to name. All pools had a fine show in spite of the cool summer and some spray damage to leaves after each visit of the St. Louis Mosquito Control unit. Mr. Kreher also took charge of the Linnaean Garden and assisted with shrub labeling and identification.

A nursery was begun in the area north of the Lath House for the growth of experimental material as well as for summer plunging of many of the plants used in shows. Once water was made available here, some remarkable growth was obtained from the plants. This area will be a valuable addition to our operation.

FLORAL DISPLAYS

The floral displays were all designed and installed by Mr. Kohl with the exception of the Poinsettia Show that opened on December 1.

Mark Paddock

Each floral display takes hundreds of flower pots. Charles Harrison prepares a load of clay pots.

Claude Johnston designed this one, maintaining the fine standard set by Mr. Kohl over the years.

FLORAL DISPLAYS-1967

Dec. 1-Jan. 8	Poinsettia Show
Jan. 15-29	Cyclamen and Primrose Show
Feb. 3-Mar. 19	Orchid Show
Mar. 26-Apr. 30	Spring Flower Show
May 6-7	Metropolitan African Violet Society Show
Apr. 23	Flower Sunday, Christ Church Cathedral
May 13, 14	St. Louis Horticultural Society Spring Flower Show
May 20, 21	Rose Society of Greater St. Louis Show
May 25-Jun. 18	Hydrangea Exhibit
Jul. and Aug.	Display of Begonias, Fichsias, Gloxinias, and Foliage Plants
Sept. 2-10	Henry Shaw Cactus Society Show
Sept. 23-25	Greater St. Louis Dahlia Society Show
Sep. 30-Oct. 1	Fall Harvest Show
Nov. 3-26	Chrysanthemum Show
Dec. 1	Poinsettia Show

GROUNDS

The overall appearance of the grounds has continued to improve under Jim Hampton's direction with much effort going into lawn improvement. A program of crab grass control has reduced that problem and the whole lawn area has been limed, fertilized, and aerated a number of times. The simple matter of cutting grass to maintain an even, green turf is extremely demanding during the summer, but the compliments of visitors show the value of the effort.

The new nursery in the northeast area of the Garden will be fully

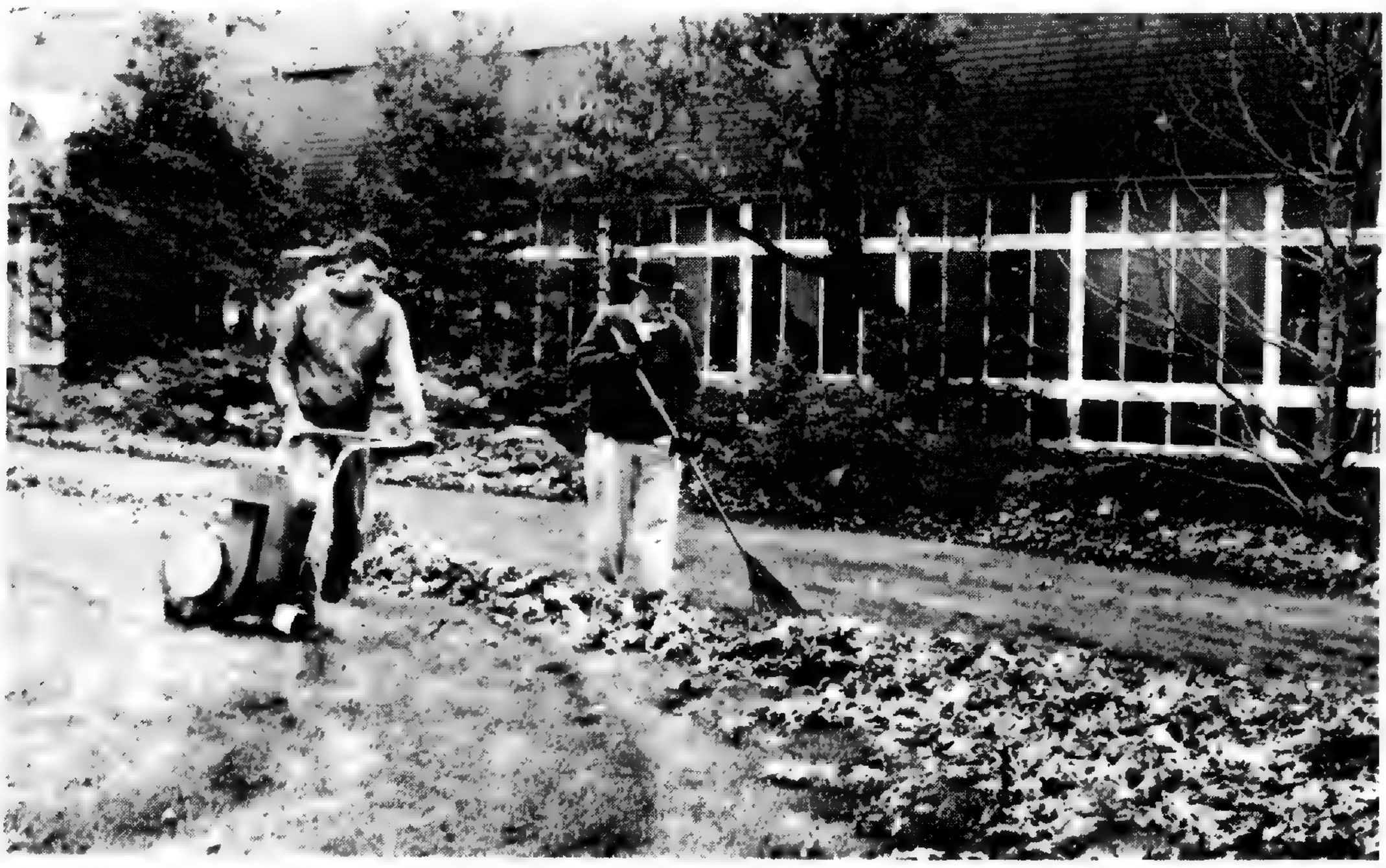
utilized for hardy plants and a start has been made in consolidating the growing of all our young stock here.

A small new greenhouse given to us by the Cupples Corporation has been erected in the same general area, which will increasingly become a service region for the whole Garden. These greenhouses are being used for all propagation for the Grounds section.

There have been heavy calls on the Grounds crew for such projects as grading and seeding in the parking lot area. The contractors were so late in completing their work that very little of the landscaping could be done.

Most of the shrubs on the grounds were pruned during the early spring, and the accumulation of many years' growth removed. A similar program is now under way for trees, and further shrub pruning should be the next step in getting them back into shape. Several trees have been removed either because they were diseased or because they were crowding more important plants.

All burning has now been eliminated from the Grounds by the purchase of a wood-chipping machine which reduces prunings to a useful mulch. Additional mulch from local tree companies has been used to give a heavy cover to planting beds that reduces the need for weeding and aids the structure and water-holding ability of the soil.



Mark Paddock

Raking leaves in a garden is an unending fall task using the time-honored rake, but easier with a specialized blower technique.

THE ARBORETUM

The 1700 acre Arboretum at Gray Summit, Missouri, 35 miles southwest of St. Louis, is the scene of increased activity. It has been the policy of the Garden in recent years to maintain the Arboretum at minimum cost and therefore publicity concerning its availability to the public has been minimal. There are, however, activities of certain groups and Garden staff that are desirable and appropriate, yet create very little extra maintenance effort and expense for the limited Arboretum staff. One example would be scientific meetings held at the Arboretum. During the year, several national committees of biologists have met at the "Manor House" with Dr. Gates. A fine place for such activity, it enables busy scientists to escape from their administrative chores and accomplish maximum work in minimum time. There is increasing use of the Arboretum by students in botany and zoology from the Garden and local universities. Scientists and teachers from the Garden and Washington University frequently use the Arboretum in their courses and research.

Dr. Anderson's popular course, "The Dynamics of Our Landscape," met at the Arboretum regularly in the spring, and he and Mr. Kenneth Peck gave science teachers of the St. Louis schools a workshop for field biology in November.

Nature lovers, bird watchers, hikers, wild flower enthusiasts, and

Mark Paddock

Beautiful Wolf Run Lake tucked away in a quiet part of the Arboretum.

many others generally interested in our natural environment visit the Arboretum regularly throughout the year. The Superintendent, Mr. Frank Steinberg, and the Schlemper brothers, Arnold and Waldemar, efficiently maintained the Arboretum in 1967, as they have done so well before.

Education

One of the primary assets of the Missouri Botanical Garden is its educational programs for children and adults. With man's increasing ability to change the world about him, such programs are invaluable for promoting interest and concern for our natural world and the role that plants play in our lives. The current administration of the Garden is actively promoting interest in our education programs and, as staff time and facilities permit, more classes are being initiated.

After over 10 years of almost single-handedly managing the Garden's educational programs, Mr. Kenneth Peck, Head Instructor, was joined by a full-time assistant in mid-November. Miss Sandra Thornton graduated from Southeast Missouri State College with a B.S. in education, having majored in art and minored in biology.

In June the Education Department was awarded a multi-purpose $3,000 grant from the Arts and Education Council of Greater St. Louis: to bring young people to the Garden from low-income housing projects; to develop live plant kits (such as seed-sowing and plant propagation kits) that could be used in schoolroom situations as well as by individuals; to write and illustrate for publication a number of pamphlets depicting several aspects of the natural history of plants. Work on one such booklet is nearly complete and a second one is under way.

In 1967 a total of 24,376 children and adults visited the Garden for the purpose of participating in a scheduled educational activity. The activities included: Saturday morning programs for children, tours of Climatron and grounds, self-guided scheduled tours, Plant Science Program for Children, Pitzman Nature Program for Children, adult courses and teachers' workshops.

In November, heads of education from various local institutions who have similar educational programs were invited to the Garden to participate in a one-day symposium. The following institutions and organizations were represented: Museum of Science and Natural History, St. Louis Zoo, Missouri Historical Society, St. Louis City Art

Museum, Outdoor Natural Science Laboratory of University City School District, and the St. Louis public schools.

On May 6 we made a visit to St. Anthony's School in Florissant to give children a lesson in how to sow seeds and grow plants. Even the cool, persistent rain on that Saturday afternoon did not dampen the interest of the 110 children who attended. Each child was given a sensitive plant (*Mimosa pudica*) to take home. On May 22, a visit was made to the 6th grades of Clark School in Webster Groves to demonstrate grafting of woody plants. The favorable response to these outside visits is indicative of how necessary it is for the Garden to be able to reach out to the community as well to draw people to itself.

A number of other outside visits were made to groups interested in the Garden. The most unusual of these was to the Juvenile Detention Center in March, where 60 young people were told about Mr. Shaw and his Garden.

ADULT COURSES

More people took adult courses in 1967 than in 1966 and more than 50% of them were Friends of the Garden. There were three new courses: "Succulents and Dish Gardens" taught by Lad Cutak, "Orchid Arrangement and Corsage Making" taught by Lloyd Kallial of Exotic Flowers, Inc., and "The Home Greenhouse" given by Derek Burch and Paul Kohl.

In connection with the "Winter Botany" course, Edgar Anderson and Kenneth Peck held three Tree Walks. The purpose of these walks was to study tree profiles in winter. Another walk to study grasses was given in June by Dr. Anderson and Raymond Freeborg. The popular course, "The Dynamics of Our Landscape," was again taught at the Arboretum by Dr. Anderson. The other adult courses, some of them old-timers now, were given by Clarence Barbre, Ray Freeborg, Robert Gillespie, Kay Hert, and James McCaskill.

PITZMAN NATURE PROGRAMS

This program made possible by grants from the Pitzman Charitable Trust has been the favorite one for the thousands of children who have attended it over the past 10 years.

One of the most interesting things experienced in giving such a program is that young people who attended summer classes here as mere youngsters return to visit the Garden and their "old teacher,"

Mark Paddock
Bird feeders and Girl Scouts after a Saturday Morning Class for Children.

Mr. Peck, who is absolutely amazed at some of the transformations he has seen. Quite a number of these young people now want summer jobs as instructors and are, naturally, quite well qualified.

The total number of children active in the program was 564 and the number of those receiving certificates was 433. Heat was not the overbearing hardship that it usually is in a St. Louis summer. There were quite a few mornings when almost everyone came in a sweater to keep warm. While each cool weather front brought rain, the latter was not a serious problem.

Classes were given on four days each week and the program was divided into two sections. The St. Louis Audubon Society very ably presented the bird and animal study courses as they have done since the program's inception. Mrs. Lanier Criger and Miss Sarah Owen were once more the principal instructors, assisted by Mrs. Robert J. Higgins, Henry Pelzo, and Mrs. Robert Hill.

Much time was spent in working in the greenhouses with plants, beginning with sowing seeds, transplanting the seedlings, and winding up with everyone making a terrarium. The children seemed to need and appreciate greenhouse activity in spite of summer warmth. Making nets and collecting insects always proves to be popular, particularly among the 7 and 8 year olds. Such activities require careful preparation no matter how often they are given, but prove to be the "meat" of the program.

There were three new instructors for last summer's program: Valerie Komar, a senior at Southwest High School; Shirley Eisenhauer, a freshman at Carlton College in Minnesota; and Ann Winfrey, a

junior at the University of Missouri, Columbia. Two "veterans," Fred Bardenheier and Alan Meyers returned to teach. The assistants were Dan Meyers, Charles Berkley, and Tim Komar. These people all did their jobs well and are to be commended for the intelligent way they worked with the children.

Research

Basic research activities continue to expand rapidly during 1967 and professional and technical staff grew proportionately, as did the number of graduate students, post-doctorals, and research assistants. Lack of laboratory and office space often presented barriers, but the renovation of several less-crowded areas gave some needed room to the enlarged programs. Staff has been most cooperative in the search for space; often at a personal sacrifice of privacy and efficiency.

Research projects require financial support and the Garden is fortunate to be the recipient of a number of grants and contracts from various federal agencies, primarily due to the fine scientific reputation of its research staff. During 1967 the following grants were in effect:

Title	Agency	Principal Investigator	Amount	Period
"Flora of Panama"	NSF	Walter Lewis	$80,000	2 years
"Pollen Morphology and Evolution in the Rubiales"	NSF	Walter Lewis	$24,700	2 years
"Botanical Studies in the Neotropics"	U.S. Air Force Office of Research	Walter Lewis	$76,000	2 years
"A Revision of the New World Members of the Genus *Chamaesyce*"	NSF	Derek Burch	$17,500	3 years
"Temperature and Light Relationships within Ecosystems	ONR	David M. Gates	$13,060	3 years
"Systematic Symposium"	NSF	Hugh Cutler	$ 1,650	1 year
"Phylogeny of Alfalfa"	Pioneer Hi-Bred Corn Company	Edgar Anderson	$ 5,000	approx. 1 year
"Energy Exchange within Ecosystems"	AEC	David M. Gates	$19,500	1 year

Dr. Gates and Dr. Lewis received a large amount of research support from the Center for the Biology of Natural Systems at Washington University. As Senior Fellows in the Center they receive financial support for research projects at the Garden including funds for research associates, graduate student fellowships, and research assistants. In 1967 this support for research located at the Garden amounted to approximately $60,000.

From the comparisons below, the rapid growth in size of research staff and graduate student participation is apparent:

	1965	1966	1967
Senior Staff & Research Associates	8	10	15
Post-doctoral Fellows	0	2	4
Graduate Students	4	11	15
Technical Staff	1	3	5
Total	13	26	39

SYSTEMATICS RESEARCH

Dr. Walter Lewis continued his studies in systematics of the *Commelinaceae*, *Convolvulaceae*, *Portulacaceae*, and *Rubiaceae*. Two field trips were made to Panama, and one each to the Pacific Northwest, Smoky Mountains, and the Yucatan Peninsula of Mexico.

With Dr. Yatuka Suda and Mr. Royce Oliver, he completed a cytogeographic study of *Claytonia virginica* (spring beauty) throughout its range in eastern North America. The study illustrates that this species is in a dramatic stage of explosive evolution perhaps as great as any species known to man today. Their work will be expanded to other species of *Claytonia* and will be correlated with energy budget and metabolic studies under Dr. Gates. Mrs. Joan W. Nowicke is completing her palynotaxonomic analysis of the *Phytolaccaceae* (pokeweed family), a completely unique kind of systematic approach to a family as a whole. Other taxonomic work nearing completion includes a pollen morphological study of the *Rubiaceae* by Dr. Lewis and a revision of parts of the taxonomically difficult *Sisyrinchium* (blue-eyed grass) of the iris family by Royce L. Oliver.

Dr. Will H. Blackwell, Jr., joined the Garden staff as Research Associate in June 1967 and has been preparing treatments of the *Loganiaceae* and *Anacardinaceae* for the Flora of Panama. In September he visited the Field Museum (Chicago) and the U.S. National Museum (Washington) to examine their material in these and other related families.

Dr. Derek Burch continued to assist in the sorting, determining, and curating of collections from tropical America. In July, Dr. Grady L. Webster arrived from the University of California at Davis to collaborate with Dr. Burch on a revision of the *Euphorbiaceae* for the Flora of Panama. Dr. Burch made a study trip to the Field Museum of Natural History on September 18-21. Most of the remainder of his research time was spent on polishing up the *Euphorbiaceae* manuscript

to conform to *Annals* format. In addition to general herbarium work, he assisted students with their research. As a member of the Editorial Committee of the *Annals*, he reviewed numerous manuscripts.

Dr. Thomas B. Croat joined the Garden staff as Research Associate in September, 1967, He is concerned primarily with a revised treatment of the Flora of Barro Colorado Island in conjunction with the Smithsonian Tropical Research Institute of the Canal Zone.

Dr. John D. Dwyer (Professor of Biology, St. Louis University) headed two separate expeditions to Latin America. The first in March and April was to Panama, where he and several graduate students collected 800 numbers and duplicates. The second field trip, again with graduate students, was to Colombia and Panama, where they collected 1200 numbers which, counting duplicates, amounted to 5000 specimens. Dr. Dwyer identified 3000 numbers of Panamanian plants for incorporation into our collections and exchange distribution. He served on the Editorial Committee of the *Annals* and did research and identification on numerous plant genera, chiefly those found in Panama.

Dr. Andre Robyns completed revisions of the following families for the Flora of Panama: *Vochysiaceae*, *Theaceae*, *Bixaceae*, *Cochlospermaceae*, *Violaceae*, and *Turneraceae*, and hopes to finish the complex revision of *Flacourtiaceae* early in 1968.

Dr. Yutaka Suda, awarded a post-doctorate fellowship at the Center for the Biology of Natural Systems in November 1966, continued his studies under the direction of Dr. Lewis on the cytology of *Claytonia* (*Portulacaceae*) and *Commelinaceae*.

Dr. Bernard Mikula finished his research on environmental influences on corn genetic expression at the Garden in May. Dr. Mikula was a Visiting Senior Fellow from the Center for the Biology of Natural Systems.

RESEARCH CONCERNING CULTIVATED AND USEFUL PLANTS

Dr. Hugh Cutler continued his studies on the evolution of cultivated plants, especially on corn and the many kinds of squash and gourds of the New World. Hybrids can be produced by crossing corn and cultivated squashes with some of their wild relatives, and information obtained at the Garden through studies on wild and weedy relatives

of these crop plants is being used by plant breeders searching for greater yield and for new sources of resistance to disease and drought.

The flow of archeological collections of plants to the Garden continues to increase. Two series of collections which had been dated by use of carbon-14 were especially important in tracing the development of agriculture in the central United States. The earliest corn was mainly hard and flinty and, at the time of Columbus, largely few-rowed. There was practically no dent corn north of Mexico, and it was not until relatively late, after 1700, that significant amounts of dent corn were grown in the Southwest and even later before dent corn was common in the southern Mississippi Valley. After 1775, however, dent corn moved northward and soon the white and many-rowed southern dents, originally from Mexico, and the eight-rowed yellow corn of the northeastern states mixed to create the ancestors of our modern hybrid field corn. Reports on some of this work have been published in botanical historical, and anthropological journals.

Professor A. M. Rhodes, from the University of Illinois, and Dr. Martin Cardenas, from Cochabamba, Bolivia, each spent a week at the Garden studying its collections of cultivated plants with Dr. Cutler.

Mr. Leonard Blake continued his studies of useful plants, especially those from the area east of the Rockies. His participation in archeological meetings and conferences in Illinois, Missouri, and Wisconsin, encouraged archeologists to search for the plant remains essential for a knowledge of the development of agriculture. At the University of Missouri he lectured on the history of corn and the methods used at the Garden to study it.

Dr. Edgar Anderson continued his research interests on heterosis (hybrid vigor). By unearthing evidence about the family trees of cultivated plants, the gap between the science of genetics and the art of plant breeding is narrowed.

On a graduate fellowship from the Pioneer Hi-Bred Corn Company, Mr. Ray Altevogt has for the past two academic years been studying under the direction of Dr. Anderson, the world's alfalfas (wild, weed, and cultivated), in the Library and the Herbarium. For two successive summers he has carried on these same basic investigations, working side by side with alfalfa breeders at Pioneer near Des Moines, Iowa.

Since giving up the task of editing the *Bulletin*, Dr. Anderson has more time for writing and reviewing scholarly publications. His large ethnobotanical collections accumulated in the Museum were placed in good order with complete labels and files. He has broadened his field courses in ecology to include lectures and field work.

BIOPHYSICAL ECOLOGY

The biophysical ecology research and training program under the direction of Dr. David M. Gates had a very productive year. The high point was a field trip to the alpine tundra of the Colorado Rocky Mountains and to the semi-arid regions of southeastern Utah during late July and early August. Accompanying Dr. Gates on this expedition were Dr. Warren Porter, Research Associate and graduate students Ronald Alderfer and Elwynn Taylor. The purpose of the trip was to determine the energy budget of plants and animals under extreme and diverse conditions. The group participated in an ecology seminar at Aspen, Colorado, sponsored by the Thorne Foundation of Boulder, Colorado.

Other personnel working in the ecology program, in addition to those mentioned above, are: Laverne Papian, applied mathematician and computer programmer; Sylvia Morhardt, graduate student, and James Allman, technician. Many items of equipment were acquired for the ecological laboratory, including an infrared gas analyzer for the measurement of photosynthesis. A detailed determination was made in the laboratory of the basic coefficients of the energy budget relationships for plant leaves. The theoretical research concerned with the energy budget of animals being done by Dr. Porter and Dr. Gates reached a significant stage of development. They can predict the survival climate for an animal if the basic animal properties of size, color, insulation, metabolic rate, and evaporative loss are known.

The biophysical ecology program was supported by the Center for the Biology of Natural Systems of Washington University, the Atomic Energy Commission through a grant of $19,500 per year to the Garden, and the Office of Naval Research through a small grant to Washington University.

In June Dr. Gates was a member of an advisory team from the United States to the Icelandic Research Council which visited the new volcanic island, Surtsey, off the coast of Iceland.

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GRADUATE STUDENTS

Reflected in the growth of scientific activities at the Garden is the increase in numbers of students being trained here. The national role the Garden has played in the training of fine botanists is legend, and we confidently expect the teaching and training of botanists to continue to expand to the utmost throughout the next few years.

The graduate students now being trained at the Garden are listed below:

Sponsored by Dr. Burch:

Bruce McBryde. PhD. candidate 1966-
Research: Tree species of *Datura*.

Sponsored by Dr. Dwyer:

Tom Elias. Ph.D. candidate 1966-
Research: A monograph of the genus *Hamelia* (*Rubiaceae*).

Sister M. Victoria Hayden. Ph.D. candidate 1966-
Research: A systematic morphological study of New World Rubiaceous seeds.

Olga Herrara. M.S. candidate 1966-
Research: The Panamanian species of *Psychotria*.

Joseph Kirkbride. M.S. candidate 1967-
Research: The Panamanian species of *Rondeletia*.

Bernard Lallatheir. PhD. candidate 1967-
Research: Vegetation sites in Panama as related to soil plant relationships.

Sponsored by Dr. Gates:

Ronald Alderfer. Ph.D. candidate 1965-
Research: Energy Budget Studies.

Elwynn Taylor, Ph.D. candidate 1966-
Research: Plant-water demand and CO_2 regime.

Sylvia Morhardt. Ph.D. candidate 1967-
Research: Energy Budget Studies

Sponsored by Dr. Lewis:

Ray F. Altevogt. Ph.D. candidate 1965-
Research: Phylogenetic studies of alfalfa.

Daniel F. Austin. Ph.D. candidate 1966-
Research: Monograph of genus *Maripa* (*Convolvulaceae*).

Joan W. Nowicke. Ph.D. candidate 1964-
Research: Polynataxonomic study of *Phytolaccaceae*.

Kenneth Robertson. Ph.D. candidate 1966-
Research: Monograph of *Jacquemontia* (*Convolvulaceae*).

Professional Activities

TEACHING IN SEMINARS

In July Dr. Lewis organized a Systematics Seminar to meet in the Herbarium once each week. Persons attending prepare plant family material for examination and discussion in a prearranged sequence. To date, 17 sessions have been attended by a minimum of 20 persons each. The seminars will carry one unit of credit per semester at Washington University beginning in 1968.

Each week a group of graduate students, post-doctorals and research staff connected with Dr. Gates' Biophysical Ecology Program meet with Dr. Gates at the Garden and hold informal seminars related to their research projects. This group of 5 to 8 individuals usually meets in the Director's office or the Experimental Greenhouse on Wednesday mornings.

Dr. Cutler gave the second semester course, "Seminar in Ethnobotany," at the Garden for Washington University graduate students. Four courses in systematics were given by Garden staff for Washington University students. Dr. Lewis taught one in the spring entitled "Experimental Approaches in Angiosperm Systematics" and one in the fall, "Problems in Plant Taxonomy." Dr. Burch taught two courses; "Angiosperm Systematics" in the spring and "Systematic Survey of the Pteridophytes" during the fall. Dr. Gates taught a course in "Biophysical Ecology" in the spring semester.

All of the above courses were either taught at the Garden on a regularly scheduled basis or used the Garden's facilities heavily during instruction.

ANNUAL SYSTEMATICS SYMPOSIUM

The fourteenth Annual Systematics Symposium on the subject "Systematics of Animals and Plants Associated with Man" was held at the Garden under the direction of Dr. Cutler. It was again supported by the National Science Foundation. As usual, botanists and zoologists had reserved all of the nearly 200 places more than two months before the October 13-14 meeting. Active discussions followed all of the papers and many participants came early and remained after the meeting to consult with our staff and use the library and herbarium.

FIELD TRIPS

All of the Garden's professional staff had opportunities for field trips for research during the year. Researchers in the fields of systematics, ethnobotany, and ecology must carry out field trips in pursuit of their research—this is the very nature of those disciplines. It is

also extremely important that the scientific communities across the nation and the world have the opportunity to communicate directly with each other about their research discoveries. Scientific information that is not published or communicated to others is virtually worthless. For this reason, professional staff members attended scientific meetings, conferences and symposia away from their home institution. The professional staff of the Missouri Botanical Garden made scores of field trips, attended dozens of scientific conferences and meetings, and gave numerous lectures to groups in other states and countries in 1967. Space limitations will not permit us to describe them all, but some examples can be mentioned.

Dr. Lewis attended four separate meetings as a member of the Flora of North America Editorial Committee. Dr. Gates was elected Chairman of the Steering Committee of the Flora of North America, and was appointed to the Committee on Public Policy of the Ecological Society of America. He has met with this group several times, including a time at the White House with the Scientific Advisor to the President.

Dr. Gates made a trip to Iceland under the auspices of A. I. B. S., and from there he visited Kew Garden in London and the fantastic gardens of Morris Mason of Norfolk. In August, Dr. Gates testified before the House of Representatives subcommittee on Science, Research, and Development of the House Committee on Science and Astronomics. Dr. Lewis attended a meeting in Seattle as a member of the Program Committee of the Eleventh International Botanical Congress.

Miss Eugenia Maddox visited scientific libraries in Kansas City to study their operations. All of the systematics staff and graduate students made at least one extended field trip to Panama, most making several trips. Dr. Derek Burch attended the annual meetings of the American Association of Botanical Gardens and Arboretums in Ontario, Canada. Dr. Burch also visited Botanical Gardens in Florida. Dr. Anderson made several trips to the Pioneer Hi-Bred Corn Company in Iowa to study the many varieties of corn growing in their experimental plots. Dr. Cutler visited archeological sites in the Southwest as part of his studies on the history of cultivated plants in the United States.

In May, Lad Cutak represented the United States at the Ninth Congress of the International Organization of Succulents at Beaulieu, French Riviera, where he delivered an illustrated lecture on the Garden, showing some of the leading cactus and succulent collections in the United States.

The Library

(Eugenia Maddox, formerly Librarian of the University of Tulsa, succeeded Dr. George B. Van Schaack as Head Librarian in October. Dr. Van Schaack resigned from his position after having directed the Library since 1958.)

SINCE there are no statistical records of either library use or book and periodical holdings, it is difficult for a newcomer to compare this year's accomplishments with those of former years. It should be noted, however, that there is no doubt about the excellence of the collection; the richness of its research materials is well known to botanists and librarians throughout the world. In 1967, visitors came from all parts of the United States, as well as from Canada, South America, and Australia. Those who did research in the library included graduate students from a large number of universities, and prominent botanists from universities and government agencies.

Much of the Librarian's time has been devoted to becoming acquainted with the Library and planning for the future. It is hoped that by applying modern library methods the Library can be reorganized so that users will not be dependent upon the Library staff for locating research materials. Staff time gained in this manner can then be devoted to some of the "housekeeping" duties, such as cataloguing and classification, and the preparation of books and periodicals for binding. At least one additional professional librarian will be needed to catalogue the large backlog of books and periodicals that has accumulated during the past five years. The Library should be reclassified completely, but a job of this magnitude could not be undertaken without additional cataloguers and clerical assistants.

The Library staff now consists of three full-time and five part-time employees. Fortunately, the inability of staff members to cope with the above problems has had no appreciable effect upon the rate of accession of books and periodicals. Even though it is becoming increasingly difficult to find book rarities in the field of botany, the number of items purchased for the Library seems to have remained fairly constant during the past few years. Publishers' and dealers' catalogues have been checked regularly, and many interesting and valuable works have been acquired. In addition, countless publications have been received through exchanges with other institutions. Gifts have also increased the Library's holdings. Donors of books during 1967 were Mr. Adolph Burmeister, Mr. George Pettus, and Mrs. Stanley Hubbs, all of whom we wish to thank for their generosity.

We also wish to express our gratitude to members of the National Council of State Garden Clubs for their many donations of funds for the repair and restoration of books.

Major changes in the Library during the last three months of the year were the addition of a Xerox 914 copier and the provision of adequate lighting in the reading room. Work space was gained by rearranging the furniture and shelving in the combined office, reading room, and folio room. The next project is the addition of shelving in the few areas in which there is unused space. Even with this, shelves will be filled to capacity.

Projects for the future, in addition to those already mentioned, include careful consideration of every means of improving and extending library service to botanists and students of botany. With the present competent, loyal, and dedicated staff we should be able to make progress toward our goals during 1968.

The Herbarium

To increase the holdings of tropical plants for the Flora of Panama research in the Herbarium, four major collecting expeditions to Panama and the Canal Zone were organized and completed in 1967. The trips were highly successful, collecting approximately 5230 flowering plants which were pressed, dried, and sent to the Garden for incorporation in our collections. The duplicates (each number was collected in groups of four to five whenever possible) will exceed 22,200 and will be used for exchange with sister institutions throughout the United States after determinations have been made.

In addition to the Panamanian expeditions, field trips to Mexico and South America by students and staff members resulted in the collection of an additional 1059 numbers, or 2282 plants.

The Air Force Office of Scientific Research awarded a grant to the Garden in early 1967 and this made possible the greatest year in Garden history for collecting in the neotropics. In addition to Dr. Walter H. Lewis, as principal investigator, funds were also provided for the following Washington University staff members to conduct research in their own areas: Dr. James Maniotis, fungi; Dr. H. Wayne Nichols, algae; Dr. Bruce Parker, tropical aquatic ecology, and Dr. John E. Ridgway, bryophytes. Both Dr. Maniotis and Dr. Ridgway made extensive collections of fungi and bryophytes, respectively, in Panama.

As of December 31, 1967, the accession number was 1,900,705 with 65,852 additional numbers added in 1967. These additions

include plants, and, to a lesser extent, type photographs of plants added to the Herbarium during a 12-month period largely from exchanges, gifts, purchases, and the collections of staff members. Additions are chiefly from North, Central and South America, Mexico, Europe, and tropical Africa. Also included in the above 1967 total are several thousand specimens which had been incorporated into the collections without first being stamped; This long-range and time consuming project was started early in 1967, but it will be some time before it can be said that there are no unmarked specimens contained within our Herbarium.

A total of 16,625 plants were exchanged with other institutions during the year, and 7,521 specimens were received at the Garden for study by our research staff. We, in turn, sent out 7,978 specimens to 17 other institutions on a loan arrangement. Over 26,000 specimens were outstanding on loan to other institutions at the end of the year.

The *Gray Index* card file has been kept up to date with the filing of 2,000 cards, and the *Index Nominum Genericorum* involved the filing of about 1,800 additional cards.

Claude Johnston

Professor Richard W. Pohl of Iowa State University using the Herbarium in his research.

Printing of negatives of African type photographs continued and to date over 7,000 8 x 10 prints have been made. Labels continue to be typed at the rate of 15 per print.

Major collections from Africa, Mexico, and Latin America were determined by Drs. Burch and Dwyer, Messrs. Royce L. Oliver and Tom Elias, Misses Olga Herrera and Susan Verhoek. Lt. Col. R. Kendall Baker, Rtd., specializing in orchids, has been invaluable in identifying innumerable collections. Each staff member has likewise determined material in plant families of their research interest.

Publications

One of the very finest opportunities the Garden received in 1967 was the arrival of Mrs. Barbara Lawton as Editor of the *Bulletin*. Since she assumed the editorship starting with the September-October issue many changes have occurred: the Bulletin has expanded in both size and scope. It is now a bi-monthly publication; six issues published on the first of alternate months. The format has been changed considerably, while maintaining a traditional feeling. Cover color will be changed on the first of each year. The Bulletin is now being printed in and mailed from St. Louis.

The Garden staff and others with Garden affiliations have been extremely generous with advice, botanical information, and articles. There are now several regular features: "Gardening in St. Louis," "From the Director," "Friends of the Garden," and "Who, What, Where, When." The issues average 36 pages which gives better opportunity to spread the word on horticulture, research, and activities at the Garden. About 3800 copies of the *Bulletin* are being printed of each issue for the Friends of the Garden membership, garden clubs, paid subscriptions, exchanges with other institutions, Garden staff and alumni, and others, including counter sales.

The *Bulletin* is one of the direct lines of communication between the Garden and the community. We are, therefore, making a great effort to expand our circulation to include St. Louis area leaders, educational and public libraries of the bi-state region, and editors in this region.

The Annals of the Missouri Botanical Garden is a journal in its 54th year of publication, containing scientific contributions from the Missouri Botanical Garden and the Department of Botany at Washington University. Additional progress has been made in expanding the scope

of the journal, and papers from outside our institution are now accepted for publication.

The Editorial Committee consists of the Editor, Walter H. Lewis; Assistant to the Editor, Patricia E. Putman; Derek Burch; John D. Dwyer; and Andre Robyns. Dr. George B. Van Schaack was also a member of the Committee until his retirement from the Garden in November.

Three issues were published in 1967, totaling 400 pages. Two of these issues were devoted to the Flora of Panama project. The other issue contained seven articles on the results of individual research projects.

Subscriptions are continuing to increase, with 1967 showing a 30% increase over 1966. Almost 400 scientific institutions receive the Annals through an exchange arrangement by which our Library receives their publications. Journals received on this exchange basis would cost the Garden $3,000-$5,000 per year if they were paid for through subscriptions.

Public Relations

Ladislaus Cutak, Manager of Public Relations, and Leslie Gleason, Publicist for the Friends of the Garden and social events, have continued to increase the Garden's exposure to the public, both in the media and through special events. Hardly a week passed without some mention of the Garden in local dailies, weekly neighborhood news, radio, and television. There were many excellent features and photo-feature articles in the Post and Globe during 1967. One of them, "Aloe Touted as Cure for Burns and Rashes," is still causing a response. The story about Judith Moore, "Only Woman on Garden Staff Digs Outdoor Work," appeared throughout the country.

Grounds Maintenance magazine carried "Air Pollution Damage to Plants." The *St. Louis Magazine* featured "Shaw Started More than a Garden" authored by Dr. Gates, and the German *KOSMOS* magazine had a color-picture story on the Climatron in their August issue. *Horticulture* magazine carried a fine, complete article about the Garden in their June issue.

Scores of illustrated lectures were presented by the Garden staff during the year before garden clubs, civic, social and religious organizations; the subjects ranging from plant explorations to specifics on particular plant groups. Mr. Cutak made spot appearances on Harry Fender's program over KMOX, as well as appearing regularly on a weekly program initiated by WMRY-FM of Belleville, Illinois.

It is amazing how much interest our Climatron still generates after seven years of operation. As the first building of its type for exhibiting plants in naturalistic surroundings and under ideal climatic conditions, it serves as a pattern for architects to follow in building similar structures. During 1967 an increasing number of U. S. cities asked for information and literature on our Climatron, and some even sent representatives to inspect our installations, with an eye to creating similar biological houses.

Commercial firms, particularly banks and civic centers, have been increasingly interested in staging special exhibits in which the Garden is asked to participate. In April, the Garden assisted the Visitors' Center by contributing to a miniature replica of the St. Louis World's Fair of 1904 some rare old photos depicting the role of the Garden in the Fair. In August an exhibit was set up at the McDonnell Planetarium consisting of herbarium specimens of plant material obtained by the Lewis and Clark Expedition, the first government-funded research project in the United States. These exhibits were viewed by over 150,000 people.

The Garden also helped prepare special exhibits for Famous-Barr's "Hail to the British Commonwealth" festival and the 54th Annual Purdue Horticultural Show. The Museum Building at the Garden was readied for permanent displays. Storage cases on each side of the main room were painted, fluorescent lighting installed, and blue and yellow satin cloth draped to form a rich background for the exhibition of rare books, gourds, and other material utilizing the theme of the Missouri Botanical Garden's role in the study of cultivated plants.

Among the distinguished visitors to the Garden were the Honorable George Price, Premier of British Honduras, who is an amateur orchid fan; Dr. Lorenzo Medrano, landscape architect and iris enthusiast; Adrian D. Thompson, Permanent Secretary of the Ministry of Agriculture and Natural Resources, Guyana, seeking information on ornamentals; Kenzo Fujihara, horticulturist and Technology Head of Kyoto Botanical Garden; Margaret Kreig, authoress of "Green Medicines;" Dr. Thomas Fujiwara of Honolulu, orchid enthusiast with the most complete collection of Lady Slipper orchids in the Islands; Professor Martin Cardenas, cactologist and economic botany lecturer of Cochabamba, Bolivia, and many others, including a Survey Team from Para, Brazil. One of our country's leading scientist-statesman, Dr. James R. Killian, Jr., also visited the Garden this fall. A member of the Board of Trustees of Washington University, he is also presently Chairman of the corporation of Massachusetts Institute of Technology.

Maintenance and Engineering

UNDER the capable direction of James Hampton, Chief Engineer, and his assistant, Jack Pavia, the Garden's physical facilities underwent many improvements during the year.

The single most important project completed in 1967 was an installation of which most visitors and staff will be completely unaware: the heating systems for the conservatories and buildings at the north half of the Garden were completely renovated. A new low pressure boiler replaced a condemned 55-year-old high pressure boiler and the other two high pressure boilers were converted to low pressure. The old steam-powered water pumps were replaced with automatic electric pumps, and the whole heating system was converted to automatic control. This conversion will save the Garden about 5000 man hours per year, since it eliminates the need for men to be on duty around-the-clock each day during the seven-months heating season. There is another bonus in this conversion; oil consumption has dropped markedly. The heating plant breeching was replaced, the brick smoke stack was reinforced, and the top 20 feet removed for safety purposes.

Other notable improvements completed in 1967 were: A 150-car parking lot for visitors was constructed and the driveway and parking lot adjacent to the Park Building were surfaced. Outdoor lights were installed throughout parts of the lower garden, and a drinking fountain was erected near the Experimental Greenhouse. The iron fence along Magnolia Avenue was rebuilt and many other sections of the Garden's fencing were repainted.

Several rooms in the Experimental Greenhouse and Administration Building were renovated and redecorated to provide space for the new personnel. The Director's office suite was redecorated. Additional air conditioners, rewiring, lighting, and telephones were installed as the new staff created these needs. A portion of the basement in the Director's residence was remodeled—Walls painted, ceiling panelled, gas furnace installed.

To provide central air conditioning for Tower Grove House, two four-ton cooling units were placed on the roof in such a way to keep the appearance of the House as authentic as possible. This installation was completed without damage to the interior.

Two orchid houses were completely rebuilt and reglazed. Automatic ventilation was installed in one of the Growing houses and the large

cooling fans for the other three Growing houses. Glass in the ends of the Floral Display House was replaced with corrugated plastic and the structure was painted outside. One of the lily pools in front of the Linnaean House had a new concrete bottom installed, replacing the old one of soil.

It is this department as much as any, that is responsible for the brightening public image that "the Garden looks better than ever."

Mark Paddock

Claude Johnston

Jack Pavia of the Maintenance Department installing flood lights on the Linnaean House.

The addition of a new, automatic boiler system vastly improved heating of our growing houses and conservatories.

Friends of the Garden

THE Women's Executive Board of the Friends of the Garden, under Mrs. James G. Alfring, who was President until May, had the Orchid Show Preview Party in February for Friends of the Garden and the Spring Flower Show Preview in conjunction with The Arts and Education Council. In the spring, Mrs. Charles Limberg and Mrs. Leslie Gleason, Executive Secretary of the Friends, worked on The Arts and Education Fund Drive. Also during the spring, Mrs. Alfring and her committee drew up bylaws, which were approved by the Director and the Board of Trustees. In May, the Friends sponsored a lecture by Gordon Blinko, a British Royal Gardener, at Steinberg Hall, and the Friends' office arranged a Spring Festival at the Garden in conjunction with the Garden staff. After a meeting with Mrs. Alfring, the Junior League Committee decided to have their annual Debutante Ball in the Floral Display House on June 24. The League donated $3,000 to the Garden and, since the Ball was deemed such a success by all concerned, requested it at the Garden again in June 1968.

Mrs. Joseph Lewis became the new President in May and had a get-together of the new Board members, staff, and Shop Volunteers at a first meeting in June. There was a memorial concert for E. Gary Davidson (Clarissa Start's husband) on the lawn of Tower Grove House in June arranged by the Executive Secretary.

Many small meetings were held during the summer and numerous money-raising projects were discussed and investigated. The Membership Committee and Friends' office worked hard on a large mailing which, combined with Board members writing personal notes to delinquent members and new prospects, brought in 198 new members. As of December 31, 1967, there are 2,799 members (based on a thorough recount in 1967); three being new life members: Mr. and Mrs. Clarkson Carpenter, Mr. and Mrs. Howard Ridgway, and Mr. and Mrs. Louis S. Sachs. The total contributions for the fiscal year ending on June 30, 1967 were $50,500; total expenditures, $10,300.

The bylaws were voted upon and passed at the September meeting. In October a membership drive contest was announced in the Bulletin, with prizes to be awarded June 1, 1968. Mrs. Richard Hawes, III, was in charge of the Veiled Prophet Queen's reception for school children at Tower Grove House. The reception was especially grand this year because all four Special Maids were also in the receiving line. Mrs. John Mitchell provided hostesses for the members of the National Trust for Historic Preservation who visited the Garden, and Leslie Gleason made

arrangements for the Repertory Opera Theatre's evening performance in the Floral Display House—a beautiful setting for lovely voices!

The Chrysanthemum Preview Party brought 900 members and a very successful Christmas sale from the Garden Gate Shop was held in conjunction with the opening of this floral display.

The Friends' Board proposed to various garden clubs of the city that they donate various needed items to the Garden, and two of them have already voted to give a herbarium case and the cost of constructing a patio behind the Garden Gate Shop for display of outdoor wares.

The December Poinsettia Preview had carolers, as well as the fashion show, eggnog, other refreshments, and a display of Christmas gifts from the Shop. Again a large crowd was on hand.

The Tribute Fund becomes increasingly well-known and donations received through it have grown steadily since its inception several years ago.

Tower Grove House

THE GRACIOUS old home of Henry Shaw, Tower Grove, continued its pattern of community service under the direction of the Historical Committee. The Committee consists of Mr. Leicester B. Faust, Mrs. Jerome F. Kircher, Mrs. Robert E. Koch, Mrs. John S. Lehmann, Mrs. George T. Pettus, and Mrs. Neal S. Wood. The Garden wishes to thank Mrs. Edwin R. Culver who served long and well as Chairman of the Historical Committee.

One of the greatest assets of Tower Grove House is the devoted and loyal hostesses who bring Henry Shaw's day back again so vividly to the visitors. The Historical Committee is deeply appreciative of their loyalty in staffing the house on snowy days as well as pleasant summer days, and is keenly aware of the time and effort they devote to Tower Grove House.

The Historical Committee is always on the alert for period pieces and accessories to be placed in with Henry Shaw's furniture. In 1967 shabby upholstery was replaced with Victorian stripes and damask, typical of the 1850s, and other appropriate additions were made such as old ingrain carpets, Victorian wallpaper for the bathroom and some unusual smaller articles. Special displays of beautiful old glass, china, Victorian dolls, and other collections are rotated in the cabinets of the house, to the delight of the public.

Members and visitors alike enjoy the many special events of Tower Grove House. An "old fashioned Christmas with Henry Shaw," the

result of much research, was particularly effective. The Repertory Opera Theatre sparked the Christmas season with a program of carols and also held a concert on a warm Sunday afternoon, reminiscent of the times when bands serenaded Henry Shaw as he sat on his balcony overlooking his beloved garden. The Veiled Prophet Queen's Reception brought thousands of school children to Tower Grove House. The house welcomed many bus loads of appreciative and admiring guests in October, when the National Trust for Historic Preservation met in St. Louis.

Since 1954 Tower Grove House through its Historical Committee has been keeping alive the tradition of Missouri hospitality so graciously expressed by Henry Shaw.

Garden Gate Shop

THE GARDEN GATE SHOP is a very successful project of the Friends of the Garden. Ever since its opening in 1965, sales have risen steadily and receipts in fiscal 1966-67 were up 50% from the previous opening year of 1965-66.

Visitors appreciate the Shop for its fine imaginative merchandise and as a good source for publications about gardening and natural history.

Mrs. Edwin F. Stuessie is continuing in the role of Shop Manager. She has guided the Volunteers, ably selected by Mrs. H. Leighton Morrill, in marking stock and selling. Along with her office duties, Mrs. Stuessie kindly and intellingently answers the many unique questions presented to her by the visitors to the shop.

As in the past, there were booths at all of the Previews. Mrs. John S. Wagner, assisted by Mrs. A. Lee Shapleigh, was in charge of the sale at the Chrysanthemum Show. For the first time there were two artists present—Ed Gray from Michigan was here to demonstrate his copper sculpture, and Jim Scott displayed his beautiful paintings. Also shown were ceramic works by Walter Brockman and hand-carved mushrooms by Roger Sloan.

Mrs. Nicholas Kurten, assisted by Mrs. George Mauze, was in charge of the Shop display at the Poinsettia Show. This was equally rewarding in its returns.

In June, Mrs. Thomas Collins and Mrs. Tom K. Smith, Jr., assumed co-chairmanship of the Shop following a very successful year under the direction of the co-chairmen Mrs. William Robinson and Mrs. Fred Wenzel.

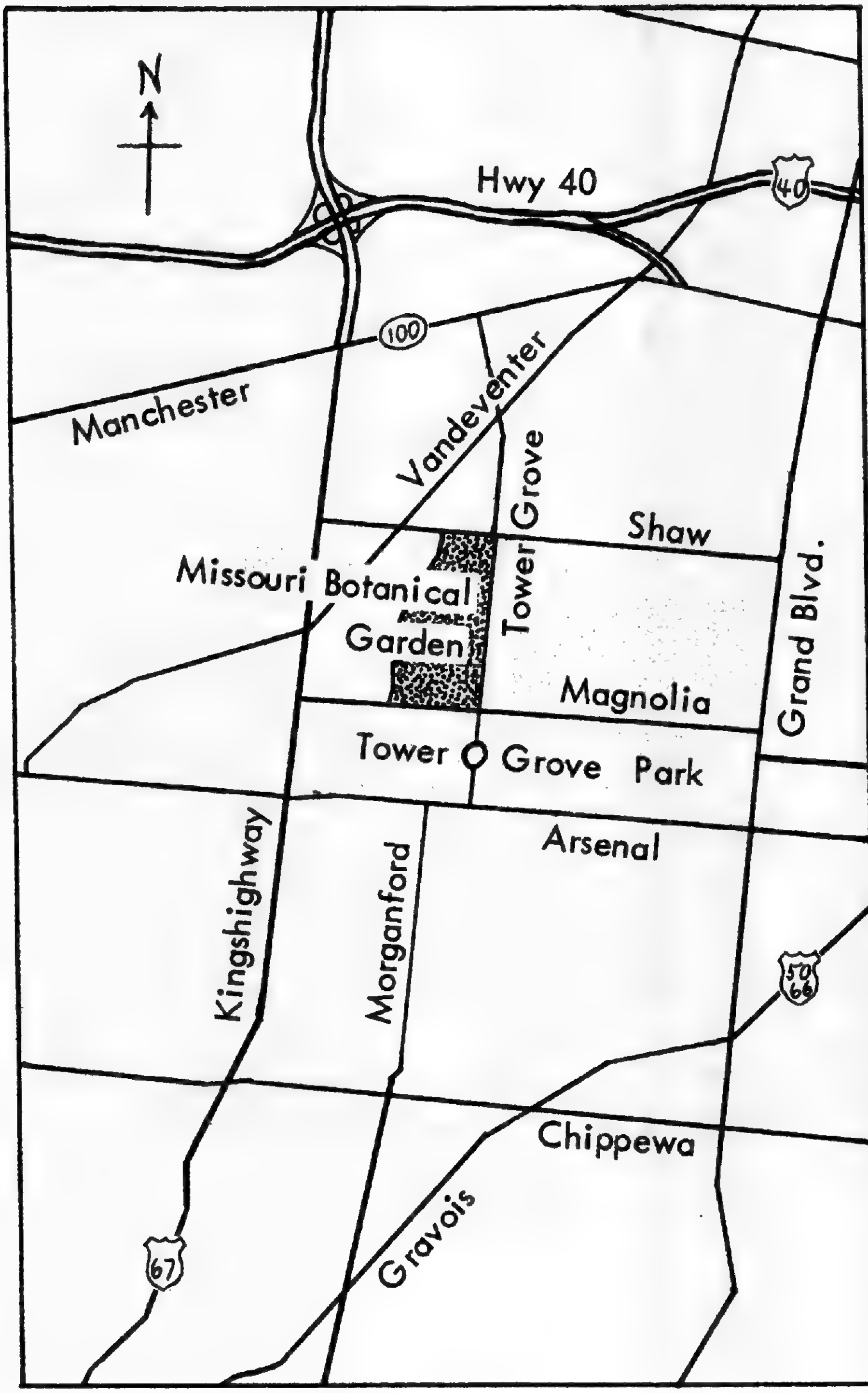
The Missouri Botanical Garden Calendar

(MARCH-APRIL, 1968)

February 11 thru March 24	ORCHID SHOW.
March 2	CHILDREN'S SATURDAY NATURE PROGRAM. "Plants with Secrets." 10:00-11:30 a.m. Admission is free.
March 9	CHILDREN'S SATURDAY NATURE PROGRAM. "Plants in a Capsule." 10:00-11:30 a.m. Admission is free.
March 16	CHILDREN'S SATURDAY NATURE PROGRAM. "Rise of Forests." 10:00-11:30 a.m. Admission is free.
March 19, 26, April 9, 16, 23 Also March 21, 28, April 11, 18, 25	HOW TO RAISE ANNUALS AND PERENNIALS FROM SEED. To be taught by Clarence Barbre and Kenneth Peck in the Experimental Greenhouse. Tuesday session—1:00-2:30 p.m.; Thursday session—8:00-9:30 p.m. $12.00 for Friends of the Garden; $16.50 to others.
March 23	CHILDREN'S SATURDAY NATURE PROGRAM. "Miniature Gardens." (Bring rigid container, maximum size—10"x10"x3" deep.) 10:00-11:30 a.m. Admission is free.
March 23 April 6,13,20,27, May 4	THE DYNAMICS OF OUR LANDSCAPE. To be taught by Dr. Edgar Anderson and other staff members at the Arboretum. (Bring your lunch and beverage.) 10:30 a.m. to 3:00 p.m. $9.00 for Friends of the Garden; $12.00 to others.
March 27, April 3, 10	FUNDAMENTALS OF BONSAI. To be taught by Mrs. Kay Hert in the Experimental Greenhouse. 7:30-9:30 p.m. $15.00 for Friends of the Garden; $18.00 to others.
March 29	SPRING FLOWER SHOW. Preview Party for Friends of the Garden. 5:30-7:30 in the Floral Display House.
March 30	CHILDREN'S SATURDAY NATURE PROGRAM. "Sowing Seeds." (Bring a 1 lb. coffee container.) 10:00-11:30 a.m. Admission is free.
March 31 thru May 5	SPRING FLOWER SHOW.
April 6	CHILDREN'S SATURDAY NATURE PROGRAM. "Nature Films." 10:00-11:30 a.m. Admission is free.
April 13	HOME ORCHID CULTURE. Course instructor, Robert Gillespie. 10:00- a.m. to 3:00 p.m. $8.00 for Friends of the Garden; $10.00 to others.
April 13	CHILDREN'S SATURDAY NATURE PROGRAM. "Flower Shapes and Names." 10:00-11:30 a.m. Admission is free.
April 13, 14	DAFFODIL SHOW in the Amateur Display House.
April 20	CHILDREN'S SATURDAY NATURE PROGRAM. "From Dust to Seed." 10:00-11:30 a.m. Admission is free.
April 24 May 1	INTRODUCTION TO HERB GARDENING. Lectures by members of St. Louis Herb Society in the Experimental Greenhouse. (Bring a sandwich.) 11:00 a.m. to 2:00 p.m. $10.00 for Friends of the Garden; $12.00 to others.
April 27	CHILDREN'S SATURDAY NATURE PROGRAM. "Transplanting Seedlings." (Bring a 1 lb. coffee container.) 10:00-11:30 a.m. Admission is free.

Visit Your Missouri Botanical Garden

(SHAW'S GARDEN)



MISSOURI BOTANICAL GARDEN
BULLETIN

VOLUME LVI NO. 3 MAY-JUNE 1968

OUTDOOR LIVING IS HERE AGAIN–

After gardening with our tried and true garden tools, sit back and enjoy your patio with accessories from our beautiful new collection.

THE GARDEN GATE SHOP/at the main gate/Tower Grove and Flora

Missouri Botanical Garden Bulletin

VOLUME LVI NO. 3 MAY-JUNE 1968

EDITORIAL & PUBLICATION OFFICE
Missouri Botanical Garden
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CONTENTS

COVER: PHOTO COPY BY TODD STUDIO

FROM THE DIRECTOR

THIS YEAR I shall have two summers! I spent part of January and February in the Southern Hemisphere visiting botanical gardens and lecturing at universities in New Zealand and Australia. It is important for me to see how other botanical gardens are managed. We directors learn from one another. Each garden or area is distinguished in its own special way.

A whole new world of plants was opened to me; a most exotic world of strange shapes and magnificent flowers. Isolated from other land masses, Australia, New Zealand, and Tahiti have had a small stock pile of plant species for evolution to work with. Only 2000 species are native to New Zealand as against more than 2400 for Missouri alone.

Christchurch in New Zealand, is a city of beautiful gardens—every home is surrounded by flowers. This is a land of mountains, waterfalls, glaciers, hot springs, beaches and lush vegetation swept with rain and cool winds blowing off the Antarctic continent. There are great Nothofagus (southern beech) forests, tall podocarpus trees (yew-like conifers) with gaunt branches sparsely leaved, and incredibly massive kawii trees on the north island.

Australia, a continent of deserts and dry, hot winds, contrasts sharply with the verdant green of New Zealand's rain forests. More than 600 species of eucalyptus decorate the landscape of Australia. The flora of New Zealand and Australia are as different as night from day. The great coastal cities of Australia each have a splendid botanical garden beautifully landscaped and planted with trees and shrubs from throughout the world. In contrast, the relatively new botanical garden in the capital city of Canberra has only native Australian vegetation. I shall never forget my first visit to Botany Bay, Cape Solander and Cape Banks. Here Captain Cook landed and the first Australian plants were collected by Europeans and eventually taken to Kew Gardens near London.

Botanical gardens are beautiful and interesting places to visit. Perhaps you, too, would enjoy seeing some of them with me some day.

David M. Gates

GARDENING IN ST. LOUIS

MAY AND JUNE

THIS SEASON'S GARDENING is one of continuing the weeding, spraying, dusting that was begun earlier. The daily walk through the garden will show what needs to be done. This is the fun season: planting window boxes, planters and jardinieres; thinning of annuals; cutting flowers for the house; cutting off dead blooms; staking where necessary; and finding a good shady spot for the house plants out of doors. Healthy plants vigorously blooming are late spring's rewards for the conscientious gardener.

Finish direct-seeding of all annuals by mid-May. Set out dahlias and tuberous begonias when petals fall from apple trees. Plant gladioli every 10 days up to July 1.

Cut back tulip and daffodil foliage only after all signs of green are gone.

Gardeners who maintain a heavy layer of mulch will find their plants need less watering and weeding—pulling weeds is easier in mulched beds.

Fertilize evergreens in May.

Follow spraying programs faithfully to get the most out of your roses, and to keep leaf miners from destroying the appearance of holly leaves.

Tropical waterlilies, started inside, shouldn't be put out until pond water has a good chance of staying warm. (Cold water may cause the tubers to go dormant.)

It's always best, as warm weather comes on, to garden in the morning or evening. High sun is hard on plants and gardeners. Flowers for the house also do better if cut in the cool of the day.

The Kapok Tree and the Dramatic History of Rumphius' Herbal

André G. Robyns

THE PLANT PORTRAIT on the cover is copied from Rumphius' *Herbarium Amboinense* published in Amsterdam in 1741 (Volume I, plate 80). It is the kapok or silk-cotton tree (*Ceiba pentandra*) widely spread throughout the tropics of both the Old and the New World.

During the Garden's December expedition to Panama, sponsored by the U. S. Air Force Office of Scientific Research, I flew by helicopter over the jungle in the lowlands of the province of Darien and could easily spot the giant *Ceiba* trees with their umbrella-shaped tops standing out above the jungle canopy.

Rapid-growing and attaining a height of 90-140 feet or more, the kapok tree has a straight trunk 6-8 feet in diameter above very large buttresses; when young the trunk is usually covered with stout prickles. Branches are horizontal and form a very broad, rather flat crown with leaves palmately divided like the horse-chestnut, but with smooth edges. During the dry season, which in the tropics is winter, the tree is leafless, but is adorned with a profusion of fragrant flower clusters. When the capsular fruit splits into five valves, the many rather small, brownish seeds emerge in a dense mass of silky or woolly hairs known in commerce as kapok. The woody capsules are spindle-shaped, from 4-10 inches long, and mature at the end of the dry season or at the beginning of the wet season.

Kapok comes mainly from Java in Indonesia, where the *Ceiba* tree has been cultivated for many years. The fiber is very light and elastic and does not become matted under pressure. It is used for stuffing pillows, mattresses, and life preservers, and is also used for insulating such diverse things as refrigerators and sleeping bags. Kapok, however, is not suitable for spinning into threads as it is too brittle. An oil extracted from the seed can be used for making soap and for fuel in oil lamps. The wood is light and soft—not as light as balsa, another bombacaceous tree—but is good for making boxes, toys, paper pulp, etc., and the Indians sometimes make dugout canoes from its trunk. It is also occasionally planted for shade.

RUMPHIUS' *HERBARIUM AMBOINENSE*

Georg Eberhard Rumpf, better known as Rumphius, was born in 1628, probably in the little town of Hanau, Germany which had a

population half-German and half-Dutch. In 1652 he joined the Dutch East India Company and the following year he reached Batavia, never to see his native country again. In Amboina, one of the chief islands of the Moluccas in Indonesia, he settled down and spent his leisure time in the study of the wonders of tropical nature. Our amateur naturalist began to write his herbal in 1663. It progressed rapidly, but in 1670 the first of a series of tragedies occurred when he became blind. Then in 1674 a violent earthquake levelled his home, killing his wife and daughter. In 1687 the town of Amboina burned to ashes, destroying his manuscripts and the original illustrations for his herbal. Fortunately, a copy of his manuscript stored elsewhere survived. However, his blindness prevented him from replacing the lost plates or even correcting those made by his assistants. Some of the illustrations are poor in botanical detail and discrepancies between some descriptions and illustrations are found, but Rumphius is, of course, not to blame for this!

In 1690 the first six books of the herbal were shipped to Batavia and, two years later, from there to Holland on board the "Waterland" which was sunk by the French with its entire cargo. Once again, fortunately, there was a copy of these manuscripts and in 1696 these, together with three more books, reached Holland safely. During 1697 the last three followed, and finally a supplement to the herbal reached Holland two years after Rumphius' death in 1702 at the age of 75. This herbal wasn't published for 39 years—probably for several reasons, one strong deterrent being the fact that it contained spice trade secrets of the Dutch East India Company. Professor J. Burman of the University of Amsterdam finally acquired the manuscript in 1736 and prepared it for the press. The six folio volumes of Rumphius' *Herbarium Amboinense* were published between 1741 and 1750, and the supplement, making a seventh volume, in 1755. The folios (comprising 12 books) contain 1660 pages, 700 plates, and descriptions of nearly 1200 species.

Although the herbal is essentially pre-Linnaean (the starting point of our modern naming system is 1753 with the publication of Linnaeus' *Species Plantarum*), Rumphius' work remains important even to this day, three centuries later, because many names of Malaysian plants are typified by his descriptions and figures. This work is surely an outstanding example of one man's perseverance.

Dr. Robyns is Visiting Curator of the Flora of Panama at the Garden and Chargé de Recherches *of the National Foundation for Scientific Research in Belgium.*

THAT TINY BROWN SPECK

Clifford W. Benson

(Executive Secretary, American Iris Society)

Creating new irises is an exciting experience. It is, indeed, likened to the preparation of fine food. The finest ingredients are brought together and "cooked with care." A beautiful iris should be like a fine meal—easy on the eye, nourishing and satisfying. Not only can the results be satisfying and fascinating but baffling as well!

A knowledge of genetics is helpful. It is advisable to know the parentage of the basic two parents for 4-5 generations. The challenge to grow something different or to create new varieties is one that is endlessly stimulating and rewarding. Watching for the first blooms from one's own seedlings provides a thrill quite unequaled by any other gardening experience.

In 1967, there were over 550 new irises which were registered with the AIS registrar. Where did these brand new irises come from? How did they come into being? Practically all were the end result of the tireless efforts of amateur hybridizers the world over and most of the major horticultural divisions were included.

How do you plant the tiny brown speck that we call an iris seed? There are several acceptable methods. Many prefer to plant their seeds in slightly raised beds in the open garden. Others prefer to plant their seeds in hotbeds heated with manure or electric cables (usually lead or plastic covered wire). Still others prefer to plant their seeds in flats, boxes, flowerpots and tin cans of various sizes. No matter what method is used, excellent drainage must be provided.

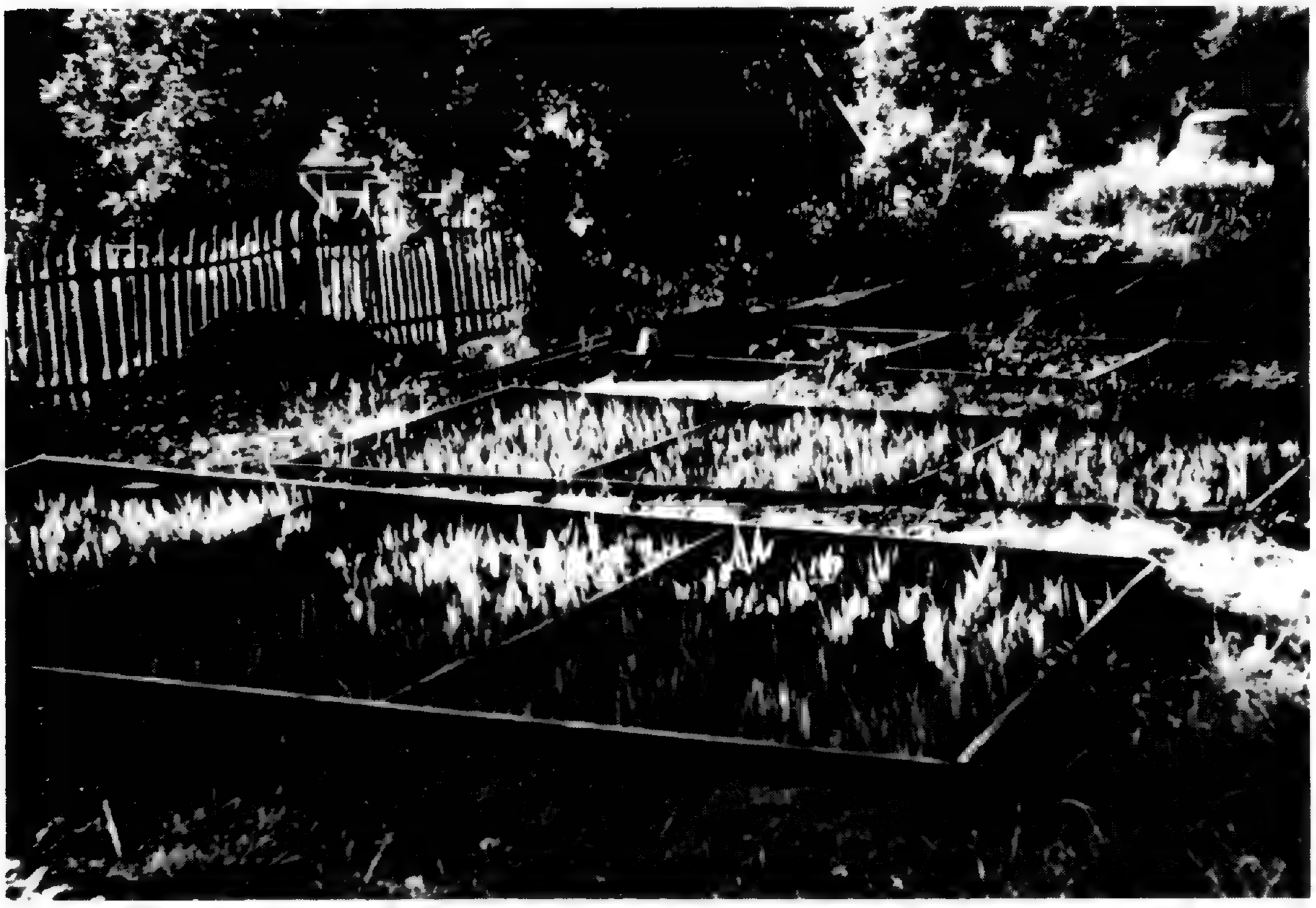
I prefer to plant seeds in coldframes. Soil in frames should be carefully prepared. It should be loose and friable. Each frame should receive an ample supply of rich loam and well-rotted compost. In addition, a liberal quantity of peat moss is incorporated and either vermiculite or sand—all meritorious aids for loosening soil and stimulating root growth.

A pleasant and convenient time to plant seeds in the St. Louis area is in the month of October—too late to have them germinate the same year and still early enough for warm weather to be around. I never plant freshly harvested seeds.

Two or three days prior to planting the seeds, the soil in each frame is forked under and well mixed, raked and pulverized as thoroughly as possible. The waiting period is primarily for the purpose of allowing the soil to settle. The seeds are planted quite close together—nearly touching—one inch deep in trowel-made rows four inches apart. Each row is marked at planting time with a suitable label with cross number and parentage. Later, this label follows the plants from the frames out into the field. Precise record-keeping is essential in scientific plant breeding —just as important as in breeding race horses.

After the seeds have been planted, the rows covered and lightly tamped down, steps are taken to prevent the rains from packing the top of the soil. Rain-tamped soil will prevent the young seedlings from emerging in the spring.

Prairie hay (identified in some quarters as marsh or salt hay) is excellent as a covering for the soil in the frames; a layer of 3-4 inches is adequate. After the hay has been put down, each frame is watered well. From then on, the soil is kept moist—only moist—not overly wet.



Young plants in cold frames in April.

Too much moisture will rot the seeds. In addition, and since I happen to have them, I place old screens on top of each frame. They "spray" the rains and also act as deterrents for anything or anyone ambitious enough to investigate. I have learned from experience that rabbits find unprotected seed frames suitable places for rearing families in the fall and spring months.

I have glazed sashes for each frame. The prairie hay and the screens are removed about the middle of January and each frame is then covered with sash which will remain undisturbed the rest of the winter. About the latter part of March, the seeds will commence to germinate. A month's delay in germination can be expected without glass covering.

April 1st or thereabouts—sometimes the latter part of March, depending on weather conditions—the frames will be ventilated daytimes by raising the sash an inch or two and closing it again at night. Eventually the plants will be hardened off to such an extent that by the middle of April, the sash can be removed completely in daytime (weather, again, must be considered) but should be placed back on the frames at night.

Photo by C. W. Benson

Lined-out seedlings in May.

Vigorous young iris in August. Photo by C. W. Benson

In the St. Louis area, it will be the middle of May before the sash should be dispensed with completely; it should be readily available for placement in case of a weather report forecasting frost, a cold snap, heavy rains, or hail. If hail turns up in the forecast, the sash is completely covered with screens.

If sash is not available, the prairie hay/screen method throughout the winter months is highly successful. I had excellent results using this method for quite a few years. The big advantage in using the sash is the "head start" it gives the seedlings.

Some factors, such as the maturity of the seeds, planting procedures, depth of planting, soil friability, moisture and the like, most certainly have some influence on germination. Under favorable conditions, germination may be from 80% to 90%. Certain crosses don't germinate at all, whereas some consistently yield small numbers of plants in relation to the number of seeds planted. It would probably be a little too much to expect seeds to germinate 100% the first year. In the majority of cases they don't. If left undisturbed, however, they may germinate the following year, or later. If the frames are to be used the following year, the soil in them, with ungerminated seeds, must be replaced with fresh soil.

Seedlings should be lined out in the field (or a prepared plot in the backyard) as early as possible in the spring, weather permitting. In the

Iris plants the following May. Photo by C. W. Benson

St. Louis area, this is usually in early May. Early transplanting enables the young plants to take advantage of spring rains (normally plentiful in this area) and start them off in a grand manner for a long growing season. To obtain most bloom the following year, the seedlings must be kept growing vigorously. They should be under frequent cultivation and they must never lack moisture.

Since I usually am unable to transplant my seedlings from the frames to the field until after I return from the national convention, the young plants in the frames are meanwhile kept growing vigorously until I can attend to the transplanting. They are foliar-fed each week or so. Frequently, they receive, in addition, applications of liquid manure—the color of which resembles weak tea. The object: to keep the seedlings growing without letup.

When I transplant the seedlings to the field, they have small rhizomes, in most cases about the size of a small fingernail. At this time, small side shoots (increases) are sometimes also in evidence.

The seedlings of each cross are transferred from the frames to the field in individual containers—boxes, cans, or the like—the plants of one cross in one container, with the label with which the plants were marked in the frame. They are planted immediately. The exposed roots, before planting, are always shaded from the sun. If interruptions occur, and they frequently do, I place water-soaked newspapers or sacking material over the roots.

The field is well drained and receives full sun. The seedlings are lined out eight inches apart in 100-foot rows. The rows are spaced four feet.

After each row has been planted, the plants are thoroughly "watered in" with either Hyponex, Ra-Pid-Gro, or Sea-Born, to help combat the shock of transplanting. The seedlings are foliar-fed and kept well watered and cultivated throughout the growing season.

The rate of growth and increase is influenced by the care accorded the seedlings throughout the season. A short season, with unpleasant and early crisp weather, will retard growth. On the other hand, in a long season of pleasant weather, with sufficient moisture, the seedlings will grow uninterruptedly and maximum results will be attained.

In a good season, growth continues in this area to the end of October or into early November.

Each fall the bountiful supply of leaves is hauled to the field and deposited between the rows. What remains in the spring is plowed into the soil. I have two huge compost piles in continuous operation—both with the usual ingredients and groundup discarded irises and daylilies. There is usually sufficient well rotted compost which, from time to time, is added to the field and to the beds in the display garden.

Irises are heavy feeders. Their food requirements must be met and replenished from time to time. Irises cannot be grown in the same soil indefinitely without appreciable deterioration.

I usually grow between 2500 and 3000 seedlings each year—some years more and some years less. They are rigorously rogued; I number and save only those seedlings that suit my purposes—about 40-50 yearly. They must be exceptionally good. Color is the first requisite; in any event, I believe so. What practical purpose would a beautifully branched and formed, or heavily substanced iris of unattractive color, serve? None; except for further breeding and experimentation. But not for exploiting commercially.

Numbered seedlings are lifted as clumps when time allows in June, July, or August, and placed in specially prepared rows for further watching and evaluation. Those carrying seed pods are also lifted and the stalks securely staked.

As each new iris bloom season arrives, I gaze in awe at the myriad of colors when I approach the long rows of seedlings. The closer I look, the more the marvel of plant breeding deepens and the mystery sharpens. I'll never cease to be amazed at the beauty that emerges from the tiny brown speck we call an iris seed.

DAYLILIES FOR YOUR GARDEN

George T. Pettus
(President, American Hemerocallis Society)

Hemerocallis, the botanical name of that hardy garden perennial known as the daylily, is a word derived from the Greek meaning "beautiful for a day." It aptly describes the plant's habit of each day opening a beautiful new bloom which closes and dies that night. Most modern hybrid daylilies have many flower buds per stalk to assure a bloom season of four or five weeks for each plant. I enjoy seeing the the new clean fresh flower each day. How many other plants can offer this?

The modern hybrid daylily is relatively new to the American garden and still unknown to most gardeners. Many know only *Hemerocallis fulva*, the old tawny daylily of questionable beauty that grows wild beside the road in many rural areas. The vast improvements of today's daylily over *Hemerocallis fulva* are almost beyond description. Modern hybrid daylilies adapt amazingly well to the St. Louis climate and their range of types is very wide. In our climate most mid-season daylilies flower in late June, July, and August when there is very little else blooming in St. Louis gardens. Early varieties bloom with the last daffodils and there are late ones that bloom until frost. Some varieties have flowers that are always small, under two inches in diameter. The largest varieties consistently produce flowers the size of dinner plates. For the rock garden or in the perennial border there are short daylilies that grow only 15 inches tall. Most modern hybrids will range in height from 24 to 36 inches, but some varieties will grow as tall as four feet. The flowers range from pale cool yellows to orange through pink to red and, even, lavenders. Almost all shades can be found except blue and white. Several amateur hybridizers are attempting to develop these two colors and may succeed within the next few years. Daylilies vary in pattern, too. Some are solid colored; others are blends of different hues; others are bi-colors and eye-zone types (with a contrasting color in the eye or throat of the flower). Some older varieties close before sundown, but most modern hybrids will stay open until dark and a few until midnight. The latter are ideal for planting around the terrace or patio

Note the trend toward wider petals, more overlapping, and more ruffling in these three award-winning varieties hybridized by the late Elmer A. Claar of Chicago. From left to right, BESS ROSS was introduced in 1954, PRESIDENT RICE in 1957, and LEXINGTON in 1961.

where they can be enjoyed during the evening hours.

The American Hemerocallis Society*, which registers all named daylilies, now lists over 12,000 different named varieties. About 800 additional ones are named and registered each year. The vast number of new registrations indicates the popularity of hybridizing this perennial plant. Although some of these yearly 800 registrations represent the work of commercial nurserymen, the bulk is the result of backyard gardeners who are finding fun and beauty in hybridizing daylilies. The ease in hybridizing and the short wait to see the seedlings bloom are two of the main attractions for amateur hybridizers.

In listing the following few cultural suggestions for getting maximum display from daylilies in our St. Louis conditions, let me say that you can disregard many of these suggestions and still get good bloom.

1. Planting time—after danger of last frost and up to September 15.
2. Location—prefer full sun, though some shade is OK. Avoid planting in full shade. Stay at least two feet away from shrubs, more from trees.
3. Prepare hole—dig a large hole, refilling with friable soil and plant food below root level.
4. Planting—spread roots out and plant so crown is about one inch below final ground level. Water-in a newly planted daylily with a bucket full of Rapid-gro solution.
5. Feeding—work into soil around plants a well-balanced commercial fertilizer in spring or at beginning of bloom season.
6. Watering—during times of drought give about one inch of water every week or so.
7. Divide—after four or five years most daylilies will clump up and need to be lifted, divided, and transplanted. This will give you additional plants for your garden or to share with friends.
8. Selection—choose daylily plants that will give you the performance for the place and purpose you select, i.e., color, bloom season, and height. For St. Louis conditions it is best to start growing dormant varieties and delay trying the evergreen or semi-evergreen types which require pampering here as they are best suited to Florida and southern California climates.

No doubt many gardeners contemplating the purchase of their first daylily will be confused by prices ranging from 50¢ to $5.00 and occasionally more. The $5.00 plant is undoubtedly 10 times more scarce than the 50¢ one, but it is unlikely that it is 10 times better. Most of

*Further information about the American Hemerocallis Society and how to become a member can be obtained by writing: Mrs. Lewis B. Wheeler, Secretary, Box 458, Crown Point, Indiana, 46307.

Today's daylilies range in color from pure pale yellow, melon, and pastel pink to brilliant orange or red. Each year finds new exciting color tones being hybridized. Two of the newest are the warm apricot pink of ANTONY HOUSE (hybridized by Fischer) top photo, and the cool pale lilac pink of the flower, bottom photo. JO WOOD (Pettus), a variety named for Mrs. Neal S. Wood of St. Louis.

the new hybrids show marked improvement over the older ones. The very newest one, just introduced commercially at high prices, will in 10 years be inexpensive. In the interim, the hybridizers of tomorrow will have introduced even better plants. In any case, there are many varieties of daylilies now on the market that sell at very reasonable prices.

The American Hemerocallis Society, besides printing its quarterly publications of daylily information, makes yearly awards to daylilies that are judged outstanding in the opinion of a panel of specially selected Awards and Honors Judges. The following varieties have, over the past five years, received the Society's highest award, the Stout Medal. These highly rated medal winners all grow well in St. Louis gardens, and would therefore be good varieties for the beginner to consider in choosing his first daylilies:

Bess Ross, Stout Medal 1962, a large bold red with an especially long bloom season. (see photo)

Cartwheels, Stout Medal 1966, large, wide gold flowers of great substance.

Frances Fay, Stout Medal 1964, a beautiful, light melon pastel on short stems.

Luxury Lace, Stout Medal 1965, a small delicate lavender-pink, a color quite new to daylilies.

Multnomah, Stout Medal 1963, pale apricot blooms on taller stems.

It is unfortunate that so few general nurseries sell any daylilies and those few offer only a limited selection of the very old varieties. To buy modern hybrid daylilies it is necessary to contact a grower specializing in growing and selling these plants. Most of these specialists advertise in the publications of the American Hemerocallis Society and yearly these publications list the names and addresses of all dealers who are members of the Hemerocallis Growers Association.

At the Missouri Botanical Garden there is a good display planting of modern mid-season daylilies located in the area just north of the Lehmann Rose Garden and south of the Climatron. A visit to this area during June, July, or August will be a rewarding introduction to modern hybrid daylilies.

GINGER
(*Zingiber officinale*)

Edgar Denison and Edgar Anderson

A letter from Edgar Denison to Edgar Anderson:

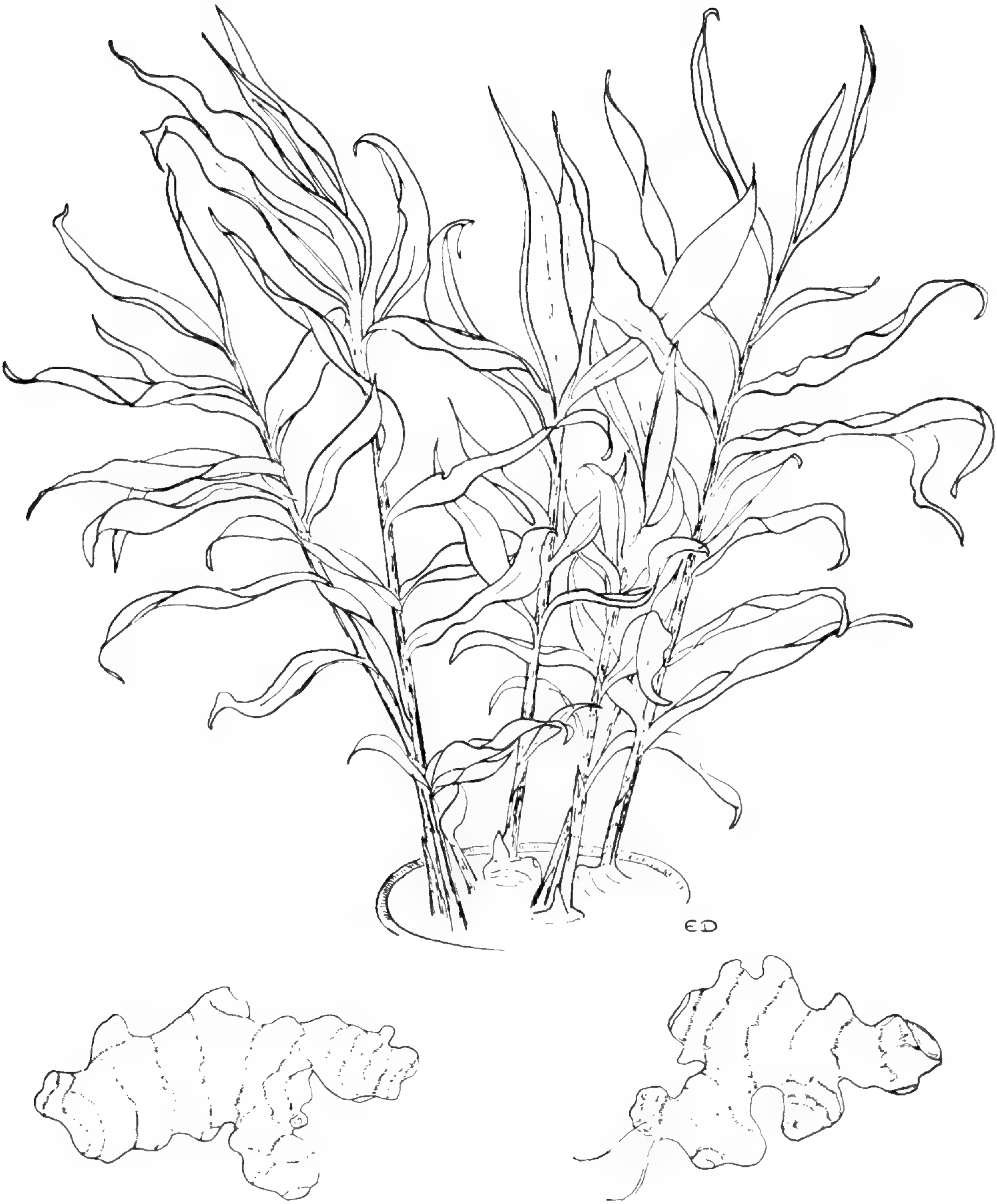
"It occurred to me that some of the readers of the *Bulletin* may be interested to learn that Ginger can be grown here without too much trouble. So I made the enclosed sketch of a ginger plant which was out in my garden all summer and was potted for winter storage.

"Many years ago, when St. Louis was still fortunate enough to have a 'China-town,' I bought fresh ginger roots, alias tuberous rhizomes. When planted, after the soil warms up, ginger (*Zingiber officinale*) will grow well and multiply its roots quite generously.

"The shoots are about 2½ feet long, the individual leaves reach 10 inches and the rhizomes vary from four to six inches in length. The shoots dry up soon after the plants have been potted and brought inside. We water sparingly in winter, but during the growing season ample water is required and, I believe, a rich soil is of benefit. In the many years we planted the roots, we never had a blossom, much as I would like to see one some day. L. H. Bailey, the academic authority on domestic plants, informs me that medicinal ginger is made from the roots; condimental ginger from the leaves, and the delectable candied ginger from carefully selected young rhizomes."

A letter from Edgar Anderson to Edgar Denison:

"I learned long ago, as you did, that if one is to get really accurate information about plants cultivated for folk medicines and condiments he must mistrust books and get as many facts as will be revealed by those who grow and those who process the plants. In addition to the delicacies you mention, there were the little green pottery jars of



Ginger plant and tuberous rhizomes.

'stem ginger' we used to get directly from China, with a taste like candied ginger but even more delectable. By experimenting with fresh rhizomes in Ethiopa and more recently in super markets here, I have evolved the following theory: Ginger has two main taste components: (1) a plain hot one, not very volatile and (2) a delicious volatile one. If we could arrange according to taste what we can buy, grow, or cook in St. Louis in order from (1) to (2), they are as follows:

a. ground ginger from the druggist or grocer.
b. dry rhizomes (technically a stem) from the grocer.
c. low-grade candied ginger.
d. high-grade candied ginger.
e. imported stem ginger.
f. freshly made stem ginger from your own kitchen, made from fresh ginger rhizomes, thinly sliced and gently simmered in sugar and water to a thick syrup.

"(I suspect that the dried leaves are used only as an adulterant in a.)

"Study nature not books! and nature broadly conceived includes factory and farm."

(Edgar Denison, a research engineer with Union Electric, is an amateur naturalist of professional status.)

PLANTS AND FLOWERS FOR SALE

The Ladue Garden Club will have its Flower Cart on the parking lot of Ladue City Hall every Friday in May from 10 am to 2 pm.

EVENING PRIMROSE I

Edgar Anderson

THE MISSOURI evening primrose (*Oenothera missouriensis*) on the rocky glades at our Gray Summit Arboretum are not only one of this country's most spectacular wild flower displays, they are one of the most fascinating to watch. The big, golden cup-shaped flowers (several inches across) are pollinated in the late afternoon and at night by big hawk moths. The moths hang in the air above the blooms, uncoil their long tongues, and suck the nectar from the calyx tubes. The finest time to watch them is early on a moonlit evening when the flowers are first golden; then as the daylight fades they look paler and paler until they seem white. Just before all the yellow has disappeared they are

Photo by Claude Johnston

The Missouri evening primrose blooms in late May and early June. Here is shown the pale gold flower, both whole and with petals removed to display the extremely long stamens and calyx tube.

Photo by Claude Johnston

The seedpod of the evening primrose in varying degrees of development. Early travellers through the Ozarks reported that Indians used leaves of these plants for food.

the most celestial pale yellow I have ever seen; they look as if they might float away on the slightest breeze.

The next morning the moths are gone and the nectar-filled calyx tube of every flower in bloom is being visited by hordes of tiny ants. I had always supposed they were taking the nectar without making any return to the plant. While Mr. Johnston was taking the accompanying pictures, I noticed that ants were falling in and crawling out of the nectar and climbing around in the stamens and stigmas. They were smeared with honey and pollen; some of them certainly pollinating the stigmas. It would be interesting to find out if they are really effective pollinators and cross-pollinators.

Two or three days after pollination, the angles of the seed pod grow out in four long wings. Green or reddish-green at first, by August they look as if made from stiff gray paper. Then as the seeds ripen, they crack open and the wings curl back. They look like pale gray lilies and frequently are blown here and there about the glades, scattering those seeds which have not been destroyed by rodents.

EVENING PRIMROSE II

Kenneth Peck

THERE ARE times when an active gardener runs out of familiar things to grow. At this point, he seeks new plant materials. I would like to suggest one of the larger flowering forms of evening primrose, specifically, *Oenothera fremontii*. Seeds of this species may be obtained from Claude A. Barr, Prairie Gem Ranch, Smithwick, S. D.

Seedling plants begun in February produced blooms by June 15 of the same year. The fascination with these plants is that it is possible to watch their flowers open right before your eyes. Many have seen this happen, yet when I observed it in my garden and told friends and neighbors about it, they were delighted.

A single mature specimen of this *Oenothera* (é-no-thera) may have up to 30 blooms 2 to 3 inches in diameter. This species is frequently said to be short-lived. This is true when it is grown in heavy silt soils, but will persist for 5 to 8 years or more in a well-drained medium. Perhaps for best results fresh plants should be started from seed every 2 to 4 years.

The accompanying photo sequence will let you appreciate the rapid opening process if you take note of the time passage between each view:

	Photo No.	P.M.	Description
Side Views	1	7:30	Bud stage; lobe of a stigma curving out to left
	2	7:35	Same as #1, no appreciable change
	3	7:40	One petal lobe showing
Face-on Views	4	7:45	Bud beginning to open rapidly
	5	7:45 +	Bud beginning to open rapidly
	6	7:45 +	Bud beginning to open rapidly
	7	7:45 +	Bud beginning to open rapidly
	8	7:45 +	Bud beginning to open rapidly
	9	7:45 +	Bud beginning to open rapidly
	10	7:45 +	Bud beginning to open rapidly
	11	7:45:15 +	Opening process slows down
	12	7:55	Petal lobes fully extended

1

2

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12 Photos by Kenneth Peck

Photo by Mark Paddock

Al Saxdal, rose grower supreme, inspects one of his charges.

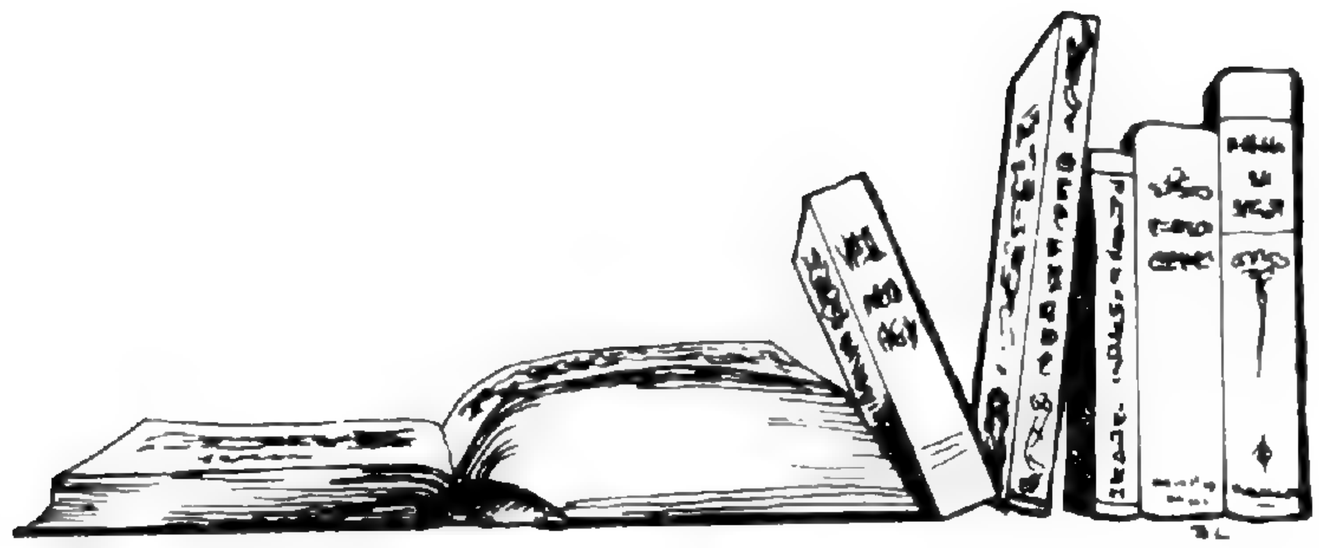
ROSE GARDENS

Barbara Lawton

The rose gardens are now approaching their peak of bloom and beauty. In the five years that Alfred Saxdal has been with the Missouri Botanical Garden, the rose gardens have continued to improve until now they are as fine as any in the Midwest. The Garden now has three areas in which a total of 4500-5000 rose plants are growing. Here about 200 varieties of roses are grown, including many of the oldest hybrids as well as the longtime favorites, and the newest varieties.

The All-America Rose Selection Test Garden at the south end of the grounds contains tomorrow's favorites. The new Lehmann Rose Garden, near Tower Grove House, is appropriately in the country home tradition. Accented by spectacular azalea beds, this garden is surrounded by handsome old hardwood trees and expanses of green turf. In front of the Linnean House is the old Rose Garden, established in the 1920s, which is the most formal of these providing pleasant paths along which to stroll among the geometric rose beds.

Mr. Saxdal knows roses as few can. He has found many beautiful roses that will do very well in this region. Among these are the floribunda, Apricot Nectar, and the hybrid tea roses: Tiffani, a pink blend; Peace, a yellow blend; Mr. Lincoln, dark red; Summer Sunshine, yellow; Garden Party, white; Tropicana, orange-red.



WITH BOOK AND TROWEL:

Gardening Books Reviewed

Nancy Chute

DON'T ASK THE horticulturist what garden books to buy. They claim never to have read any and say they go by "ear." Well, that is fine for them—and I can lay claim to similar proficiency in diapering a baby or cooking an egg without seeking reference material. But my education in things horticultural is thin, and I need a small library to turn to for advice and solace.

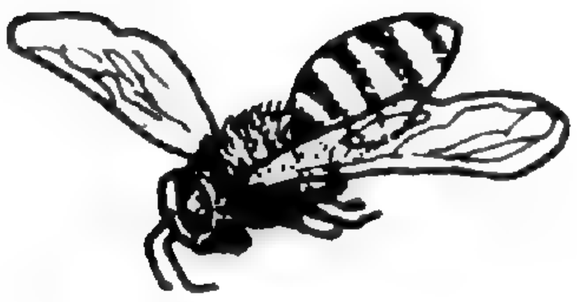
Since the resident experts declined comment on book selection, I had great fun looking through the collection at the Garden Gate Shop and reading some that caught my fancy. The following remarks are based on the findings of an over-enthusiastic and under-experienced gardener.

Anyone with aspirations even faintly horticultural needs a good reference book. Pick it out for the same reasons you'd select a basic cookbook. If there were to be a "one and only" in your library, I'd make it *America's Garden Book* by the Bush-Browns (Charles Scribner's Sons). This classic work has been revised to keep it up to date and encompasses the field from planning on through bugs and cold frames. It will prove valuable for the "punch 'n grow" crowd on up.

From here on it's a wide-open field, and the choice is made according to your special interests. A book devoted only to growing annuals had never seemed vital to me until I read *The Picture Book of Annuals* by Arno and Irene Nehrling (Hearthside Press). "Annuals are a good way to acquire gardening experience since they are the least expensive and easiest to grow," the authors say, and go on to discuss how they can be used to good effect in everyone's garden. Each flower gets a straightforward appraisal without the glowing hard-sell of the commercial

catalog. More than just a picture book, there's a complete section on cultural techniques. Directions are explicit, with step-by-step sketches. Many lists of annuals arranged by height, color, sun or shade lovers, fragrance, use as ground covers, etc. Garden clubs might be interested in the Beacon Hill window box beautification project they mention.

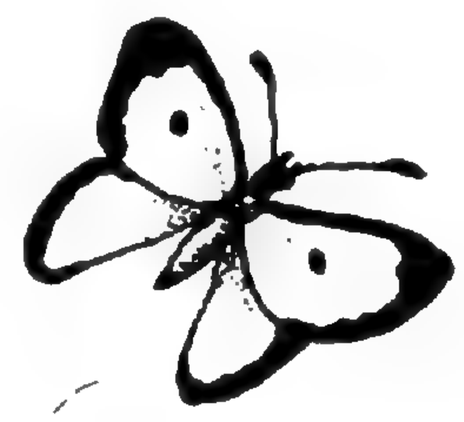
Donald Wyman, Horticulturalist for Harvard's Arnold Arboretum and President of the American Horticultural Society, has written a new book whose very salable point of view is expressed in the title, *The Saturday Morning Gardener—a Guide to Easy Maintenance* (Macmillan). He elaborates on the three essentials toward this end: good planning, short cuts (very good section here on mulches) and the selection of the right low-maintenance plants. There are wonderful lists of such plants, about which he comments: ". . . even though full agreement cannot be reached with these lists, they aid in independent thinking and experimentation on the subject, which is all to the good." He recommends developing the proper state of mind toward weeds and points out that the more fertilizer, the more growth and thus the more work. So, if your hedges and lawn look happy, think twice! To make his recommendations applicable across the country he has included plant hardiness zone maps inside the book covers. It's too bad the many photographs are small and in black and white. But peer closely—it's worth it.



The "Sunset" Magazine people publish a fine collection of how-to-do-it books. One intriguing one is the "*Sunset*" *Patio Book, Revised Edition* (Lane Magazine and Book Co.). By their definition a patio is a garden living room, and in hearty magazine prose they describe the elements involved. Emphasis is on "how to plan it" rather than "how to do it," with references to other "Sunset" books for construction details, etc. Many original techniques and uses of materials—a good "idea" book to get you started.

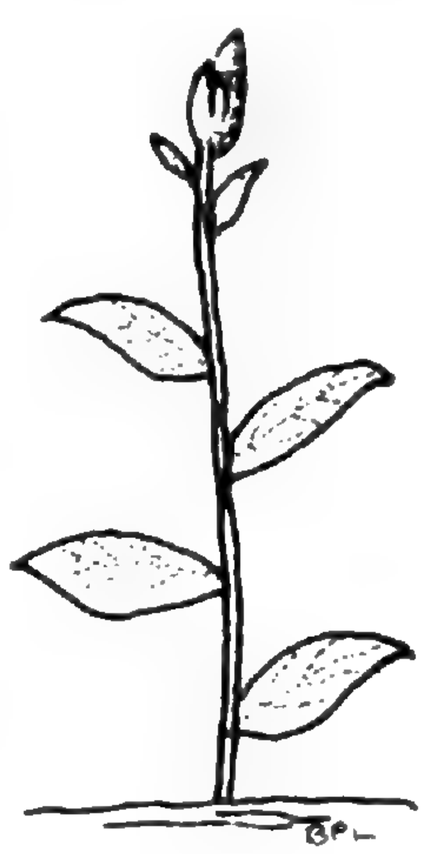
The Brooklyn Botanic Garden publishes meaty little handbooks on many subjects, each full of articles by experts in the particular field. I enjoyed reading the calm opinions of scientists on the touchy subject of biological control of pests. It seems the "when in doubt get out the DDT" school of thought is losing ground to the "don't fight the system" or "work with nature" boys. For some second thoughts, try: *Handbook on Biological Control of Plant Pests.*

With biological control the insects that prey on a plant are killed or suppressed by using the natural enemies of said pests. As an example, some lady beetles (ladybugs to us) consider aphids haute cuisine, while their cousins swing for mealybugs and scale. Better yet, these little pests can also fall victim to diseases and parasites. We can learn about the good guys and the bad guys in Cynthia Westcott's ("The Plant Doctor") article, "Gallery of Insect Friends," with pictures. There is a dramatic story of the flesh-eating screw worm's complete eradication in the Southeast United States.



The authors do not tout biological control as a complete solution; rather say it should be integrated with a chemical program, using as little chemical as necessary and the kind that damages helpful insects the least. Pointing out that biological control is not only safer but cheaper than chemical means, they suggest ways of reducing the need for chemicals in our gardens. Actually, the handbook is stiff going in spots, but worth it.

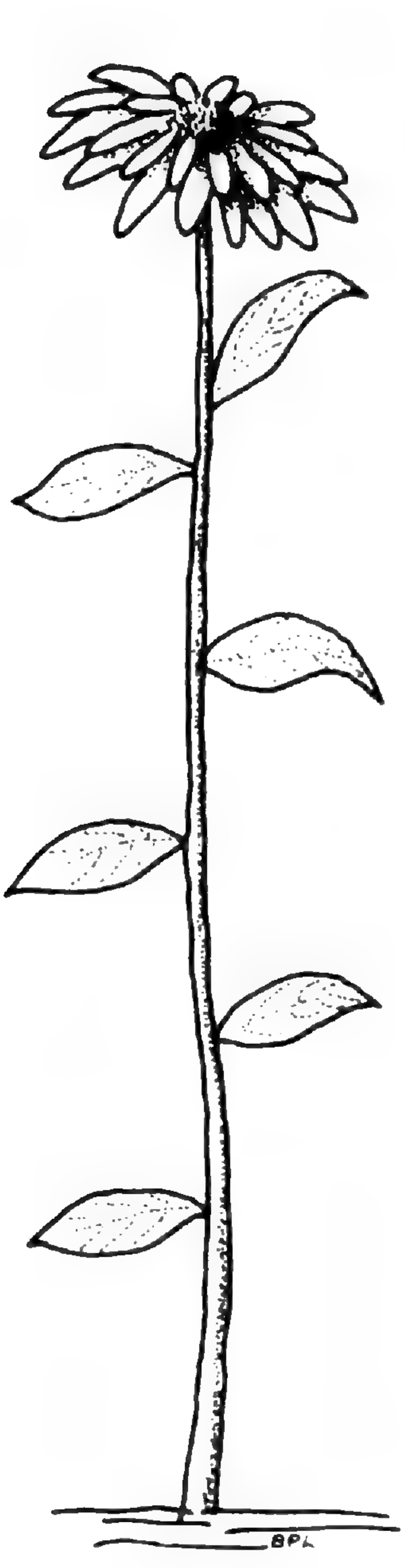
Most of us are more interested in the "pretty" part of gardening. Unfortunately, the next material falls under the heading of Housekeeping: Mumps and Measles Division.



While the contributors to the *Handbook on Garden Pests*, also put out by Brooklyn Botanic Garden, touch on biological measures that will help the problems, they concentrate on explaining the safe ways to use pesticides for ornamental shrubs and plants. They give us a spray formula for home garden use

with safety ratings, principal uses, and the equipment needed. Best of all are the illustrations of the diseases and pests—really excellent coverage.

Getting one-up on crabgrass et al turns out to be not as easy as advertisements claim. From the *Handbook on Weed Control* (Brooklyn Botanic Garden) we get the straight story. Their explanation of the weeds' intentions in life make the counter measures seem suddenly logical. Included are a rogue's gallery of lawn and garden weeds (and prescriptions for their downfall) as well as good management practices. They also tell us how to keep annual and perennial beds weed-free and discuss natural landscaping via herbicides (they're "iffy" about this). The emphasis is on exact measurement of weed-killers, stressing use only when needed and at the proper growth time. Here again we are urged to avoid chemicals that accumulate in the soil.



Back to the pretty things in life with Edwin Steffeck's book *Wild Flowers and How to Grow Them* (Crown Publishers, Inc.). He tempts us with lovely illustrations and clear descriptions of these beautiful and often fragile native plants, encouraging us to try them in our gardens. There are full details on the likes and dislikes of each and carefully detailed instructions for transplanting or propagating them. Sponsored by the American Nature Association and the Wild Flower Preservation Society, the book also makes a strong plea for conservation. Active, aggressive public programs of conservation are needed, he feels, lest our native plants disappear with civilization. It is Mr. Steffeck's hope that garden clubs and civic groups will undertake projects to re-introduce these plants and to protect them from destruction by bulldozer.

In the same vein is *Gardening With Native Plants*, another superb handbook from the Brooklyn Botanic Garden. Guest editor Helen Hull chose as contributors to this handbook pioneers in the field. The general objective—to encourage interest in preserving

our natural heritage and growing the native plants in our gardens—is similar to that of Mr. Steffeck's book. Here, however, there is a broader sweep of subject matter. One fascinating article tells how to make a terrarium of wild plants. There is a list of books available on wild flowers, where to buy their seeds (or how to collect your own), and names of trails and preserves to be visited.

The discussions of regional flora, although interesting in themselves, have facets that apply to plants in general. Our own Edgar Anderson, in his article "Wild Flowers of the Ozarks," explains why plants there are so different from others of the same species. Also, many fine illustrations and cultural suggestions for different regions.

We're about ready for a funny book, something easy to read. I enjoyed Janet Gillespie's latest, *Peacock Manure and Marigolds* (Viking Press), to the point of reading aloud sections of it to a long-suffering husband. It got quite a lot of attention from the reviewers, for a garden book, when it came out in 1964. Even Harper's and Saturday Review accorded favorable remarks. She has absorbed the controversy from the Rachael Carson furor and combines this research with her own experiences, plus those of her forbears, to come up with ways for our gardens to grow with minimum spray. Other bits of lore and amusement, too.

For that very special gift, you'll want to consider *America's Great Private Gardens* by Stanley Schuler (Macmillan). This handsome work takes us via color photographs and commentary on a tour of 36 private (*i.e.*, not open to the public) gardens across the country. The St. Louis garden of Mrs. Warren T. Chandler is one of these.

After such heady browsing in the horticultural field, I regained perspective with a foray into the intricacies of botany. Dr. Anderson makes complex subjects clear—and palatable—to the uninitiated with his delightful presentation. *Plants, Man and Life* (Edgar Anderson, Little Brown, 1952) is a history of cultivated plants and, at times, a scientific detective story. He has revised the original, adding a gossipy glossary helpful to the general reader (University of California Press, Berkeley, paperback or stiff cover).

(*Mrs. Chute is a volunteer and Friend of the Garden.*)

WHO, WHAT, WHERE, WHEN

A NEW COLLECTION OF IMPORTANT BOTANICAL PAPERS to be studied by graduate students ("Papers on Plant Systematics," selected by Robert Ornduff, published by Little, Brown and Co., Boston, 429 pp. $6.00) provides evidence of the Garden's importance in basic research. Five of the 30 articles are by staff members or by students who once studied here and one-quarter of the pages are filled with their work. They range from the work of a 1924 graduate, Carl Epling, to recent papers by Dr. Anderson and his students and by Dr. Walter Lewis. Our Herbarium is one of the five largest in the New World, and the Library has few equals anywhere for taxonomic work, but the teaching and research staff has always been small in comparison with that of many other institutions.

IMPORTANT VISITORS TO THE GARDEN come in all shapes and sizes. During the last week in February, a flock of the gregarious migrating cedar waxwings encamped in the trees between the Administration and Museum buildings. These handsome crested birds are predominantly seed and berry eaters, though they also catch insects on the wing. They can be seen, at times, flocked in berry-bearing trees and shrubs.

DR. EDGAR ANDERSON, Botanist, appeared on The Visiting Scholar Program at the Virginia Polytechnic Institute during the first week of March. Made possible by an anonymous gift, The Visiting Scholar Program enables the Virginia Polytechnic Institute to offer learning of the highest rank to students, professors, and the public by inviting "the world's greatest minds" to participate. Dr. Anderson conducted seminars for plant breeders, botanists, and professors. For his public lectures, he chose the subjects "Natural History and the Exact Sciences: An Effective Combination for Biological Research" and "Corn Breeding Problems."

LEONARD HALL, well-known conservationist of Possum Trot fame, gave a lecture to the Friends of the Garden and the general public on March 7. Mr. Hall spoke on "Trees, Their Association with Man, and Their Importance in His Modern Environment." Hall received the Thomas Stokes Award "for the best writing on natural resources in an American newspaper," the Governor's Award as Missouri State Conservationist for 1965, and many others.

THE AFRICAN VIOLET SOCIETY OF AMERICA held its national convention in St. Louis April 18-20. There was a tour of the Missouri Botanical Garden, and Director David M. Gates gave the convention a dynamic opening speech entitled *Plants, Planets, and People.* The Society held workshops devoted to various phases and problems of African violet culture and to successful programming for local violet societies. Judging schools were also held.

MR. JOHN MASEK gave a slide talk on Japanese gardens and Bonsai at the Garden on April 23. Mr. Masek, a landscape nurseryman, traveled to Japan last fall, the only Midwesterner in a group of 15 people. His slides cover all phases of Japanese gardening and culture.

Photo courtesy Post-Dispatch

Miss Donna Panos holds a large flower of the southern magnolia.

AMONG THE MANY SPRING HIGHLIGHTS at the Missouri Botanical Garden is the blooming of the southern magnolia or bull bay (*Magnolia grandiflora*), the grandest of all broad-leafed evergreen trees in the South. St. Louis is a little too far north for this tree to be hardy, but there are a few specimens in our area. Probably the grand-daddy of all is the one in back of Tower Grove House which produces saucer-shaped white blooms as large as nine inches in diameter in late May and early June.

FLOWER SUNDAY AT CHRIST CHURCH CATHEDRAL was held this year on April 28. A lasting memorial to Henry Shaw, who in his will designated that the Missouri Botanical Garden furnish the flowers which decorate the Cathedral, the sermon is always dedicated to "the wisdom and goodness of God as shown in the growth of flowers, fruits, and other products of the vegetable kingdom." This year's sermon was delivered by The Rev. Claudius Miller, III, rector of the Church of the Good Shepherd (St. Louis County).

Photo by Pan American Airwa

Rio Harbor.

You Don't Have to Know the Language to Enjoy South America

The fabulous scenic wonderland of South America boasts of beauty that's beyond the need of words in any language. Here you will see private gardens, emerald-matted jungles, and such marvels as the Inca mountain-top cities of Peru and the pastoral meadows and fjord-like lakes of the Chile-Argentine border. All this is contrasted with exciting, bustling, modern cities like Buenos Aires, with its daring architectural "Edificios," and exotic Rio de Janeiro, the gay city of fiestas and carnivals, framed by the world's most beautiful harbor.

Be sure to join the "Friends of the Garden" Garden Tour of South America, leaving St. Louis January 16th, 1969 and returning February 7th. The tour will be under the leadership of Lad Cutak, noted Missouri Botanical Garden horticulturist, and Jean Berke, Inc., whose 20 years' experience in planning international garden tours brought them the distinction of being the subject of the very first article of its kind to be featured in a national magazine such as "Life."

For further information about this exciting experience, contact:

Sante Travel Agency PA 6-3040 or
Friends of the Garden Office TO 5-0440

or mail the coupon below to:

The Friends of the Garden
Missouri Botanical Garden
St. Louis, Missouri 63110

Please send information on the
Garden Tour of South America to:

NAME_____

ADDRESS_____

CITY_____ STATE_____ ZIP_____ PHONE_____

Photos by Claude Johnston

Dr. Burch and Dr. Lewis explain the intricacies of gardening and the Herbarium to Mrs. Robert E. Koch (Ladue Garden Club), Mrs. John Hundley, Jr. (Sowing Circle Garden Club), and Mrs. John Wagner (Ladue Garden Club).

Mrs. Jay Taussig from the Grass Roots Garden Club, Mrs. Charlotte Lange, and Mrs. Joseph Lewis listen as Susan Verhoek recounts the history of the Garden's special collections.

THE HERBARIUM THANKS...

all members of the Grass Roots, Ladue, and Sowing Circle Garden Clubs, and Mr. and Mrs. Joseph Lewis for the gifts of four new herbarium half-cases. Each has been inscribed with a brass plaque indicating donor and year. These cases are necessary for housing the dried collections of plants received from all over the world and stored at the Garden for botanical research purposes. The Herbarium has about 2 million such specimens with thousands more being added annually, largely as a result of the staff's ever increasing activity in tropical exploration. Overcrowding has become acute, and new cases are desperately needed in 1968 to keep pace with acquisitions. It is gratifying to botanists at the Garden to find our Garden Clubs and Friends willing to contribute directly to the Garden's scientific program. We hope that such support will continue.

On Washington's birthday the Herbarium staff held a coffee in appreciation of gifts received in 1967. The donors and some Friends had an opportunity to visit with the staff and see the Herbarium.

11,000 St. Louisans need not read this...

but, if you were *not* one of the 11,000 who joined together last month to support the Arts and Education Fund, stop for a moment and think:

This once a year appeal provides an important part of the income which keeps the Garden growing together with the St. Louis Symphony, Adult Education Council, Community Music School, KETC (Channel 9), Little Symphony, Mark Twain Summer Institute, Museum of Science and Natural History, Young Audiences and the Arts and Education Council.

These are ten of the great privately supported riches of our community. They come to you for help once a year through the Arts and Education Fund. If you have not given, please send your 1968 contribution now to the Arts and Education Fund, Box 1968, St. Louis, Missouri, 63118.

If you are one of the 11,000 who have given to the Fund in 1968, one million St. Louisans who use, enjoy and learn from the ten agencies are greatly in your debt for helping them enjoy the full life.

L. J. Sverdrup
Campaign Co-Chairman

Eugene F. Williams, Jr.
Campaign Co-Chairman

The Missouri Botanical Garden Calendar

(MAY and JUNE, 1968)

May 3, 4 — HERB SOCIETY PLANT SALE. May 3, 9:30 a.m.-4:00 p.m.; May 4, 9:30 a.m.-1:00 p.m.

May 4 — CHILDREN'S SATURDAY NATURE PROGRAM. "Nature Hunt." Admission is free. 10:00-11:30 a.m.

May 11 — CHILDREN'S SATURDAY NATURE PROGRAM. "The Mighty Oaks." Admission is free. 10:00-11:30 a.m.

May 18 — CHILDREN'S SATURDAY NATURE PROGRAM. "The Bread-Winning Family." Admission is free. 10:00-11:30 a.m.

May 18, 19 — SPRING FLOWER SHOW. St. Louis Horticultural Society.

May 18, 19 — DAHLIA BAZAAR in Museum Building.

May 25 — CHILDREN'S SATURDAY NATURE PROGRAM. "Dangerous Plants." Admission is free. 10:00-11:30 a.m.

May 25, 26 — ROSE SHOW. Rose Society of Greater St. Louis.

June 1 — CHILDREN'S SATURDAY NATURE PROGRAM. "Plants of the City." Admission is free. 10:00-11:30 a.m.

June 2-23 — HYDRANGEA SHOW.

June 3 — PITZMAN NATURE PROGRAM. Registration begins, by phone or in person at the Garden.

June 4 — THE MAGNIFICENT FLORA OF SOUTH AFRICA. An illustrated talk by Prof. W. P. U. Jackson of the University of Capetown. Admission is free. 7:30 p.m. in Museum Building.

June 8 — CHILDREN'S SATURDAY NATURE PROGRAM. "Uses of Wild Plants." Admission is free. 10:00-11:30 a.m.

June 18 — PITZMAN NATURE PROGRAM begins first five-week session. Pre-registration required.

July 3 thru August 25 — SUMMER SHOW of begonias, caladiums, coleus, fuchias, gloxinias.

(Call TO 5-0440 for further information.)

Visit Your Missouri Botanical Garden

(SHAW'S GARDEN)

THE Missouri Botanical Garden's main entrance is at Tower Grove and Flora Place. The Garden is served by both the Sarah (No. 42) and the Southhampton (No. 80) city bus lines.

The Missouri Botanical Garden Arboretum—1600 acres—established at Gray Summit, Missouri, in 1926, is open to the public.

The Garden—70 acres—is open every day except Christmas and New Year's. For the main entrance, grounds, Climatron, display greenhouses, and Floral Display House:

May 1 through October 31.....9:00 a.m. to 6:00 p.m.
November 1 through April 30.....9:00 a.m. to 5:00 p.m.
Sundays and Holidays.....9:00 a.m. to 7:00 p.m.

For Tower Grove House:

May 1 through October 31.....9:00 a.m. to 5:00 p.m.
November 1 through April 30.....10:00 a.m. to 4:00 p.m.

The Display House presents four major shows: November, Chrysanthemums; December, Poinsettias; February, Orchids; April, Spring Flower Show. During the year other shows, competitions, and festivals are sponsored by various garden clubs and flower societies.

Courses in botany and horticulture for adults are conducted by the Garden staff. Children's nature classes are provided free on Saturdays from mid-September to early June. The Pitzman Nature Program is held for children during the summer. The Garden is world famous for its scientific research program. The scientists of the Garden hold teaching appointments on the staff of Washington University.

The Missouri Botanical Garden was established for the public's benefit in 1859 by Henry Shaw. The Garden, a non-profit institution, relies for support solely upon contributions from the public, the Arts and Education Council, and income from the Shaw estate. The Garden receives no city or state tax support.

Support your Garden and take part in Garden activities through the Friends of the Garden. Information may be obtained from the Main Gate or by mail or phone (TO 5-0440).

MISSOURI BOTANICAL GARDEN
BULLETIN

VOLUME LVI NO. 4 JULY-AUGUST 1968

Groß Indianiſch Flos Solis Peruuianus.
Sonnenblum.

Planning to entertain in your garden
or patio this summer? Come see us...
we have things you will need...

THE GARDEN GATE SHOP/at the main gate/Tower Grove and Flora

MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME LVI NO. 4 JULY-AUGUST 1968

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EDITORIAL & PUBLICATION OFFICE
Missouri Botanical Garden
2315 Tower Grove Avenue
St. Louis, Missouri 63110

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FROM THE DIRECTOR

CULTURAL AND SCIENTIFIC institutions are often taken for granted and frequently their staff members are better known outside their own communities. We wish more people of the St. Louis area were aware of this city's most unusual cultural and scientific institution—the Missouri Botanical Garden. Botanical gardens do not exist in every city of the world—there are parks; there are gardens, there are floral displays, but there are very few botanical gardens such as this which contribute significantly to research, teaching, and the public education concerning the world of plants.

The Missouri Botanical Garden receives no financial support from either the City of St. Louis or the State of Missouri and has come close to financial disaster because too many of the people of St. Louis and its environs take it for granted. After 109 years of serving the public, the Garden is launching a major drive for capital funds. These funds are desperately needed for construction of a new Library-Herbrarium building and a new educational facility which will include an auditorium. This drive, the first in the Garden's history, will be in effect from January 1 through July 1, 1969. We earnestly solicit your financial support through direct contributions, pledges of future contributions, remembering the Garden in your will, joining the Friends of the Garden organization. In whatever way you elect to assist the Garden financially, your contribution will be gratefully received.

The Missouri Botanical Garden is well-known throughout the botanical and horticultural world and has already contributed greatly to the people of St. Louis. Have you contributed to the Garden lately? If not, won't you do so soon?

David M. Gates

GARDENING IN ST. LOUIS

JULY—AUGUST

SOIL MOISTURE is often the biggest summer problem. Flower beds and shrubs should be checked daily for dry, baked soil and water applied as needed.

Remember that bluegrass does much of its growing underground when nights are cool. Crab grass is shallow-rooted and most active during hot weather. Thus, the two rules for successful bluegrass lawns: 1. Cut bluegrass no shorter than three inches because a thick, long lawn will shade out annual weeds. 2. Do not *sprinkle* the lawn, but give it a good soaking once every 10 days if the ground is dry.

Mulches are the gardener's friend in holding soil moisture as well as keeping down weeds. Any vegetative waste will qualify as mulch (even woody prunings if chopped fine enough); dead blooms, hedge trimmings, grass cuttings, pulled weeds.

Shade trees can be pruned now. It is best to keep in mind the natural shape of a given tree, plus its setting in your yard. Pruning should not only help the tree, it should also have its esthetic rewards. An inconspicuous paint or commercial compound may be applied to wounds to prevent infection though many feel this is not necessary if pruning is properly done.

Continue with a simple regular spraying program where needed.

Cutting of dead and wilted flowers and of seeds will keep annuals blooming luxuriantly.

Patio and planter geraniums do well in any well-drained soil mix. Feed sparingly as rich soil will produce lush foliage but, alas, few blooms.

Early morning, even before breakfast, is the best time of day in St. Louis heat spells. Flowers for the house are best when cut at this cooler time. Gardening is a good way to start the day.

Sunflowers In The Library

Carla Lange

THE WOODCUT of the sunflower copied for this issue of the Bulletin was taken from Pierandrea Mattioli's *Kreuterbuch*, edited, revised, and enlarged by Joachim Camerarius, and published in 1586 in Frankfurt am Main, Germany. This herbal is part of the Garden's extensive pre-Linnaean collection.

The illustrations in this book include some of those prepared by Conrad Gesner for his own proposed treatment of plants, never published because of his untimely death from the plague in 1565. His woodcuts were sold to Camerarius with the proviso that he should undertake their publication. Camerarius failed to fulfill the spirt of this obligation, for although he published many of them, he included these only as supplements to his own drawings in his German Mattioli edition of 1586. The large remainder had to wait for publication by Trew, a century and a half later.

The finest collections of woodcuts of plants of first-rate importance were those of Brunfels, Fuchs, Mattioli, Gesner, and Camerarius published between 1530 and 1590. From a scientific viewpoint, those of Gesner and Camerarius show a marked advance in the introduction of enlarged sketches of separate parts of the plants, such as petals and seeds.

Sunflowers In The Fields

Edgar Anderson

THE SUNFLOWER is the only one of the world's great crop plants which originated in or near the continental United States of America. Anciently, it was one of the most sacred plants of our Indians. It has now spread around the world as an oil crop, an ornamental, and a whole weed complex of prairies, plains, railroad tracks, industrial areas, and city slums.

From all of these, such a backlog of pests and diseases have evolved and accumulated that every attempt to grow sunflowers as a standard commercial crop in the United States has resulted in disaster. The only approaches to success were in the far Northwest, outside the range of the weedy sunflowers.

The world's authority on these plants is Professor Charles Heiser of Indiana University, who began to dig into these fascinating problems as a student of botany at the Missouri Botanical Garden and Washington University. Dr. Hugh Cutler of the Garden staff continues to measure and catalogue the sunflower remains of prehistoric peoples in the new World. This evidence accumulates slowly and requires skill and patience to interpret, but it is outlining with precision the long and tangled history of the sunflower and the people who grew it. How, for instance, did it spread to Peru, and at so early a time that its Latin scholarly name, as you will see from the cover, has become *The Peruvian Flower of the Sun?*

MASTER SHOWMAN: PAUL A. KOHL

Barbara Lawton

DURING the past four decades, millions of visitors to the Missouri Botanical Garden have been inspired and thrilled by the flower displays found here throughout the year. The vast majority of these floral "shows" have been due to the artistic skill of master Floriculturist Paul Kohl.

It is fitting that we learn a little about this vigorous but unassuming man in 1968, for it was 60 years ago that he first visited the Garden. Mr. Kohl's contributions to the Garden and its visitors are inestimable, yet relatively few of us really know him as a person. His talents and skills are many, covering outdoor, temperate plantings as well as tropical and temperate gardening in greenhouses, but he is best known for the famous seasonal flower shows held in the Floral Display House each year—Chrysanthemums in the fall, Poinsettias in December, Orchids in late winter, and the Spring Flower Show.

Born in Indianapolis, Paul Kohl moved to the St. Louis area at an early age. He says, "As a boy I was deeply interested in plants, and I recall going alone on a Saturday morning to Shaw's Garden to see my first chrysanthemum show in 1908 which, at that time, was staged in a tent. I remember that after returning home from the Garden I tried creating a show in miniature on a dinner plate by using twigs and bits of plants to represent flowers."

The Henry Shaw School for Gardening, which had opened in 1889, was improved and enlarged in 1914. This made it possible for those wishing to have professional training in such fields as gardening, horticulture, and landscape architecture to obtain complete training in the necessary subjects at the Missouri Botanical Garden. The courses of instruction for the three-year school (listed in the Bulletin for April 1914) cover all phases of botany plus design—from mechanical drawing to garden architecture.

Paul Kohl heard of the school and with several other students enrolled in the fall of 1914. Classes were held in Tower Grove House,

Claude Johnston

Paul Kohl staging the spectacular 1968 Orchid Show.

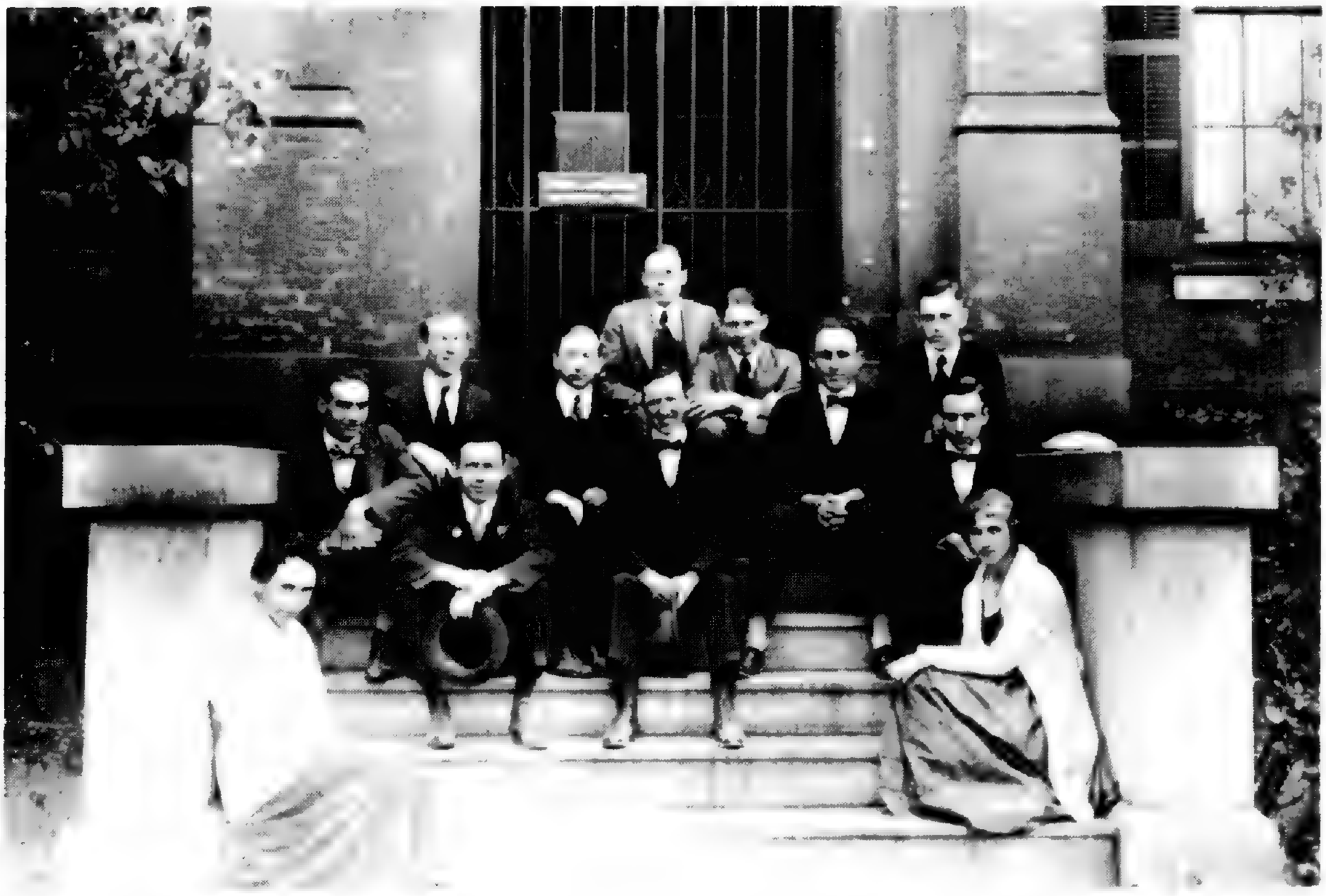
the south room of the Museum, a portion of what is now the Library, and also at Washington University. The students of this period were most fortunate in being able to train under John Noyes, the nationally distinguished landscape architect who designed the Rose, Linnean, Formal and Economic gardens. John Noyes is the man responsible for the good, over-all fundamental plan for the Garden.

Mr. Kohl graduated from the School for Gardening in the late fall of 1917, and became assistant supervisor of the school gardens in the St. Louis public schools. After only a few months, he entered the Army and in June of 1918 he was assigned to the Army Transport Service in Tours, France. During this period, travel was Paul Kohl's business and what pleasurable trips did not come about through Army assignments, he took on leaves and post-service vacation. He says, "For me, it was fortunate to be stationed in the Touraine Valley where the numerous chateaux and gardens and the many historic places were an endless source of interest. Touring the parks and gardens of Paris and visiting Versailles and Fontainebleau brought to life the gardens that had been described in the landscape course at the Garden. From Paris to Lyons, the Rhone Valley, south France to Lourdes and Cauterets in the Pyrenees, Pau, Bayonne and Biarritz, Bourdeaux, LaRochelle, St. Nazaire, Quimper and Brest were a grand tour of France by train and automobile."

Army service behind him, Paul Kohl returned to his previous work in the public school garden program for but a few months, as he was offered the position of floriculturist at the Missouri Botanical Garden. He joined the Garden staff in January 1920, and took charge of the Rose Garden, Linnean Garden, Italian and Economic gardens, and the flower borders on the Knolls.

Surveying his years at the Garden, Mr. Kohl reminisces: "In the years I have been associated with the Garden, each decade has seemed like the chapter of a book. The early nineteen hundreds had been the construction years. Some of the greenhouses had been moved north of the Linnean Garden wall and used as growing houses until about 1925, when the remaining structures were dismantled. The entrance gate, conservatories, parterre, fruticetum, arboretum, and the west stone wall all had given way to a new and enlarged garden. The only portions of the original garden walls now remaining are the stone walls along Tower Grove and Shaw boulevards, the stone and brick wall near the Linnean House, and the Linnean House itself.

"The 1920s were years of establishing the gardens recently created.



This 1917 photo of staff and students of the School for Gardening shows some familiar faces. At the back is Dr. George T. Moore, director at that time. In the next row of four are: instructors, George H. Pring and Alex Laurie; and students, James Monteith, Garland Ellis. The front row of five men includes: students, George Pedlow, Andrew Cella; instructor John Noyes; and students, Clarence Pedlow, Paul Kohl. The women students in front are Clara Fuhr and Margaret Corley.

Smoke pollution was getting worse as the St. Louis population and industry increased, and this initiated thoughts of moving the orchid collection to some area remote from the smoke belt. After considering several locations in the country, land was purchased west of the town of Gray Summit, Missouri. This meant many trips down the narrow, winding Manchester Road to the new arboretum to take pictures of the progress in developing the site and the erection of the new orchid range.

"During the next two decades the Garden remained stable but in the 1950s, changes were again being made. The Economic Garden was eliminated and half of the formal or Italian Garden became part of the floor of the Climatron, which was completed in the fall of 1960. The pot plant greenhouses, built in 1920, were replaced with four new houses in 1966, and these adjoin the new Park Building."

The staging of the floral displays were added to Mr. Kohl's duties in 1927. This involved not only designing and staging four to five large shows and intermediate displays each year, but also growing the plants, and obtaining or making the various props. Paul Kohl worked out ways

for raising and caring for the fussier plants in quantities. One has only to see the basket, cascade, and spider mums which he displays so artistically in the Fall Chrysanthemum Show to see how well he has succeeded.

In 1933 the Society of American Florists sponsored a large flower show in the St. Louis Arena, using the main building and the east wing. The Garden was prevailed upon to install a garden in this show and, in addition, staged a large display of orchids and three pools of tropical waterlilies. This first spring flower show in the Arena was such a success that succeeding shows, sponsored by the local florist and nursery industry, were staged in 1935, 1938, 1939, 1940, 1941 and 1942. The Second World War ended this series of shows, but in 1947 another one was held, this time in Kiel Auditorium. Two more spring shows were staged downtown in 1948 and 1949, and the last big show, in 1951, was again held in the east wing of the Arena.

All of these shows were of one week's duration and the Garden participated in each one. They entailed a great amount of additional work for Kohl's men. Every bit of material, sod, flowering plants, shrubs, and trees had to be trucked to the Arena or Kiel Auditorium and then, a week later, the process was reversed.

In Henry Shaw's will is a bequest that once a year a sermon be preached in Christ Church Cathedral "on the goodness of God as shown in the growth of flowers, fruits, and other products of the vegetable Kingdom." In the early years, the altar was decorated with cut flowers from the florists. Later the Garden was requested to furnish cut flowers and many iris and peonies were supplied when the sermons were given on a Sunday in May. When the dates of the sermons were changed to two weeks after Easter, cut flowers from the gardens were not available so flowering pot plants were requested. These solicitations increased through the years to the extent that the occasion at the Cathedral was referred to as "Flower Sunday." The Garden now grows and transports two truckloads of plants to the Cathedral annually and, in recent years, has been called upon to help stage and water the plants. Few people realize the number of man hours involved in growing and preparing the plants, delivering and calling for them on this occasion.

Whether plants are grown for the gardens or the flower shows, they are grown in pots. Whenever a new venture for the benefit of the Garden is started, it gravitates to the pot plant department. That was the case with "Through the Garden Gate" plant sale, so successfully

held on the parking lot of Famous-Barr in Clayton each year from 1960-1964. The number of plants to be sold was increased each year, until it reached such proportions that our own plants for garden use were being crowded off the greenhouse benches. Planning and installing flower shows requires ingenuity, timing of plants to bloom at specified times, carpentry for fashioning the backgrounds, and the use and re-use of materials to reduce expenses. Plans are geared to accommodate hundreds of visitors in a few hours and, when necessary, models are made of the main features of the shows so that the men can see, in miniature, what they are building. All plans for the shows are drawn to one-eighth inch to the foot, and then are chalked full scale on the floral display house floor.

Paul Kohl took up photography in his early years and his slides form a fine visual record of the flower shows and the Garden's growth. Recently he gathered photographs dating back to the Garden's beginning and, incorporating these with his own slides, made up an excellent slide show. The public has come to know Mr. Kohl personally through his slide shows and talks, as well as his *Bulletin* articles, lectures, and courses on gardening and plant therapy.

He has brought along younger men, training them to the special demands of his unusual field. The Poinsettia Show in 1967, staged by Claude Johnston, was a tribute not only to Claude's talents, but to Paul Kohl's training. The men in Mr. Kohl's section are open in their admiration and respect for him. One said, "When you're working with Mr. Kohl, the time flies—it seems that no sooner do you start work than it's time to quit." "He's a real master," said another. "Mr. Kohl's not content with less than perfection. He can stand 'way up there on the top level of the Display House and tell if part of a flower show set is off by this much." Here the man held his thumb and forefinger almost together.

Here is the measure of this quiet and unassuming man, Paul A. Kohl. His native skills, artistic sense, and way with plants are beautifully demonstrated in his flower beds and floral shows; that he is respected as much by his staff as by his public is a tribute few men earn.

THANKS FROM THE GARDEN...

Mark Paddock

SEVERAL substantial gifts have been made to the Library Restoration Fund in the past few months. This fund is used to restore valuable books in the Missouri Botanical Garden library. The project is well under way, with three part-time book restorers and bookbinders working at the task. Mr. and Mrs. Joseph Bascom recently donated $5,000 to this fund and Mrs. Arthur Hoskins gave $2,000 for book restoration.

Mr. and Mrs. W. E. Waller donated $1,000 to the Garden in memory of Mrs. Waller's father, the late Professor Henry C. Cowles. Professor Cowles was one of America's very first plant ecologists. He is often considered the Father of the School of Dynamic Ecology.

Several very substantial bequests have been made to the Garden recently. Mr. Otto Tietjens bequeathed $217,000 to the Garden, Eleanor L. Garvin bequeathed approximately $105,000, and Mabel Johnson bequeathed $42,000 in memory of Ellen Ricker. All of these bequests are being added to the endowment funds of the Garden and are invested according to the investment policies of the Board of Trustees. Income from these investments is then used for Garden operations.

Kenneth Peck

Drops of honeydew cover the windshield of a car parked under a tree.

HONEYDEW

Kenneth Peck
(*Illustrated by Sandra Thornton*)

HAVE you ever noticed how automobiles parked under trees on warm days frequently become covered with distinct spots of dust? These spots are sticky droplets which have fallen from the trees and become covered with dust. If you are standing under a tree, you may feel an occasional droplet of this material but will seldom see anything. What is actually going on here is that a group of soft-bodied insects called aphids are giving off a substance known as honeydew. Aphids gather in great numbers on the tender, growing tips of branches and are responsible for the removal of great quantities of sap from plants.

In order to figure out how aphids were capable of removing sap, it was necessary to make some observations. Using a hand lens and a low-power microscope, I was witness to some rather unexpected events.

While watching an aphid-infested rose branch, I noticed that the aphids frequently wiggled in an up-and-down motion, but not all at the same time. After watching for some time, I saw one aphid raise its body as though it were going to stand on its head. After doing this, the aphid rubbed its abdomen with one hind leg six or eight times. While doing this, a droplet formed at the very rear of the aphid's body. To my amazement, the final act of this sequence was a hind-leg kick that removed the droplet quickly and cleanly. The aphid then lowered its body.

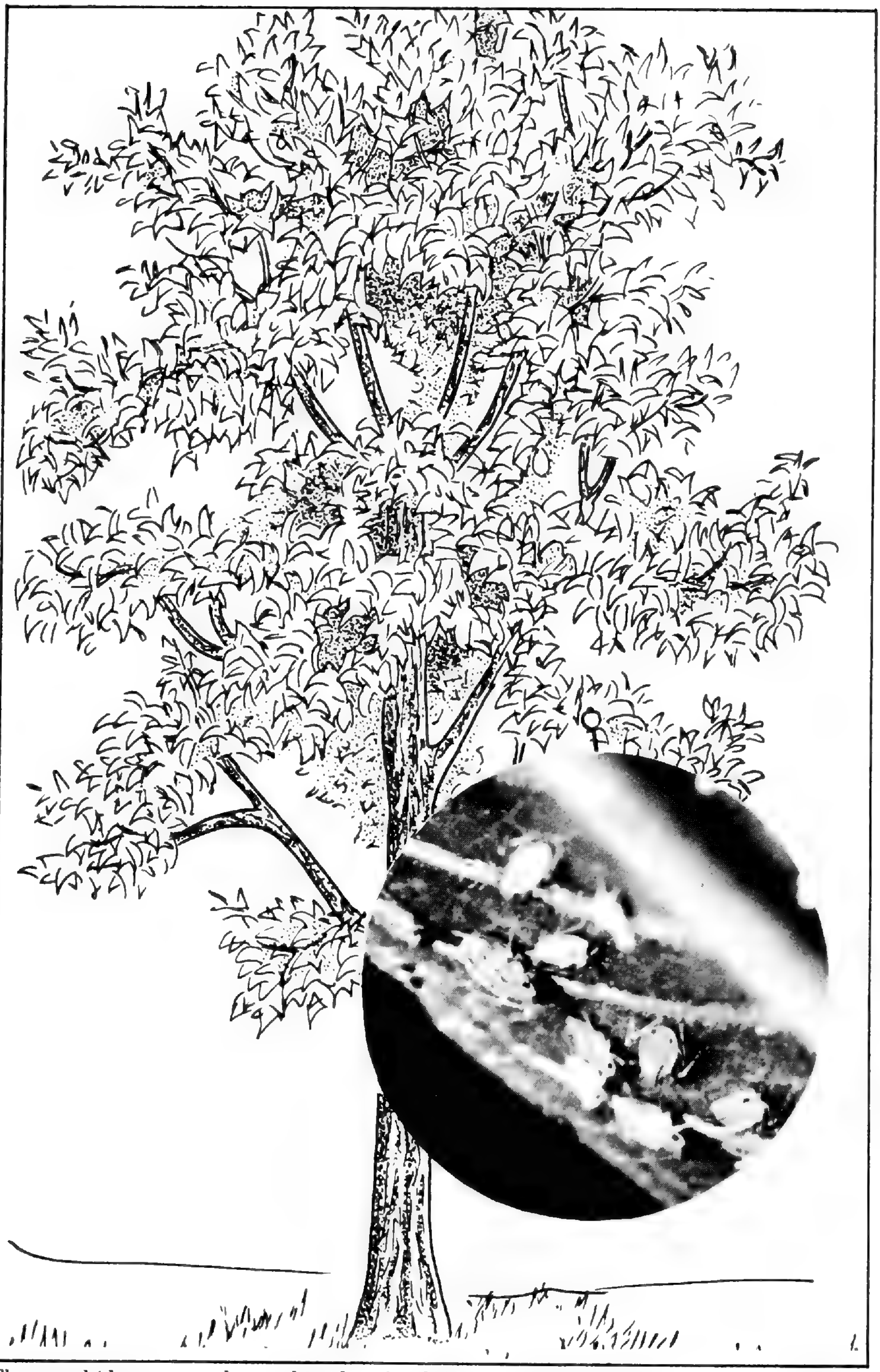
To make sure I had really seen what I thought I saw, I patiently waited for other aphids on this branch to do the same thing. The day following my little discovery, I peeked in on some aphids of a different sort on a branch of *Viburnum*. To my delight, they performed the same little act of using a "chorus-line" kick to remove the tiny bead of liquid sugar. This, then, is the source of honeydew. The illustrations in the center fold show a sequence of these events.

The kicking behavior is not seen in all kinds of aphids, but even so, this does not prevent them from forcibly discharging sugar droplets. This is almost more mystifying, for there is little one can see that shows just how the droplets are so efficiently ejected.

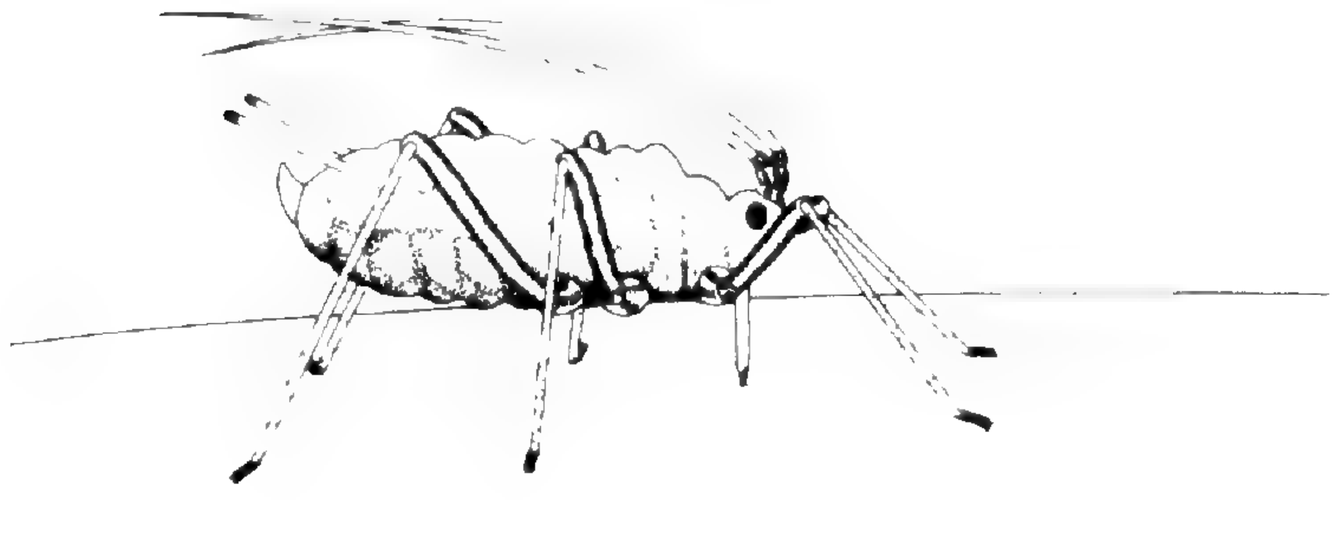
Asking why such means of sap removal might be necessary poses an interesting question. The sugar droplets are frequently watery (see picture), while being very sticky at other times. Drying out very quickly, they leave a film on any solid surface. Were any great number of sugar droplets to fall on a single aphid, the poor creature would soon be all "gummed up." It looks like aphids must get rid of these sugar droplets out of necessity.

W. M. Wheeler, in his excellent but highly technical book entitled *Ants*, has a marvelous chapter on the association of ants with aphids and other insects. It gives a highly descriptive account of the well known fact that aphids are visited and tended by ants. Certain ants keep aphids underground in winter and take them to plants during the growing season. This is mostly true of the kinds of ants showing no strong food preferences for other insects, seeds, or fungi.

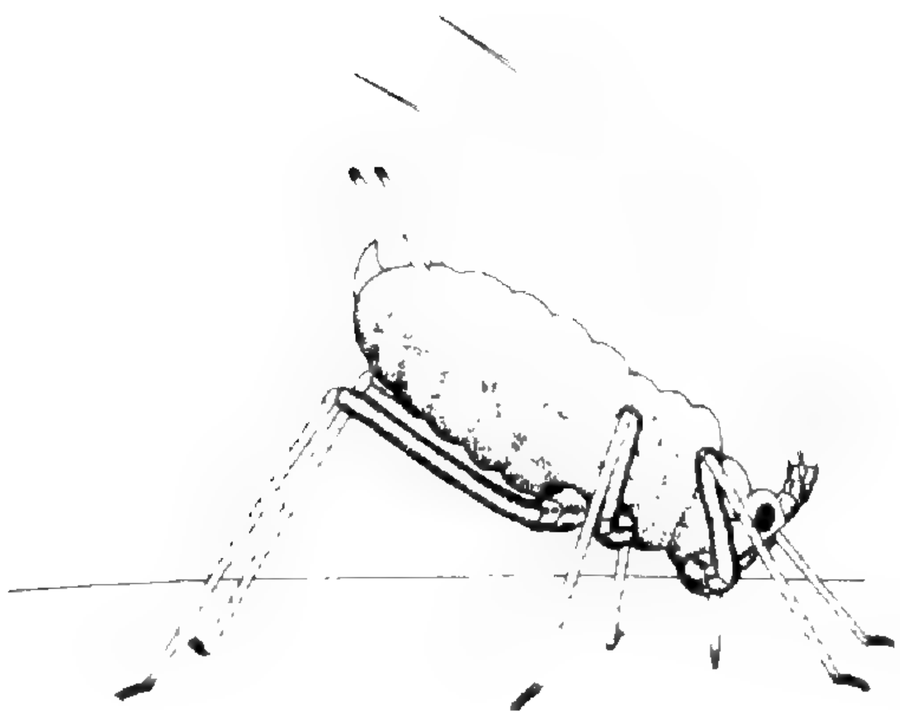
When ants are hungry, it is supposed that they visit aphid-infested vegetation for the purpose of obtaining honeydew or "ant-manna." By gently stroking the aphid's abdomen with its antennae, the ant may induce the aphid to gently eject honeydew which is immediately consumed by the ant. If an aphid does not respond to an ant's strokings, the ant will seek another aphid that will. Honeydew falling on leaves may be licked up by ants and by bees and wasps as well.



These aphids are on the underside of a leaf, removing sugary sap which becomes honeydew. The aphids shown here are magnified about seven times.



Aphid in "normal" position. The proboscis is vertical to the leaf or stem surface, the stylets having been extended until they pierce the sugar-conducting "phloem" (see text).

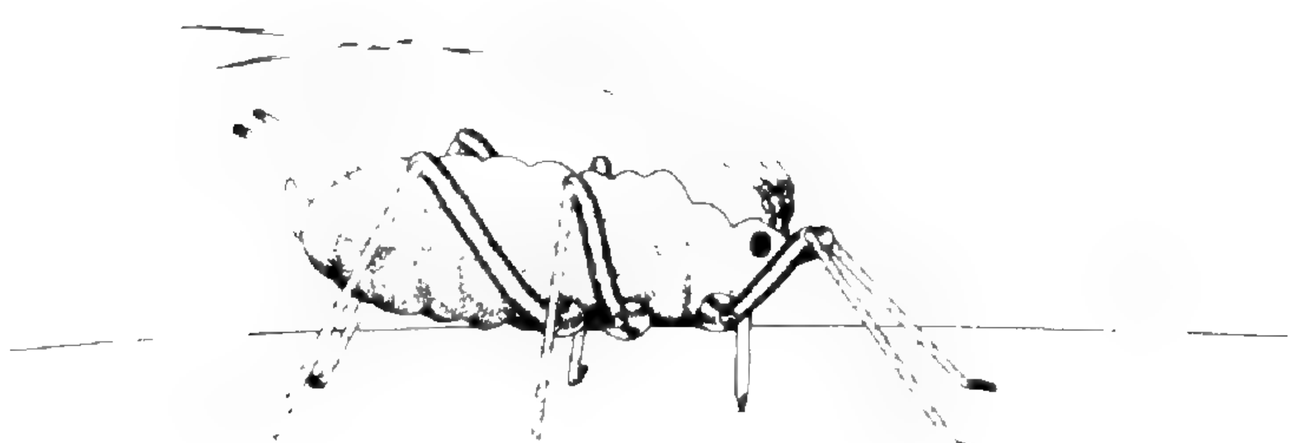


Before giving off honeydew, the aphid raises its body slowly, but in a somewhat uneven, up-and-down-and-up-again kind of movement.

Soon after the aphid has raised its body to a nearly vertical position, it begins rubbing its abdomen with the "thigh" portion of a hind leg. This is almost simultaneous with the formation of a sugar droplet as shown.

The droplet is a bit larger. The aphid, still nearly vertical, has finished "rubbing" its abdomen and has "cocked" the lower portion of its hind leg.

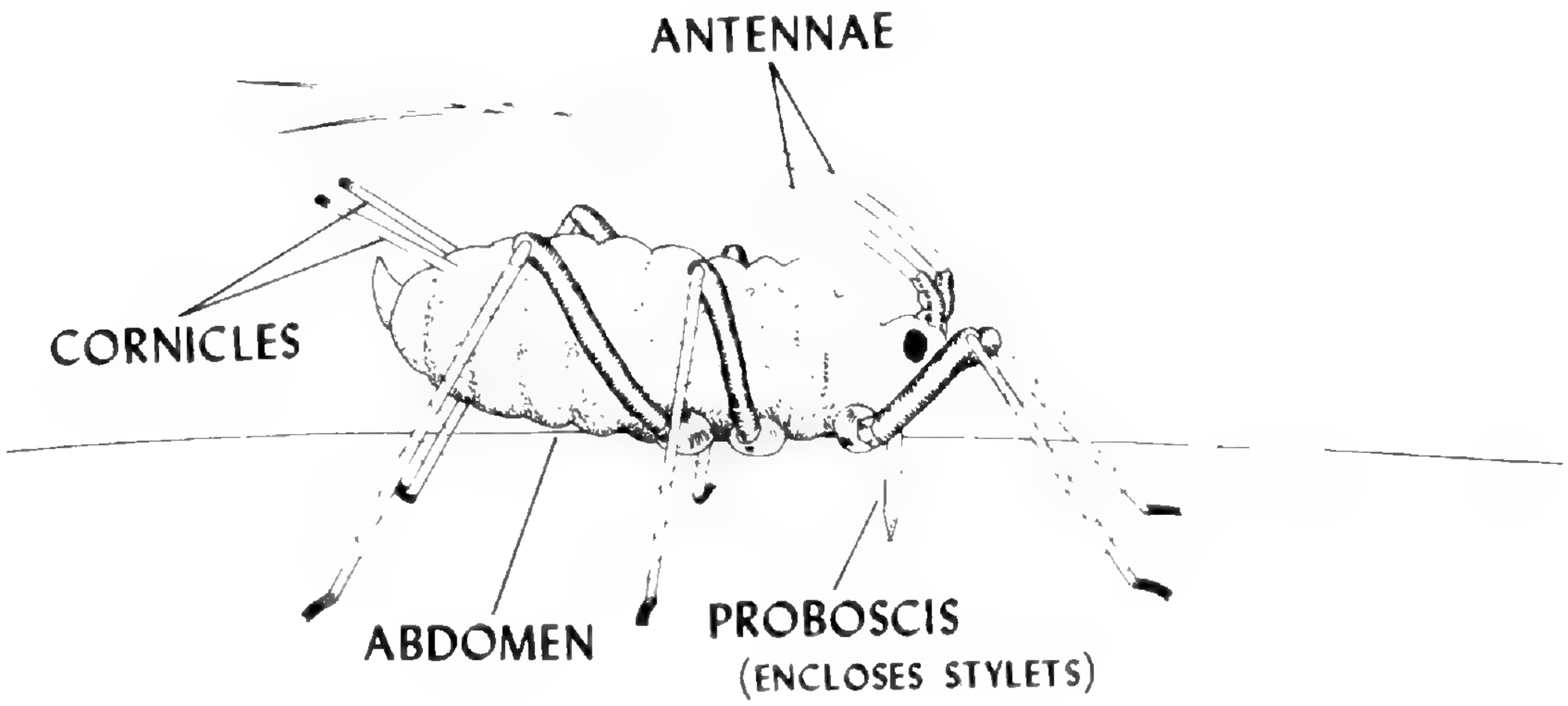
The aphid releases its "cocked" leg, kicking the sugar droplet free. The kicking motion is so quick, that you never see the droplet of honeydew, even when watching very closely.



The honeydew released, the aphid quickly resumes its "normal" position. It may repeat this sequence again after 20 to 30 minutes. From beginning to end, the process here illustrated takes place in less than 10 seconds.

The cornicles or siphons which occur on the aphid's abdomen do not secrete honeydew as it was once thought. However, a waxy substance can be squirted from these structures into the face of an enemy like a lady bug. This protective device merely slows the enemy down so that the aphid may take evasive action. I mentioned earlier that certain aphids kick the honeydew from their abdomens. Others have noticed that aphids kick when they are giving off the protective waxy substance into the face of the enemy.

The kicking is an interesting habit in connection with the voluntary release of honeydew, and in the absence of aphid-tending ants, ejecting the honeydew seems logical. But the rubbing that an aphid does of its



The parts of the aphid mentioned in this article.

own abdomen suggests a parallel to the stroking done by ants. You can, in fact, stroke the abdomen of an aphid with a hair and cause it to gently yield a drop of honeydew as it would for an ant. Another reason why it is good for an aphid to forcibly eject honeydew is that it removes the sugar that would attract possible enemies.

It should be mentioned that sucking insects other than aphids are responsible for honeydew and other forms of sugary excretions. Mealy bugs, which are usually white and wooly looking, and scale insects, which are brown and shiny appearing, both give off large amounts of honeydew, particularly in tropical climates. The jumping plant lice of Australia give off a form of honeydew which becomes crystalline and is called "sugar-lerp." Ants and people are equally fond of it. The sur-

prising thing is the amount produced—according to one account, a man can pick up two to three pounds of sugar-lerp a day!

Plant scientists have used the aphid as an instrument in the study of the sugar made by plants. From the illustrations, you can see that the aphid's mouth penetrates the surface of the leaf or stem. The mouth is a tube containing four slender hairs which are pushed through soft plant tissues into the sugar-conducting part of the plant which is called "phloem."

While the aphid's mouth is still inserted in the plant, it is possible to cut the body away from the tubular mouth, thereby leaving an open conduit to the phloem. Under pressure in the phloem, the sugary sap

Kenneth Peck

Aphids can infest a plant in such number that whole leaf and stem surfaces are almost completely covered.

will flow sometimes for several days, yielding pure sap.

Analyzing the sap from a tree can give the botanist clues to the way plants make food. The green leaf of a plant is a factory which manufactures sugar by converting radiant energy of sunlight into the chemical energy of sugar. This is perhaps the single, most important biological process we know of. Because of the marvelous water-conducting system of plants, the machinery of the leaf is supplied with enough water to keep it cool, and the sun won't scorch it to death. Some of the water brought to the leaf is also used in the sugar-making process. Consequently, the sugar formed is a liquid thicker than water and is transported to the phloem in the leaves down through the stem and into the roots. Aphids, by gathering on the soft parts of plants, can easily "tap"

the main stream of sugar from the veins of leaves and tips of branches.

More has been done toward learning how to eliminate the aphid as a pest on plants than toward trying to understand why nature allows this little fellow to make his wholesale pilferage of plant sap such a successful way of life. There is some broad indication that plants regularly lose many substances, even sugars, from their leaves during rainfalls, in quantities that can be measured in the hundreds of pounds per year per acre. Thus, plants actually add much to the soil from which they are at the same time constantly removing other materials, like water and minerals. Perhaps the aphid's removal of honeydew from trees is a small but important part of the great system of exchange that takes place between plants and their environment.

ARTS AND EDUCATION COUNCIL

MISSOURI BOTANICAL GARDEN

"SHAW'S GARDEN"

Publication of this article was made possible through a grant to the Education Department of the Missouri Botanical Garden from the Arts and Education Council of Greater St. Louis. Reprints have been prepared for use and distribution in Garden programs.

Elwynn Taylor

A cloud layer in the Climatron just above the tops of the tree ferns. The layer is only 14 inches thick and is formed and maintained in the Climatron in much the same way clouds are layered in the atmosphere above us.

THE CLOUDS OF THE CLIMATRON

Elwynn Taylor

WHEN you visit the Climatron in cold weather you can plan on finding a rain storm inside. The cool panes of the dome condense moisture from the warm, humid air within the structure. This condensation produces a regular falling of large drops of water. Most lady visitors find it wise to wear plastic rain hats to protect their hair.

During the late summer and fall, more complex weather systems may form within the Climatron. Those who work in the Climatron have observed a layer of clouds hanging all the way across it about 10 feet above the level of the entrance.

The cloud layer is normally less than two feet thick, often only six to eight inches. On the day the photograph was taken, the cloud

layer was 13 feet above the entrance level and 14 inches thick. The air temperature from the ground to 12 feet, varied from 80° to 84° F and the relative humidity went from 60% to 75%. Then in the very next foot of height, the air temperature jumped 11° F to an uncomfortable 95° and the relative humidity to 100%. Another two feet higher we found the temperature had decreased 3° to 92° F, and the relative humidity had dropped to 81%.

The cloud layer is exciting to watch and study. When one climbs up through it on a ladder he sees a sight far different from what might be expected in a greenhouse. The clouds below look like the ground mist of tropical jungles or of England in autumn.

The physical cause of these cloud layers in the Climatron is almost identical to that which causes cloud formation in the sky. A layer of very warm air overlaying a layer of cooler air forms what is known as an inversion. There is also another cooler air layer above the warm layer. The rising moisture stops and forms clouds at the inversion layer, both outdoors and in the Climatron. Most of us have seen smoke rise from a chimney, then flatten out and spread when it comes to a certain level. The smoke stopped rising when the inversion layer was reached. Inversions determine the layers of clouds in the atmosphere and also cause air pollution difficulties because they tend to layer the pollutants in the air.

The best time to observe the clouds at the inversion layer is in the late summer when the outdoors is cool and the sun is bright, a common occurrence in St. Louis the day after a cold front has passed through. If some of the large ventilating fans are running on such a day, a visit to the Climatron between 10 a.m. and 2 p.m. may very well allow you to observe this interesting aspect of the environment inside it.

(*Elwynn Taylor is a graduate student in the biophysical ecology program headed by Dr. Gates.*)

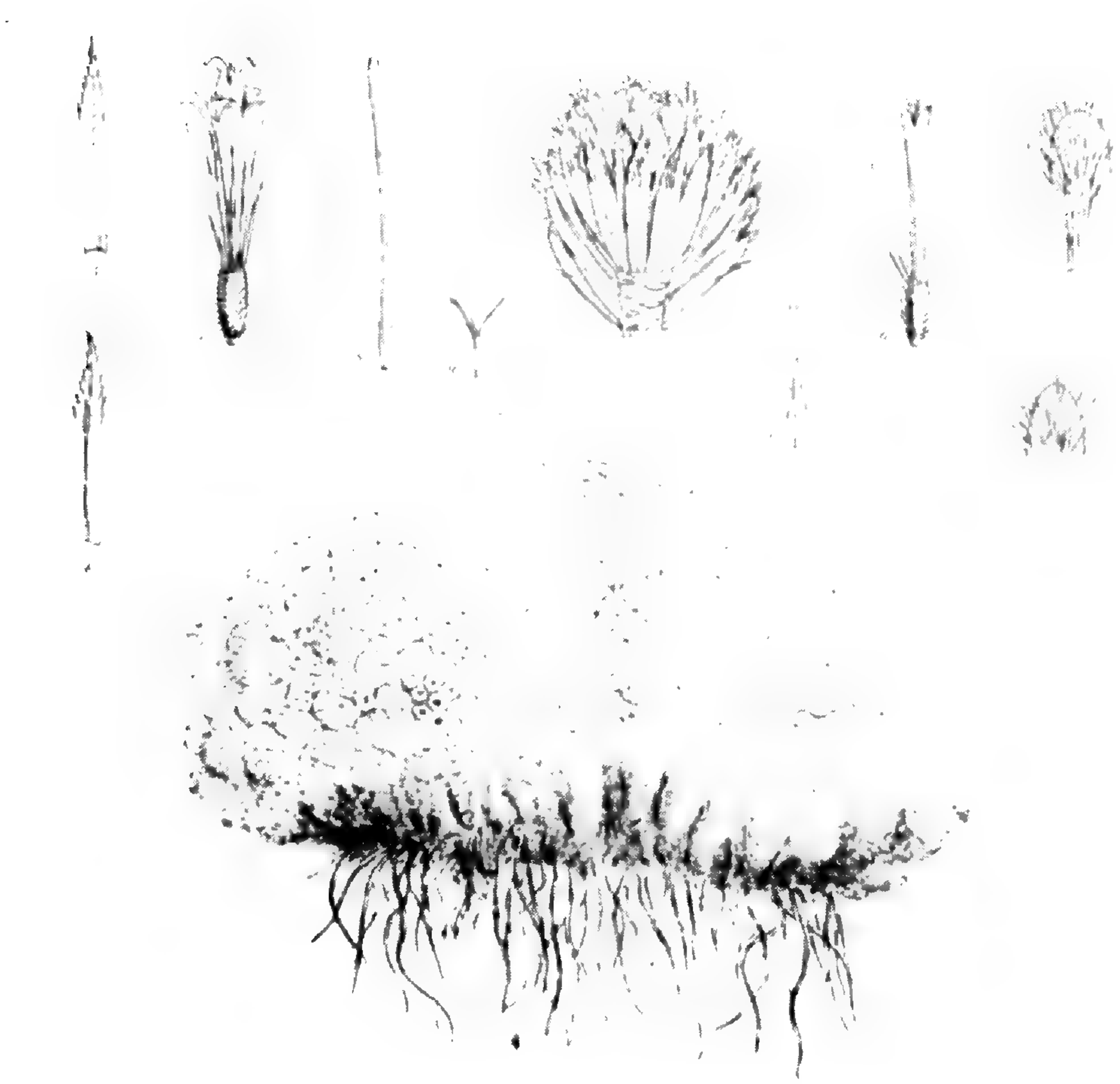
Stone Age bee-keeping

The study of pollen continues to branch out in various ways. In an international journal devoted to pollen in its various aspects a Russian scientist recently presented evidence from pollen studies that plants with a heavy yield of nectar were being encouraged in the Stone Age. E.A.

VEGETABLE SHEEP
(*Roaulia eximlia*)

David M. Gates

THERE IS, on the South Island of New Zealand, a large unusual plant, aptly named vegetable sheep (*Raoulia eximia*). Mostly white, but occasionally green, the leaf cushions of this and other related species of *Raoulia* greatly resemble in size as well as form a resting sheep when



This drawing of *Raoulia eximia* (from *Illustrations of the New Zealand Flora* by Cheeseman and Hemsley, 1914) shows an entire plant as well as individual parts of this odd member of the composite family: 1. Branch end with flower-head, 2. & 3. Leaves, 4. & 5. Bracts (modified leaves under flowers), 6. & 7. Florets, 8., 9. & 10. Pappus-hair, anther, and style-branches of a floret.

David M. Gates

Professor W. R. Philipson of the University of Canterbury at Christchurch, New Zealand, is shown here with a large specimen of the extraordinary vegetable sheep plant which grows on the South Island.

viewed at any distance. In closeup photographs, these oddities look like immense well-trimmed cauliflower heads. Vegetable sheep are found on the dry rocky faces of the mountains.

The *Raoulia* cushions are all constructed on the same plan. Above, the stems branch again and again and towards their extremities are covered with small, wooly leaves, packed very tightly. Stems, leaves, and all grow into a dense convex mass. Within the plant is a peat made of rotting leaves and branches which holds water like a sponge, and into which the final branchlets send roots. Thus the plant lives mainly on its own decay and the woody main roots serve chiefly as an anchor.

IS IT A ROCKET?

Kenneth Peck

NO, IT'S NOT even okra! It's just an *Oxalis* fruit loaded with viable seeds that will soon be dispersed and producing new plants. As a weed, *Oxalis* is a double threat: On one hand, it survives most selective weed killers and on the other hand, it has a devastatingly effective means of seed dispersal. This says nothing about its powers of vegetative growth.

Oxalis leaves are trifoliate and bring the term "shamrock" to the lips of some who see it. Common names for this plant include: wood sorrel, lady's sorrel, sheep sorrel. It has a tart taste that is somewhat pleasing to children. Leaves of most of our weedy kinds are pale green through yellow-green to almost green-red-purple. The flowers are invariably yellow, although white and magneta are common among those forms of *Oxalis* grown on purpose. Each flower is capable of producing one of the fruits illustrated above.

The theme here, of course, is the fruit and the way it disperses its seeds. The fruit is elongate, from one-quarter inch to nearly an inch long, and the surface is generously clothed with stiff-looking hairs. Looking at it end-on, it is star-shaped with five points. It is these points which form the ridges along the length of the fruit. When nearly ripe, the fruit ruptures along the ridges. Some time after, seeds are forcibly released, often in several directions at once.

The mechanism of seed release appears to be a simple affair—perhaps much simpler than what a man would design if he were assigned the task of devising the release mechanism for the plant, although it

Kenneth Peck

The familiar *oxalis* with its ripening seed pods.

challenges the imagination as to how and why such a device came to be. The seeds are lined up inside the ridges and each one is enclosed in a smooth, shiny, white rubbery jacket which is attached to the central axis of the fruit. The seeds are ejected when this jacket shrinks from drying and literally turns itself inside out with such violence that the seeds are virtually launched into a respectable trajectory.

I have, on occasion, heard these fruits discharging their missiles in greenhouses when it was very quiet and where *Oxalis* can be at its weedy worst. If you would care to have an interesting experience, take a fruit which is nearly ripe and roll it gently between your thumb and forefinger. This is not the kind of thing you will be burning to pass on to your children, but it will give you some ideas as to the force of seed release and, at the same time, aid in the spread of a noxious weed.

WHO, WHAT, WHERE, WHEN

A Souvenir and Guide Book to the Garden is now available. This full color book is being sold in several places, including the Garden Gate Shop, the Main Gate, and Tower Grove House.

The garden is very fortunate to have received a five-year grant from the Ford Foundation for the development of a training program for graduate students and post-doctoral scientists in biophysical ecology. The grant totals $420,000. Dr. David M. Gates, Director of the Garden and a pioneer in biophysical ecology, will direct the program.

The U. S. Atomic Energy Commission has granted the Garden a continuation of its contract for ecological research and training. AEC will provide the Garden with $24,800 for an additional year of the program. These grants will make the Garden one of the leading centers for ecological research and training in the world.

Frances Perry, noted English author, horticulturist, and lecturer, visited the Garden in April. She was touring the United States, giving a series of lectures before well-known garden clubs. Although no lecture was scheduled in St. Louis, Mrs. Perry wished to visit the Climatron and waterlily facilities, and also to renew acquaintance with George H. Pring, superintendent emeritus, who was instrumental in developing 40 *Nymphaea* hybrids. The name Perry is well-known in England, and also to all water gardeners in the English-speaking world. Frances Perry is related to the "House of Perry" or Hardy Plant Farm in Enfield, leading waterlily nursery in the British Isles. She has written 12 books including "Water Gardening," one of the first books to deal with this phase of gardening. The most unusual of Mrs. Perry's many honors is her appointment as the first woman on the Council of the Royal Horticultural Society.

The Friends of the Garden held a picnic on Sunday afternoon, April 21, at the Arboretum in Gray Summit. Skies were clear and wildflowers were at their peak of spring bloom. Brass band tunes by the Edelweiss Musikanten added to the festivity of the day. The picnic was a great success, enjoyed by all; a suitable finale to the Friends of the Garden's 1967-68 season.

The University Theatre of St. Louis produced "Teahouse of the August Moon" during the first week of May. Since the stage play has its locale in Okinawa, one of the most famous islands in the Ryukyu archipelago, the director of the play asked to have publicity pictures taken in the Climatron, where many Okinawan plants are grown, such as sago, rice, sugarcane, banana, ferns, and orchids. In conjunction with the performance, the Garden staged an educational exhibit telling about the island's principal plants. The Garden plays an important role in many community projects.

Mrs. Virginia M. Brewer is the new manager of Tower Grove House. Originally from Iowa, Mrs. Brewer has spent the past 20 years traveling as a customer service representative for Remington Rand. With her great interest in people and places she has always enjoyed exploring the many cities and town to which business has taken her. We welcome her to the Garden.

The St. Louis Herb Society held its annual plant sale May 3 and 4 in the greenhouse concourse at the Garden. Included in the sale were most of the culinary "greats" as well as many of the old-fashioned housekeeping, medicinal, and beauty herbs. This was the Society's greatest sale to date from a monetary standpoint. Customers were waiting in line long before the doors were opened. The sale offered local herb enthusiasts a golden opportunity to start an herb garden or to expand and round out a collection. Jan Verdonkschot, executive chef at the Missouri Athletic Club, and Harris Armstrong, professional architect, helped with the publicity.

Claude Johnston Photos

Harris Armstrong, architect, samples his green salad prepared for members of the St. Louis Herb Society.

Customers enjoy the scents of various herbs while shopping at the Herb Sale.

A portion of the Missouri Botanical Garden exhibit at the Homeowners' Field Day where staff members held a question-and-answer clinic.

THE FIFTH ANNUAL HOMEOWNERS' FIELD DAY, featuring many exhibits and demonstrations on grasses, trees, and decorative plants, was held from noon until 5:00 p.m. on Sunday, May 5, at Tilles Park in St. Louis County. The event, attended by an estimated crowd of 5000 persons, was sponsored by the St. Louis County Extension Center in cooperation with the Missouri Botanical Garden and leading nurserymen of Greater St. Louis. This was the first year the Garden was asked to participate, and an exhibit of decorative house plants and herbs was staged. Lad Cutak, Claude Johnston, Mark Paddock, and Ken Peck answered hundreds of questions.

HUGH CUTLER AND LEONARD BLAKE traveled to Santa Fe, New Mexico, to discuss their recent work on the origin and evolution of corn and squash at a three-day symposium on Problems of pre-Columbian New World Contacts. Dr. Cutler presented a paper entitled *Travels of Corn and Squash*. The symposium was arranged by the Geography and Anthropology Departments of Southern Illinois University for the annual meeting of the Society for American Archeology. Most archeologists who excavate remains of corn or squash send them to the Garden for study.

Friends of The Garden

The Board of the Friends of the Garden held their May meeting in Dr. Gates' home.

The organization now has (through April) 2820 active members. The Board asks all Friends to continue the good work of soliciting new members and to consider increasing individual tax-deductible contributions.

The Friends' attendance at the Previews has grown by leaps and bounds. There were approximately 1200 at the Orchid Show, or perhaps you noticed the crowd. In the future, guests will be welcome at the previews at a charge of $1.00.

The Garden Gate Shop has grown to be one of the finest of its kind in our area, due not only to the hard work of its staff but also the patronage and interest of its many customers. In December the Shop presented the Trustees of the Missouri Botanical Garden with a check for $10,000. The patio behind the shop is under construction and will soon be available for displaying outdoor merchandise.

Claude Johnston

Enjoying a morning meeting in the Directors' Residence are the members of the 1967-68 Friends of the Garden Board: Mrs. Charles Limberg, Mrs. Thomas Collins, Jr., Mrs. Joseph Lewis, Mrs. J. Lionberger Davis, and Mrs. Bourne Bean.

A NEW GUIDE PROGRAM

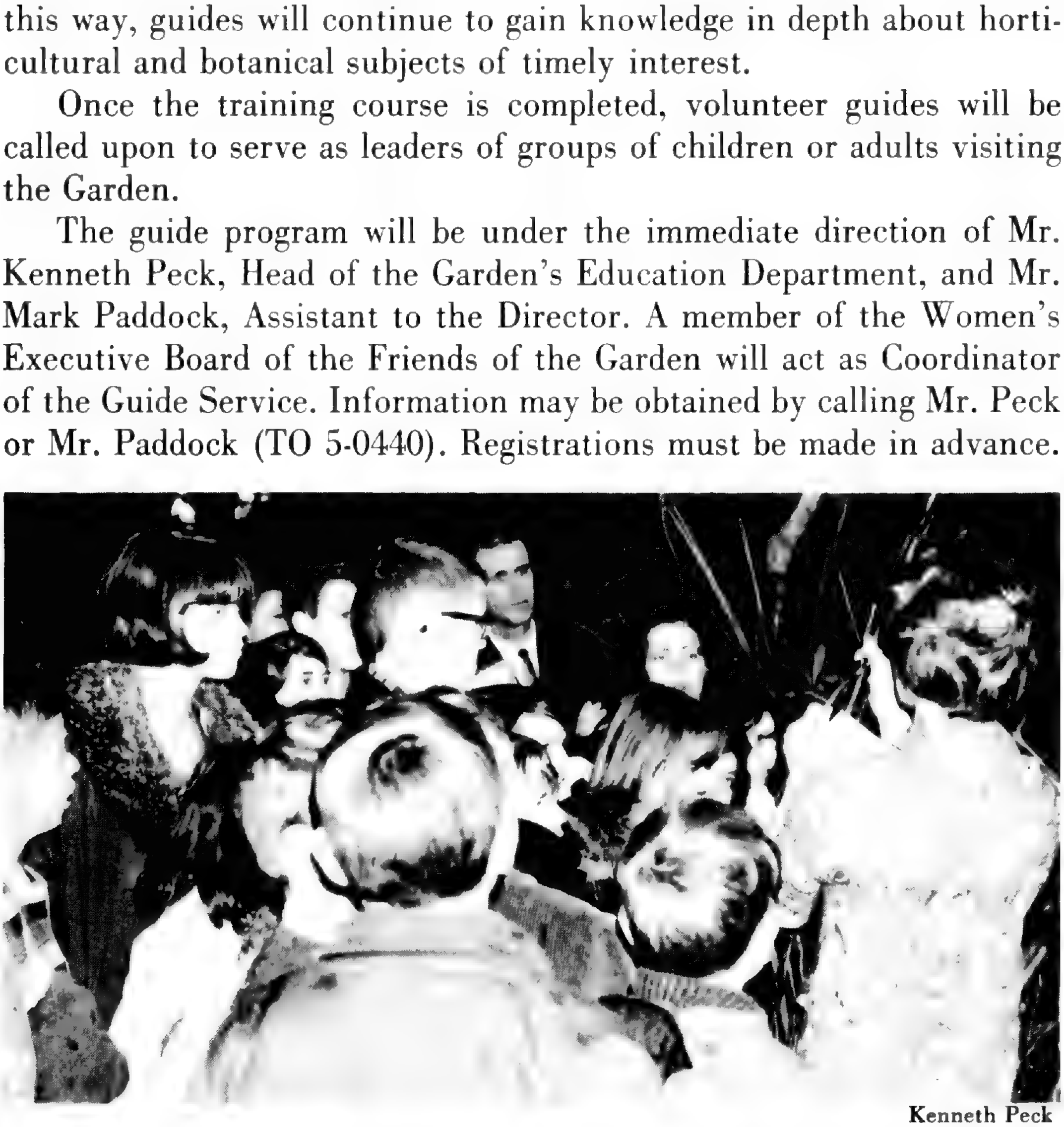
Mark Paddock

THIS FALL the Missouri Botanical Garden is beginning a training program for volunteer guides. This will be volunteer work of the finest sort, as these guides will have the opportunity of gaining as much as they are giving.

A comprehensive course of instruction will begin on September 17 and last for eight weeks. The course is planned to give participants an understanding of botany, horticulture, and the behind-scenes operation of the Garden. After the eight-week course, there will be regular meetings and discussion periods led by the Garden's professional staff. In this way, guides will continue to gain knowledge in depth about horticultural and botanical subjects of timely interest.

Once the training course is completed, volunteer guides will be called upon to serve as leaders of groups of children or adults visiting the Garden.

The guide program will be under the immediate direction of Mr. Kenneth Peck, Head of the Garden's Education Department, and Mr. Mark Paddock, Assistant to the Director. A member of the Women's Executive Board of the Friends of the Garden will act as Coordinator of the Guide Service. Information may be obtained by calling Mr. Peck or Mr. Paddock (TO 5-0440). Registrations must be made in advance.



Kenneth Peck

A good program for guides is a key to the public's understanding of the Missouri Botanical Garden. (A tour of the Climatron is shown here.)

The Missouri Botanical Garden Calendar

(JULY and AUGUST, 1968)

July 3 thru August 25	SUMMER FLOWER SHOW: begonias, caladiums, coleus, fuschias, gloxinias.
July 21	BIRTHDAY CONCERT in memory of Henry Shaw by the Repertory Opera Theatre. Enjoy birthday cake and lemonade to Shaw's favorite tunes. East lawn, Tower Grove House. Admission free; only gate fee required. 2:30-4:00 p.m.
July 23 thru August 23	PITZMAN NATURE PROGRAM Second Session for Children. Tuesday/Thursday and Wednesday/Friday sections from 10:00 a.m.-3:00 p.m. Admission is free. Pre-registration is required.
August 6, 13, 20	PREPARATION AND CARE OF LAWNS. Course will be taught by Raymond Freeborg in the Museum Building from 7:00-9:00 p.m. Friends of the Garden, $5.00; $6.00 to others.

BOTANICAL BOOKS

David M. Gates

IF YOU HAVE in your possession, or know of someone else who has, rare or unusual botanical, horticulture, or gardening books, please consider donating them to the Library of the Garden. The Library of the Missouri Botanical Garden is among the finest in America today because of the generosity and foresight of many people who have contributed generously their own private libraries concerned with the subject matter of plants.

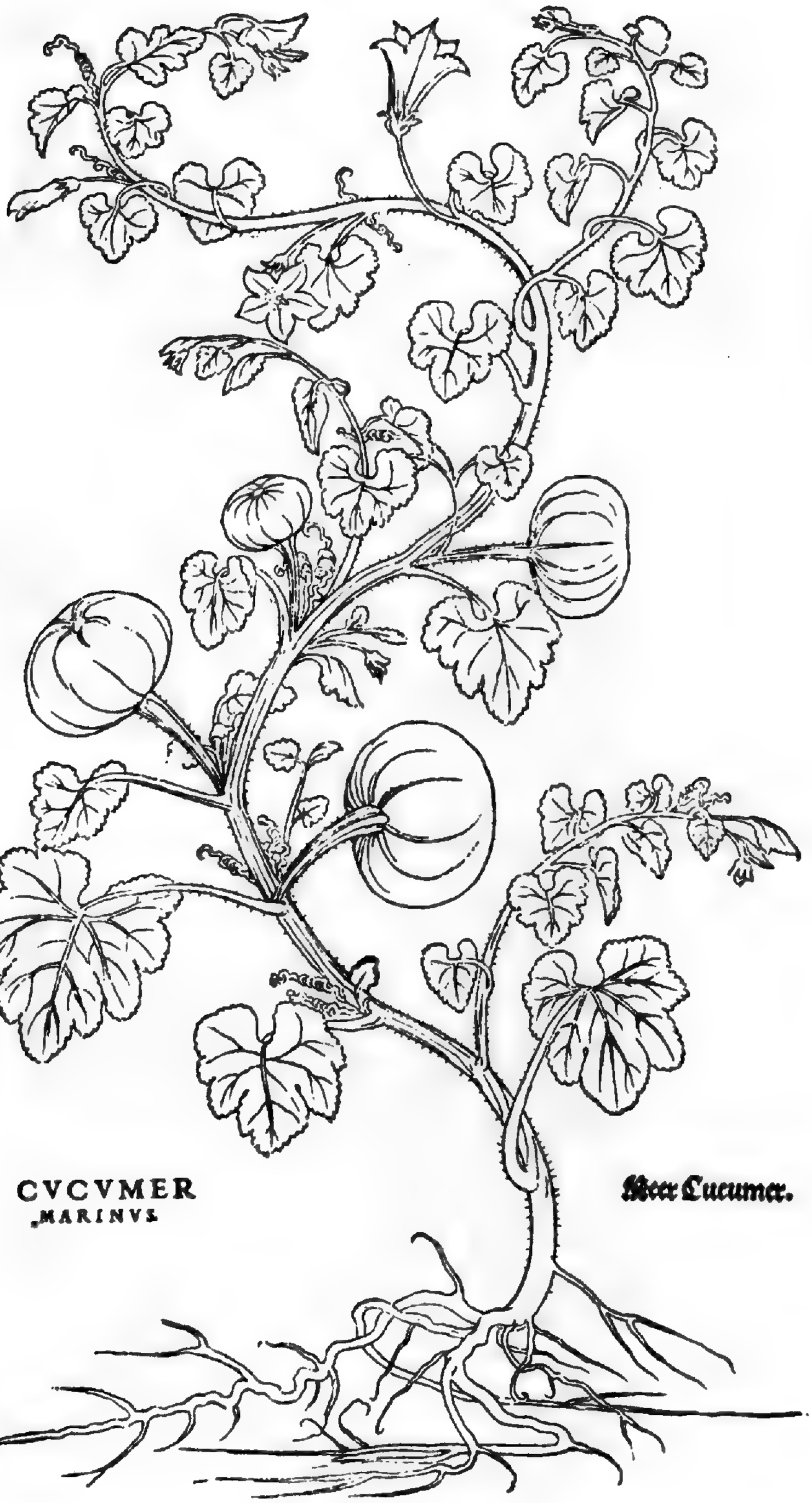
Do not assume that we have all of the books on botany or that we do not wish to receive more. Very often the copies we do have are badly worn or are in a state of disrepair, or are missing an occasional plate or page. It is quite likely that an unusual or rare book in your possession may nicely fill in a vacant spot on our shelves or add a second copy of a much used important piece of reference material.

Visit Your Missouri Botanical Garden

(SHAW'S GARDEN)

MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME LVI NO. 5 SEPTEMBER-OCTOBER 1968



Remember that we have the unusual gifts for your gardening friends...

THE GARDEN GATE SHOP/at the main gate/Tower Grove and Flora

MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME LVI NO. 5 SEPTEMBER-OCTOBER 1968

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EDITORIAL & PUBLICATION OFFICE
Missouri Botanical Garden
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FROM THE DIRECTOR

THE ENVIRONMENTAL bomb has been lit. It is not a question of whether or not it will explode. It is already detonating and our beautiful green world of plants, animals, people, water, soil, and atmosphere is being ravaged and destroyed.

We all believe that people are entitled to the highest quality of the basic human rights of life, liberty, and the pursuit of happiness, but mankind today is already denying future generations this heritage. As Congressman Daddario of New York has written recently: "We have between 30 and 70 years to reverse the destructive trends which a sprawling acquisitive humanity has created for itself. After that it will be too late. Too late to stem the human tide. Too late to control the eradication of resources. Too late to halt the pollution of Earth. Too late for anything except to witness the gradual sinking of our standard of living and the erosion of personal liberty."

The Missouri Botanical Garden can help solve some of these major issues that face mankind. The Garden is uniquely and pre-eminently qualified to give major assistance to man's well being in the future as it has in the past.

With your support, the Missouri Botanical Garden can continue its work and increase its contributions to all of us.

David M. Gates

GARDENING IN ST. LOUIS

September and October

THE HOT SEASON is behind us and gardens are aiming toward their fall peak of bloom. Asters and chrysanthemums are among the most rewarding perennials at this time of year. Roses also will perk up and come through with their late season blaze of glory. The annual zinnias, marigolds and petunias get a new lease on life.

As always, the blooms on the top depend on what's underneath, so make sure flower beds have enough moisture. Mulching holds moisture in the soil. If the summer sun kept you away from the hoeing department and the soil has baked hard, work that crust with a hoe or cultivator so that water can more easily soak in, being careful of shallow roots.

Thoroughly soak bluegrass lawns once a week. Lawns should be fertilized in early September. Seeding of bluegrass is best done at this time also. Mow lawns as long as they continue to grow.

Fall is ideal for setting out new shrubs and trees. Spring flowering perennials can be divided and transplanted now. Plant for next spring's early bloom; Narcissus and madonna lilies should be planted in September; Hyacinths and tulips in October and November. The ideal depth for planting bulbs is three times the height of the bulb, except for the madonna lilly which should be planted about 1 inch deep.

If summer's motto is "beat the heat", fall's slogan should be "beat the freeze". All planting and transplanting should be done before ground is frozen.

Miniature tulips, daffodils and other small bulbs may be started in pots now to bloom inside this winter. Place in potting soil with tops of bulbs just beneath soil surface, water, and place in dark, cool (40°-50°) place till they sprout (20-90 days depending on variety). Bring pots in the house keeping them cool, well lit, and watered. Winter blooms are a joy during your garden's off-season.

Set up a cold frame to over-winter hardy plant materials that didn't get into the garden last summer.

THE NORTH AMERICAN PUMPKIN

Hugh C. Cutler

ON OUR COVER is a photocopy of an illustration in Leonhart Fuchs' *De historia stirpium*, which was published in Basle in 1542. This, the earliest representation of our pumpkin of Halloween and Thanksgiving, must have been made from plants grown in Europe for the details are accurate and the graceful arrangement suggests a living plant more than a dead specimen.

Professor Erna Eisendrath of Washington University made a study of some early botanical illustrations and discovered that, though Fuchs had worked from a living model, most of the better known botanical works for over a hundred years later copied his illustrations. Some of these copies were reversed because Fuchs' print was traced directly on the new woodblock. In many cases the copies were greatly reduced in size. Fuchs had emphasized the lobed leaves and ridged and prickly fruit stem so well that even in a small copy published by Johannes Bauhin in 1650 we can recognize the plant as being the pumpkin of northern North America and not one of the four other cultivated species which were confined to Latin America and our Southwest at the time of Columbus.

Familiar cultivated varieties, or cultivars, of the same species (*Cucurbita pepo*) are Connecticut Field pumpkin, Acorn squash, Summer Crookneck squash, Italian or Zucchini squash, and White Bush Scallop squash. Usually the name pumpkin is applied to coarse and strongly flavored fruits utilized when ripe as forage, as a table vegetable, or in pies. Squashes are finer textured, milder flavored cultivars used immature, or when mature are baked, boiled, or in pies and less commonly used as feed for livestock. This separation does not always hold up. Italian or Zucchini squash is usually eaten when very young

but the mature fruits are usually coarse, strongly flavored, orange, and differ very little except in shape from the Halloween pumpkin.

Squashes and pumpkins are among the oldest food plants in the New World. In Salts Cave, one of the caves in Mammoth Cave National Park, archeologists have found small warty squashes which were left by Indians about 2400 years ago. These fruits are much like some of the smaller squashes advertised in seed catalogs today. In northern Mexico, squash seeds and fruits have been found in 9000 year old levels of the Ocampo Caves. These must have come from wild or weedy plants gathered by these early Indians for this is before agriculture is considered to have begun in this region. By 7000 years ago several kinds of squash and beans were being grown in northern Mexico. Corn slightly later.

Many gardeners have grown small, yellow-flowered ornamental gourds for decorations. These gourds are so much like some of the wild squashes of Texas and northern Mexico that it is sometimes impossible to tell them apart. The usually larger, white-flowered bottle gourd or dipper gourd is a distant relative of the small ornamental gourd and in a different section of the squash family. While the small ornamental gourd will hybridize readily with many edible pumpkins and squash and with some wild squashes, none of these will hybridize with canteloupes or watermelons.

* * *

THE MIGRATION OF A PLANT

Kentucky Bluegrass Followed Settlers of New World

Dr. Robert W. Schery

KENTUCKY BLUEGRASS, *Poa pratensis*, has made its mark as one of the most widespread and "successful" of the higher plants. Throughout history, Kentucky bluegrass has increasingly enhanced its world position, for it followed man as he felled trees and turned soil. It is a true grass, a member of the *Gramineae*, one of the plant kingdom's most useful families. We all depend upon grasses—for grains that make bread, for forage that nurtures our livestock, for the cover that holds our soil, for sugar, for certain essential oils and medicinals, and even for beer.

Except for a small percentage of instances in which there is true sexual crossing, the seed of Kentucky bluegrass is identical with the mother plant on which it is borne. This type of asexual reproduction, known as apomixis, is analogous to cuttings or live starts in other grasses and horticultural plants. Apomixis has been regarded as a relatively advanced character, and often is associated with polyploidy, the doubling of the chromosomes (in the case of Kentucky bluegrass, repeated and seemingly irregular duplication).

For the bluegrass seed industry, apomixis is a boon; it is necessary to find only one plant of unusually desirable features, and propagate from it by seed. This has been the chief means of discovering new bluegrass varieties, rather than the more involved crossing of isolated parent plants. By the same token, the system imposes limitations, and it becomes difficult to cross bluegrasses of two different types in order to combine desirable features of both parents in the offspring.

Not much is really known about the hereditary make-up of Kentucky bluegrass other than that it is mixed and has an extremely wide range of chromosome numbers—ranging from less than 50 to more than 200 in some polyploids. With such a diverse genetic complex to choose from, there is almost no need for the plant breeder to attempt sexual crossing.

One of the original antecedents of Kentucky bluegrass may have been diploid *Poa pratensis*, native to southeastern Europe, with a chromosome number of possibly only 14. In its subsequent peregrinations there has occurred a grand genetic mix-up, perhaps with other bluegrasses, and certainly involving a great deal of duplication and

This drawing is after a woodcut from a 1640 Parkinson herbal and refers to bluegrass as "Medow Grasse." The plant is shown at seeding time, June in St. Louis. Each shoot that becomes a seedhead will die, and the basal tillers must fill in to create an attractive turf.

variation in chromosome sets. The resulting complex—the present-day *Poa pratensis*—may represent a synthesis of several species.

Bluegrass is a "cool-weather" grass, as distinguished from "warm-weather" grasses such as Bermuda, *Zoysia*, Bahia, and other southern types. While the latter flourish in the heat of summer, bluegrass physiology is adjusted to a lower optimum temperature. In those regions or seasons where temperatures range between 55° and 80°F., Kentucky bluegrass is at its glorious best. The food build-up from photosynthesis exceeds its dissipation, and there is abundant thickening, quick revival, and beautiful color. Growth slows when temperatures approach freezing, but the health of the grass is in no way impared. Kentucky bluegrass can stand crisp freezes without harm and with scant blemishing; in middle latitudes it is not until after Christmas that its sods begin to show the effects of winter.

The grass is primarily spread by underground runners called rhizomes, which weave a firm sod. If the stembuds at the crown of the plant grow upward instead of sideways, they form new shoots (culms) called tillers, which thicken the stand of grass. This is characteristic of growth during autumn, when, incidentally, the leaves are short and bend low in response to the declining day length. Rhizomes may be produced almost any time the growing weather is favorable, particularly with plants that are not crowded (sod-bound) and are rooted in loose soil.

With "wild" bluegrass, enough rain to keep the grass green during

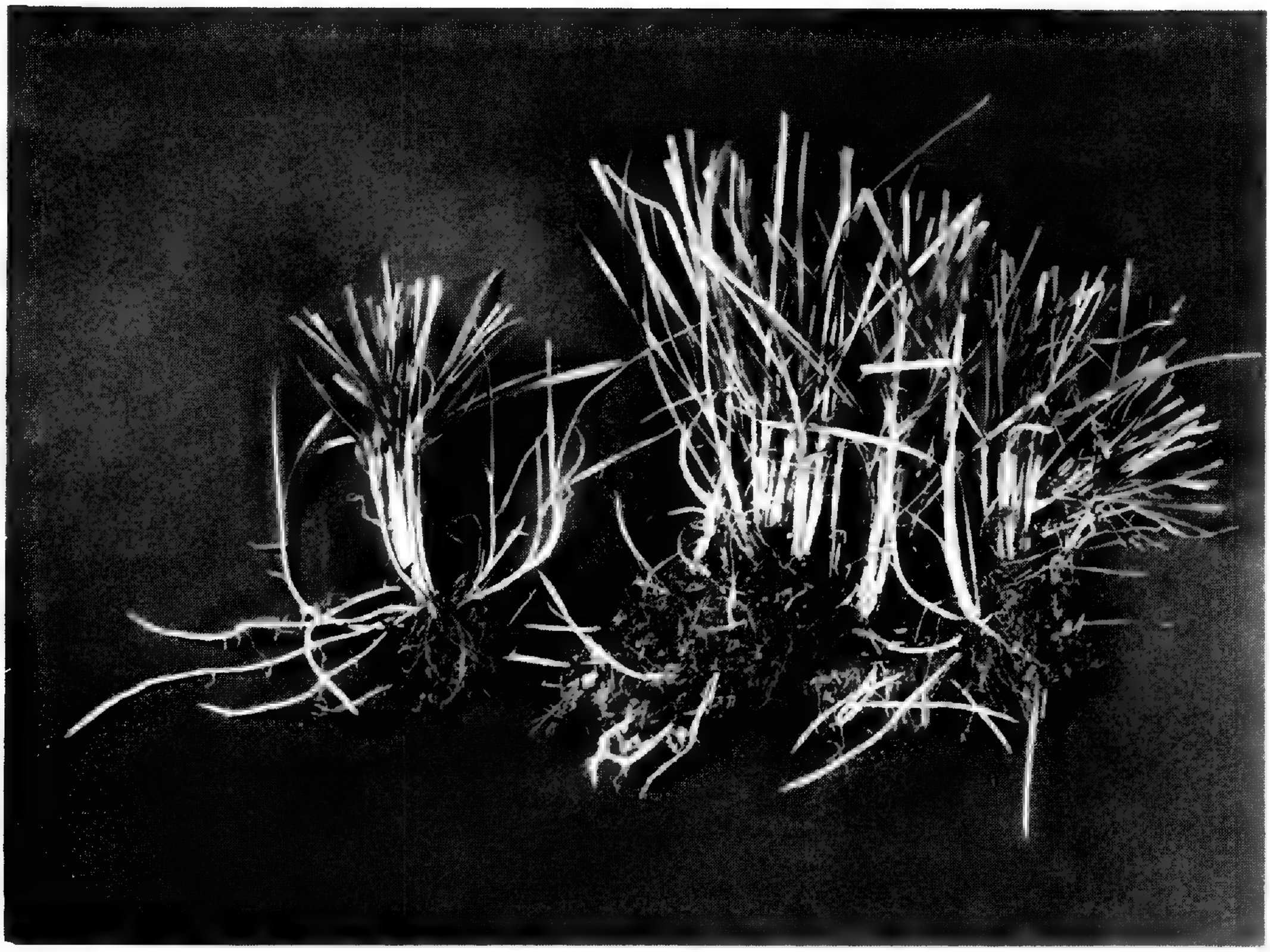
the good growing weather of autumn augurs well for a fine seed crop the following June. Many fat shoots will initiate a primordial inflorescence, or seed head, about Christmastime, as temperatures drop to near freezing. Short day length is also necessary; plants kept in a lighted greenhouse will not set seed. In spring, each culm that is to become a seed head carries characteristic, stubby "flag" leaves with a bluish sheen; the seed stalk becomes tough, and for a couple of weeks during late spring it is difficult to mow neatly. Each culm that bears a seed head will die, to be replaced by side tillers. Even the healthiest of bluegrass will experience a temporary downturn in early summer, and the regaining of its resplendency depends largely upon how quickly and fully the new tillers take over. Obviously, tiller resurrection will be more adequate in favorable climates with coolish nights.

There will be some differences in growth pattern depending upon the variety or selection, but research has indicated the marvelous plasticity of natural Kentucky bluegrass. Plants brought together from north and south, east and west, dissimilar in their appearance where they grew, all gradually mold to an essentially identical norm when grown side by side. The reason for this adaptability is not altogether known; probably it is because of the tremendous genetic reservoir that gives bluegrass a broad base compatible with most environments.

Kentucky bluegrass populations differ as the plant extends its range. In this country it seems to have behaved according to Vavilov's hypothesis that greatest variation occurs at the center of origin and dispersal. It looks as if the lower Midwest, Kentucky in particular, where bluegrass was known early and widely planted, served as the seat of dispersal. Even today, Kentucky seems to carry the largest bluegrass gene pool of any area. From this center, particularly successful hereditary combinations appear to have migrated rapidly outward, especially pushing northwest. Collections of specimens from North Dakota and Minnesota exhibit a narrower range of variation and express a more characteristic phenotype (physical appearance) than in Kentucky, where no single expression seems to have dominated the population.

This, then, is Kentucky bluegrass as we have it today—one of the most nutritious pasture grasses, an excellent soil builder, and the most widely used quality lawn grass. How came this change from diploid vagrant to polyploid world colonist, from unnoticed adventive to pampered lawn grass?

It is probably a good assumption that Kentucky bluegrass originated in Europe or the Near East, where semi-domestication and the chance



Lawn Institute

Clumps of "wild" or natural Kentucky bluegrass pulled up to expose roots and rhizomes. The many above-ground stems arising from the crown are tillers that serve to thicken the grass in the lawn, while the snake-like stems spreading sideward are the rhizomes which will turn up some distance from the parent plant to create a daughter plant.

for intercrossings leading to polyploidy have been so notable with many cultivated plants. The early Greeks had a word for it, although it merely signified "fodder herb" or "forage grass." This "pua" of Euripides and Eubulus has been verified as a floral constituent of the Peloponnesus, where the climatic cycle has a summer moisture deficit similar to that of our Midwest. It is also identified by Professor G. Hausman, Director of the Experiment Station of Field and Pasture Crops at Milan, as a "grass found in every part of Italy, especially the mountain districts." What is probably *Poa pratensis* flourished in southeastern Europe in pre-Christian times.

No doubt the Romans grazed their chargers on bluegrass as their legions marched on Heidelberg and Paris. Garibaldi's palace at Innsbruck was described as having a lovely lawn, probably of bluegrass. The herbalists of the Middle Ages made recognizable woodcuts of bluegrass, which they called "meadow grass" or "June grass" in the polynomial descriptions prevailing before Linnaeus. They verify cog-

nizance of bluegrass by the Greeks, mentioning its medicinal properties as prescribed in ancient Greek tomes. By the time botanical identification had become a science, bluegrass was known throughout the continent. It was Linnaeus, in his *Species plantarum*, who gave it the *Poa pratensis* designation—*Poa* after the old Greek; *pratensis* meaning "of the meadow." Today, in all its variations, it is universally known as *Poa pratensis*, although through the years scores of common names have been accorded it.

At the time of the discovery of the New World, *Poa pratensis* was widely spread throughout northern Europe, even though given scant attention in an age when pastures were taken for granted and cultivated lawns scarcely yet "invented," although formal estate gardens were the vogue. Was bluegrass also in Asia, the North Atlantic islands, in North America itself? We can only guess. Circumstantial evidence suggests that it was not. Glacier-capped islands of the North Atlantic make poor stepping stones, and there are no herbarium specimens to indicate that bluegrass came from the inhospitable wastes of Siberia across the Bering Sea to Alaska, and thence into the western United States. That it was not in North America when the first colonists landed at Jamestown is indicated, too, by the fact that it was never given an Indian prefix in the colonial records, a custom with newly discovered plants such as Indian corn (maize). Most likely it was merely a chance passenger on the early ships bringing colonists and cattle to the new land—taken for granted, if it was noticed at all. There are no exact records, but then who would report to Raleigh about grass while exploring a new continent beset with "treasure" and mystery?

Yet the early records of the Jamestown colony, and of subsequent settlements in eastern North America, leave no doubt that bluegrass could have gained a foothold. There are many mentions of tilled lands and gardens, prime habitat for bluegrass. Thomas Harriot's *A Brief and True Report of the New Found Land of Virginia*, 1588, includes a notation that "we found topsoil deeper, we saw there more and larger fields and finer grass, as good as any in England . . . more English cattle should be transported; likewise our varieties of fruits, roots and herbs . . . some of them have already been sown and have grown well . . . "

Other reports of "English grass", as bluegrass mixed with white clover was termed in those days, attest to familiarity that implies Old World origin. Captain John Smith, in 1629, reported "James Towne is yet their chief seate most of the wood destroyed, little corne there

planted, but all converted into pasture and gardens; wherein doth grow all manner of herbs and roots we have in England in abundance and so good grasse as can be . . . " William Penn told of sowing English grass, and Thomas Jefferson mentions it repeatedly. By Revolutionary times there were many names for *Poa pratensis*—at least twenty-seven have been counted—including "blue grass," so called by Thomas Jefferson in his *Notes on Virginia*, 1782. Other names were green grass, Junegrass, meadow-grass, and greensward grass.

Trained botanists did not set foot in America until the mid-eighteenth century. Peter Kalm observed bluegrass in 1749, indubitably *Poa pratensis*, abundant along the St. Lawrence. Gronovius listed it—no mistaking the identity—in his *Flora virginica* of 1762. And there are reports of "seas of grass," of uncertain bontanical definition, greeting Boone when he first left the Yadkin Valley of North Carolina for his explorations into Virginia's western territory, known as Caintuck. Indeed, Caintuck, eventually Kentucky, is said to have meant "among the meadows" in Indian language.

It is not known how bluegrass first reached Kentucky. One report, difficult to varify, mentions an Irishman, John Findley, who paddled down the Ohio River from Pennsylvania, and then up the Kentucky River to trade with the Shawnee in 1752. Findley is said to have built a cabin and stockade, and to have scattered "English hay" that had been packed around his cargo. Was this the first introduction of the grass that was to be named for the eventual state of Kentucky? A John Finley—perhaps the same person—is also reported to have engaged Daniel Boone to act as his guide across the old "warrior's path" from the Blue Ridge into Kentucky, in 1769. Might this, or other Boone expeditions, have carried bluegrass seed into the state, either by chance or by intent?

While these speculations may be worth considering, the most likely explanation is that *Poa pratensis*, noted so widely in French Canada by botanist Peter Kalm in 1749, may have been carried down into the Illinois country by French missionaries in the late seventeenth century, and from there spread along the waterways, by-passing the mountains, to what is now Kentucky. The missionaries may have intentionally brought in bluegrass seed as they were wont to do with seeds of other plants. Marquette and La Salle had opened missions in Illinois as early as 1762 and 1682, and there were settlements at Kaskaskia, Illinois, by 1700, and at Vincennes on the Wabash River by 1702, a half century ahead of John Findley's Indian trade in the

same general area. Both settlements were flourishing when visited by Charlevoix in 1721. It is likely that bluegrass was poised just north of Kentucky, or introduced there, before Boone visited the land he opened.

Interesting support of the belief that bluegrass may have naturalized in the Midwest is given by letters written in 1818 by an Illinois resident named Birkbek: "Where the little caravans have encamped as they crossed the prairies, and have given their cattle hay made of these perennial grasses, there remains everafter a spot of green turf for the instruction and encouragement of future improvers—a fact which, I think, is conclusive against the prevailing notion that the natural grasses, as they are called, are the best adapted to soil and climate." It is well accepted that the North American prairies were entirely of grasses that turn brown in winter; Birkbek's observation suggests that Old World introductions were present where travelers encamped.

There are those who claim that the bluegrass that made Kentucky famous actually came from southern Indiana, brought back by the returning volunteers who fought with Harrison at the Battle of Tippecanoe in 1811. It was reported that the soldiers discovered the superior qualities of bluegrass and, when they returned home, sowed the seed on limestone soil. A present-day farmer, C. Henry Baum, Jr., of West Lebanon, Indiana, maintains that General Harrison camped in his grove at both start and finish of the Tippecanoe expedition. He believes that the bluegrass seed in question was gathered from his farm. Similar claims are made for a spot five miles north of Crawfordsville, where a Federal penitentiary now stands near Terre Haute (the seed reportedly sent to Henry Clay in Kentucky by his brother-in-law, General Harrison). Another Indiana resident, Mayme Jacobs, corroborates: "My great-grandfather, John Hamilton, was a captain with General William Henry Harrison in his raid on Tecumseh, and my mother heard great-grandfather Hamilton tell of being one of those who carried the bluegrass seed to Kentucky."

Although admitting that bluegrass came to the United States with the Jamestown and Williamsburg settlers, still others have claimed that it was not in Kentucky until after 1812. Rather, they say, the cavalry with Anthony Wayne spread bluegrass at the encampments on the Pickaway Plains in Ohio, where it prospered, and from which seed was gathered and taken to the Lexington area of Kentucky. About 1822, a man named Rodeck is said to have gathered the seed and de-

livered it to the farm of his brother, who settled near Lexington. This is possible, but most likely it is not the first introduction into Kentucky, where bluegrass had probably flourished on the rich phosphatic soils for a long time. In any event, there, near Lexington, the English grass, meadow-grass, speargrass, or what you will, became Kentucky bluegrass.

Poa pratensis was not known by the name Kentucky bluegrass until after 1833. Neither Elliott's *Botany of South Carolina and Georgia*, 1812; Muhlenberg's *Catalog of the Plants of North America*, 1813; nor Short's *Catalog of the Plants and Ferns of Kentucky*, 1833, mention it by that name, although the species is invariably listed.

But by 1840 there are references such as this by Bidwell and Falconer: "the limestone region of Kentucky was famous in the West as the center of prosperous and contented agriculture. Its bluegrass pastures were widely known . . ." Well's *Yearbook of Agriculture*,

Lawn Institute

Bluegrasses of different stature. When distinctive types of Kentucky bluegrass are discovered, they can be perpetuated fairly easily because the seed is apomictic to a high degree (duplicates the parent plant because there is no sexual crossing). Here are two famous lawngrass cultivars, Fylking to the left and Merion to the right. They have been selected by horticulturists because of especially low, dense growth, resistance to disease, and other attributes of advantage in the lawn.

1855-6, mentions: "*Poa pratensis:* smooth-stalked meadow grass. In Kentucky it is called Kentucky bluegrass . . . succeeds far better in Kentucky . . . than it does in any part of Europe, where it is native." And Charles Flint, *Grasses and Forage Plants*, 1858, notes: "In Kentucky it is universally known as bluegrass, and elsewhere frequently called Kentucky bluegrass . . . "

Thus did Kentucky bluegrass gradually come to be known for the state. It remains resplendent today over the fields and pastures of north-central Kentucky, one of the finest and most beautiful agricultural areas in the world, renowned especially as the breeding ground for some of the fastest thoroughbred horses. To a large extent the growing of bluegrass for seed is now carried on farther west. But the tradition lingers in Kentucky, where a way of life has been based upon grassland farming.

Not only in Kentucky, but throughout the United States, bluegrass has played an important role in suburbs and agricultural areas. Dr. E. N. Fergus of the University of Kentucky points out: "With little assistance it achieved wide distinction for pasture and turf. One has only to imagine—if he can—home lawns, parks, playgrounds, air fields, golf courses, roadsides, cemetaries, campuses and other institutional grounds without their carpets of bluegrass to appreciate in some degree the significance of this grass in our living."

Perhaps the most eloquent eulogist was John James Ingalls, senator from Kansas, 1873-1891, who delivered a speech, "In Praise of Bluegrass," to Congress. Ingalls concluded: "Grass feeds the ox; the ox nourishes man; man dies and goes to grass again; so the tide of life, with everlasting repetition, in continuous circles, moves endlessly on and upward, and in more senses than one, all flesh is grass. But all flesh is not bluegrass. If it were, the devil's occupation would be gone."

Robert Schery is Director of the Lawn Institute in Marysville, Ohio. He was a student of the late Robert E. Woodson, receiving his master's and doctorate degrees from the Henry Shaw School of Botany at Washington University, where he later taught for several years while doing research at the Missouri Botanical Garden. Dr. Schery's interest in grasses is of long standing. He has been associated in various ways with the commercial production of grass and grass seed. His book, Plants for Man, *is considered the best text on economic botany.*

A Night in the Jungle

Andre Robyns

Albrook Air Force Base, Canal Zone, is home base for the helicopters that carried the Missouri Botanical Garden collectors into the jungle.

Susan Verhoek Williams

In a previous issue of the *Bulletin*, I described some adventurous botanical expeditions of other centuries. Current expeditions can be just as adventuresome, both in spite of and because of modern conveniences.

The latest Missouri Botanical Garden expedition to Panama, led by Dr. Walter Lewis, was working under an Air Force grant and Air Force helicopter lifts gave us access to remote parts of the Panamanian jungle. When we boarded our helicopter at Albrook Air Base, Canal Zone, early on a December morning, our pilots jovially asked if we were ready to spend the night in the bush. Their question was not entirely in jest because three days earlier the helicopter had been unable to brave a tropical storm to return for another group of MBG botanists who had been collecting specimens along sea cliffs and a river.

Our objective was the mountains in the western province of Los Santos, and our route was along the Pacific coastline, the most easily recognizable landmark. To our right we could see the coastal plain

and the mountains on the continental divide beyond. Eventually, the mountains of Los Santos loomed ahead of us and we flew through valleys and over the lower ridges. Once in the interior, we began to search for a landing spot. Helicopters are maneuverable and the pilots' aim accurate, but the mountain sides were steep and covered with dense jungle, and we had to find a clearing with enough flat space for the helicopter to put down. After some searching, a clearing appeared several hundred feet below the top of one of the jungled peaks, about 2000 feet above the Pacific Ocean, visible in the distance. A native had cleared the space to plant corn and rice and to pasture his cattle. There were two huts in the clearing and someone said, as we circled overhead, "I get that hut for tonight." As it turned out, we all did, but at the time we thought we were joking.

The owner of the clearing met us as we landed and agreed to help us find "flores." We followed our guide up and down several small hills, and since the mountains of Los Santos are covered with rain forest and it was the rainy season, it was not surprising that the path was muddy. It took some time for the botanists from St. Louis to resign themselves to sinking more than ankle deep at each step. Higher up, the mountain paths through the jungle ceased to tug at our shoes as we walked. Instead, there was slick clay which offered no footing to anyone wearing shoes, and our barefoot guide was the only one who managed the ups and downs of the trail without sliding.

Botanical collecting in the jungle was fascinating. The fruits of the trees and shrubs in the family *Rubiaceae* (Coffee family) were beginning to ripen; vines similar to morning glories were blooming, and the begonia season was in full swing. We collected a begonia with small white flowers and a seven foot stalk! Animal life was not quite so evident but our guide pointed out the two-inch paw marks of a jungle cat and prevented us from disturbing a hairy brown tarantula that measured eight inches from toe to toe. Flocks of green parrots flew from the tree tops making raucous noises.

We returned to the clearing to wait for the helicopter, and as we waited, clouds drifted around the mountain tops and rain began to fall. We decided that it was just a shower and would soon pass. Half an hour later, the clouds were lower and it was raining harder. Sitting in the clearing under the larger plastic bags which had not yet been filled with plants, everyone decided that it was not just a shower. Still we sat, ready to wave and shoot flares, listening for the comforting "whop-whop-whop" noise of our helicopter.

At first we thought we heard it in the valley to our right, and later we definitely heard it on our left. Straining to see through the clouds, we hoped a small patch of blue would reveal the helicopter; but hope was not enough. Then we heard the helicopter coming closer, evidently up the valley parallel to us, but all we could see were the same gray clouds rolling in around us. Then we saw it—a miniature seen through a tunnel of clouds! We shot our flares in case we were close enough for the pilots to see if they happened to be looking in the right direction. But just before the clouds closed in again we saw the helicopter turn and go away. They hadn't seen our flares or our clearing, and, by that time, had been searching so long that their fuel was running low. Six muddy, cold botanists sat on a hilltop and wept.

As dejection was replaced by a desire for warmth and dryness, we asked our guide for permission to build a fire and the use of his hut. The hut was a "bohio", similar to the ones found all over Panama, basically four poles and a palm thatched roof. Panamanians may add more stakes around for walls and weave them with palm thatch. Our guide's home was one of these, but our "hotel" for the evening, since it was a small corn crib, was open on two sides and the other two sides were neatly stacked with corn. It was not a luxurious looking place but in comparison with the cold, wet dusk of the rice field sur-

Joan Nowicke

In the total space available in the bohio the botanists wait for the helicopter to return. Members of the expedition grouped around the fire are Susan Williams, Dr. John Ridgway, Col. A. V. Zaborowski, Air Force liaison officer, and Dr. Andre Robyns. Not pictured are Joan Nowicke and Dr. Walter Lewis.

rounding it, the bohio seemed like home. We got the fire going, spread our plastic bags over the red dirt floor, put our muddy shoes by the fire, and Dr. Lewis served the remainder of our lunch for supper. He "carved" a hard-boiled egg, gave us each half a sandwich, and passed out candy bars for dessert. An added feature was a choice from a "relish plate"—a carrot stick, one olive, or half a pickle.

While we leisurely ate our dinner, darkness set in. Knowing it would be 12 hours before the dawn and that if we slept so early we would be awake during the longest part of the night, the six of us sat crowded into the small space not filled with corn and talked. Things soon began to move above us, dropping corn, mud and thatch down our backs and onto our plastic carpet. Someone pointed out that corn means at least mice and we hoped not rats as well. It was also observed that snakes looking for a juicy meal might find a corn crib full of good things to eat. The only way to escape such unpleasant thoughts was to sleep. However, it soon became apparent that all of us could not sleep in such a small area at once. Occasionally someone decided that he could not sleep on the lumps in his part of the floor any longer and he stepped outside to stretch for a few minutes. However, once he left his space on the floor the other sleepers spread out a little more and he was forced to join the ranks of the fire watchers or the snake patrol until a toe hold opened up on the floor of the bohio and he could work his way back in. For those who stayed awake, the night was beautiful—a cool breeze was blowing; the sky had cleared, and the stars were bright. In the distance the lights of ships on the Pacific going to and from the Canal were visible.

Eventually a rooster on the next hill began to crow, and we were able to see beyond the circle of our own firelight. The dawn promised a clear, sunny morning and we knew that our helicopter would soon be back for us. We ate our breakfast of candy bar and piece of orange and the more daring drank the coffee that our host brought us. Then we folded our plastic bags and trudged through the mud one last time to the hill where the helicopter would land.

We could see it as soon as we heard it—a long way off and searching for us in a zigzag path. As soon as it turned toward us, we set off our flares and the pilots came straight in. The loading of plants and people was accomplished in seconds and the helicopter lifted off for a calm flight back to the Canal Zone, ending our adventurous modern expedition.

Strange Aspects in the Study of Fungi

James Maniotis

VISITORS TO THE mycology laboratory at Washington University, unless they are botanists themselves, are aghast when they observe piles of petri dishes filled with animal feces. It is true, I have a great liking for the dung of animals; the more esoteric the animal, the greater my delight.

I feel it is time to explain my unusual interest. Particularly since one recent visitor to the laboratory helpfully suggested that my scatological tendency might be a Freudian neurosis. In my defense I must state that, as a mycologist, fungi are my business.

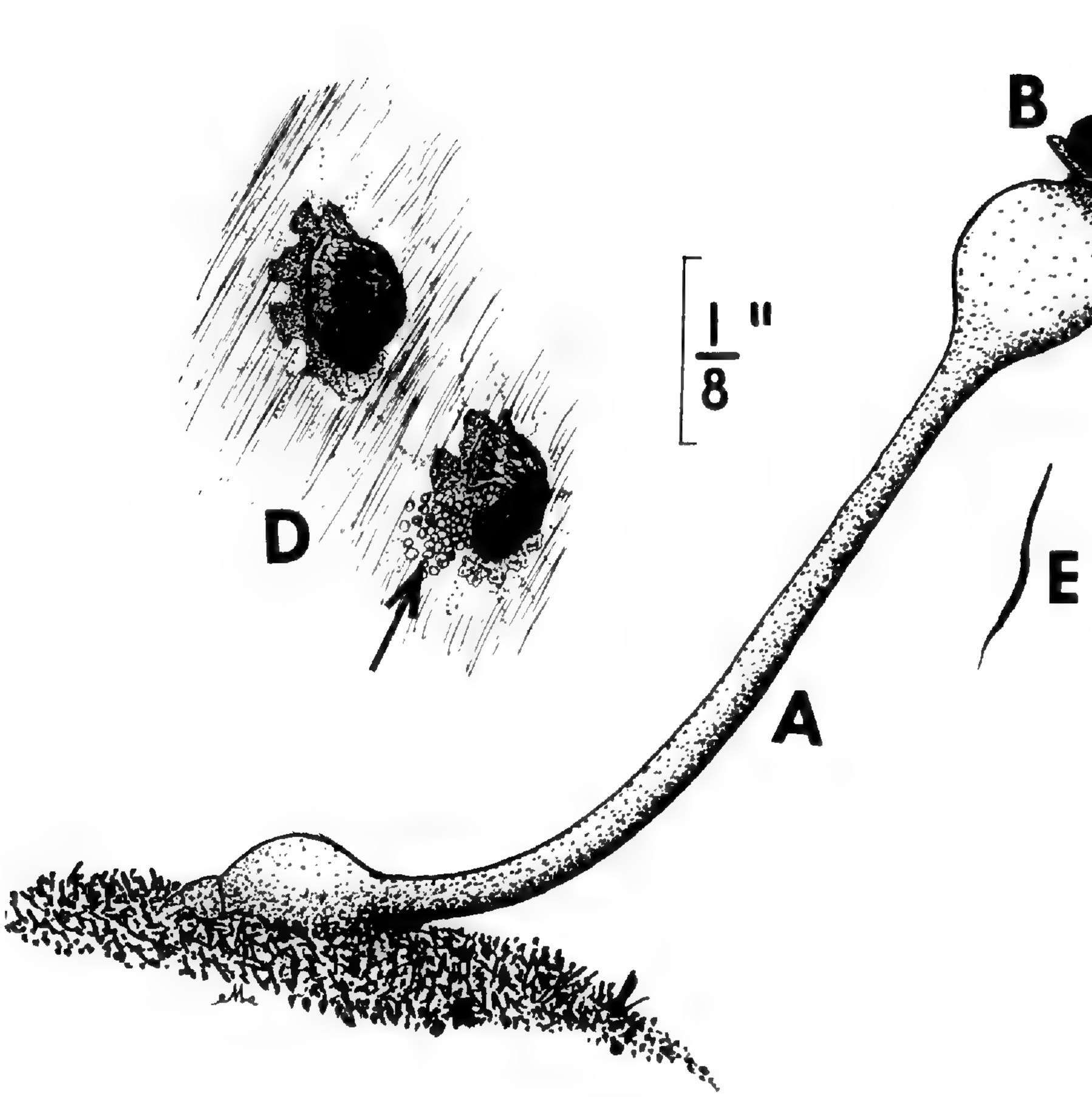
Feces are a good source of a large number of fungi, some new to science, some well-known, but all interesting (Fig. 1). Lacking the chlorophyll of the green plants, and consequently unable to manufacture their own elemental sugars, fungi grow wherever organic material presents itself. They are great opportunists. From a fungal point of view, which may be not exactly esthetic to us, a horse "apple" is a supermarket for microorganisms, containing large amounts of carbohydrates, fats, proteins, vitamins and other materials. It is not only, as Harry Truman reputedly said to Queen Elizabeth, "good for the roses," but is also good for a large number of other living things, too, including roundworms, flatworms, protozoa, bacteria, mites, insects, fungi, and so on. But let's concern ourselves with the fungi for the time being.

After a few days in a petri dish, freshly deposited horse or cow dung will yield the common pinmold, *Pilobolus*, whose spore-bearing stalks, the *sporangiophores*, cover the dung surface and look like a number of little pins sticking out of the dung (Fig. 2). Each spor-

angiophore (Pg. 21, A) develops a swelling near its top, upon which is formed the black spore-containing sac, or *sporangium* (Pg. 21, B; Fig. 4). Sporangia appear like little derby hats. Oddly enough, the sporangiophores are strongly oriented toward the light during their formation (Pg. 21, C). In nature, during the morning hours, the sporangiophore tip actually follows the sun in its apparent motion across the sky. Then, about 11:00 through noon to 1:00 o'clock, the swelling below the sporangium bursts and literally shoots the sporangium towards the sun. The sporangium may travel over a yard or more in its flight and adheres to the surface on which it lands by means of the sticky material at its base (Pg. 21, D). Hence the suitability of the name, *Pilobolus* (Greek for hat-thrower) for this fungus. Each sporangiophore aims its sporangium at a light source with uncanny accuracy. Fig. 4 show a jar containing horse dung with *Pilobolus*. It is sealed from the light except for a tiny window. Fig. 5 shows the same jar a few days later with the covering removed. The discharged sporangia are distributed in the area where the window was situated.

Why should this strange creature discharge its sporangia in such a manner? Obviously, it is distributing itself in nature. But the story doesn't end at this point. The sporangia in nature typically strike and stick to grass blades which intercept them in their flight. Normally, the spores (in the sporangia) of *Pilobolus* will not germinate to produce fungus filaments unless they pass through the mouth, stomach, and intestinal canal of some herbivore, such as cow or horse. We can simulate these conditions for germination in the laboratory by subjecting the spores to heat approximately that of the body temperature of the cow or horse, and using bile salts and acid solutions. These treatments, essentially the same as encountered by the spores inside the herbivore, encourage spore germination in the laboratory. After passing through the animal, the germinated fungal spores in the freshly deposited dung form threadlike filaments typical of most fungi. These grow through the dung, absorb food and then produce the sporangiophores. But in laboratory media, the germinated spores produce only a limited amount of filaments, which produce few or no sporangiophores, unless some substance which is found normally in dung is added. This substance was identified as *heme*, a component of blood haemoglobin and also of the enzymes responsible for cellular respiration in all living things. The *heme* probably comes from the cells or the glands lining the intestinal canal of the herbivore.

It is apparent, then, that when *Pilobolus* throws its "hat", it is



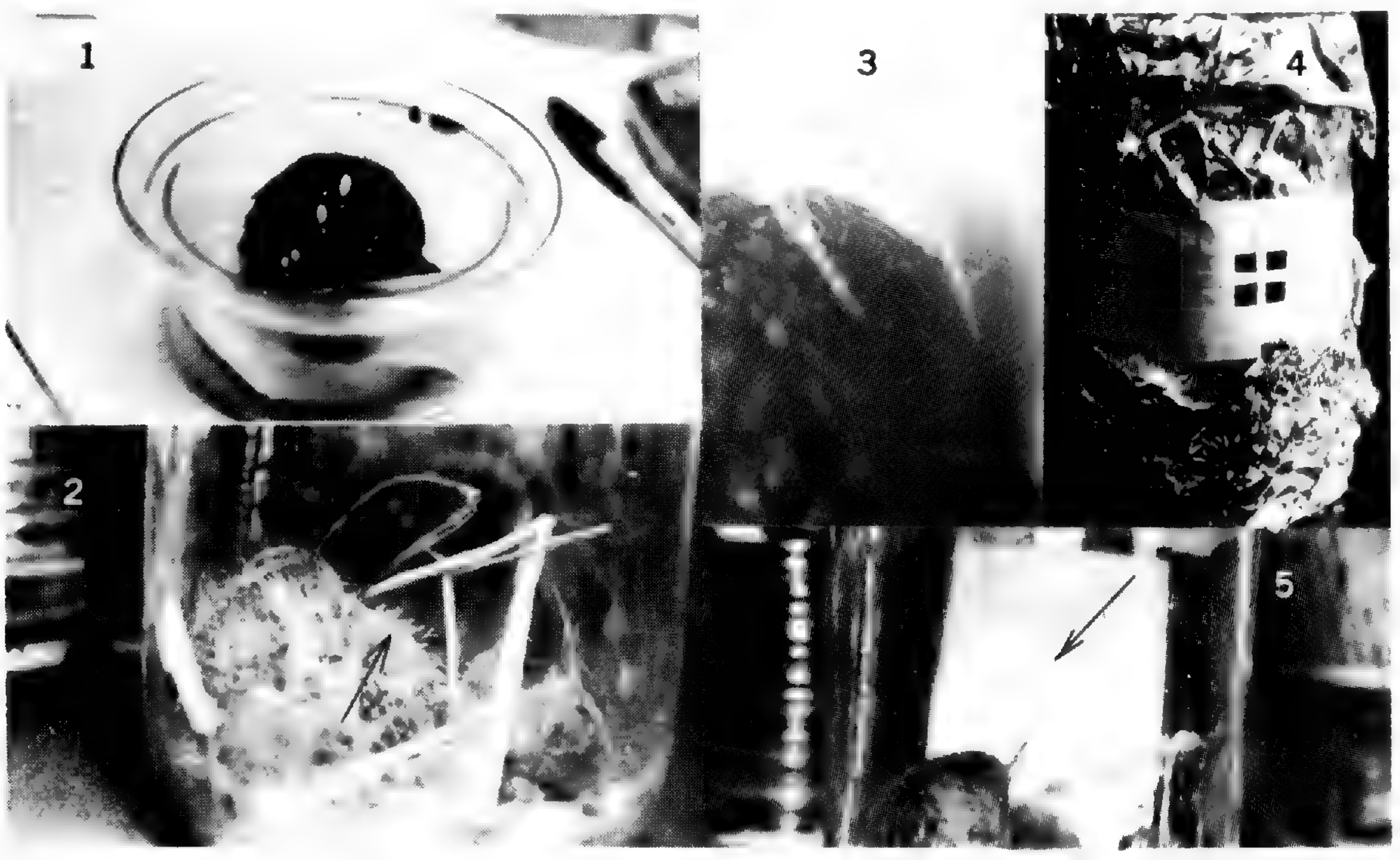
James Maniotis

Pilobolus kleinii. (A) Elongated sporangiophore terminating in (B) a swelling supporting the derby-shaped sporangium; (C) Direction of the source of light; (D) Two discharged sporangia adhering to a glass surface; the lower sporangium has burst open releasing its spores (arrow); (E) relative size of the third larval phase of the parasitic worm causing cow bronchitis compared to the *Pilobolus* sporangiophore.

not only disseminating itself in nature, but (if I may be unscientific for the moment) sticks to grass in order to get inside the horse or cow to obtain the right conditions for spore germination, to get its food and "shot" of heme to produce sporangiophores and spores!

What we have here is a beautiful instance of biological adaptation. How did this strange and involved sequence of events come about? I am only guessing now, but it seems probable that the ancestors of *Pilobolus*, being as opportunistic as other fungi, found dung to be a good place to grow, better than the dead leaves and soil where they competed for food with a host of other microorganisms. Perhaps these ancestors lost the capability of producing certain vitamins or *heme*-like materials not found in soil and leaves. Thus *Pilobolus* became committed to an existence of living on dung. But other fungi were

opportunistic, too. Conditions became very crowded on dung. Then, perhaps, a few strains of *Pilobolus* developed which had spore walls resistant enough to pass through the intestine of a herbivore without being digested by the animal. Since often the race is to the swift in nature, what swifter way was there to get in dung and start growing in it than while inside the animal? And somehow *Pilobolus* evolved this capability. In doing this, the fungus sacrificed its capabilities to grow in soil. But each phase of sacrifice of its free-living capabilities increased the capabilities of the fungus to grow and reproduce its own kind on herbivore dung. It became specialized to a particular way of



James Maniotis

Fig. 1. Horse-dung culture. Emerging from the surface of the dung are the fruiting bodies of a small species of the "inky-cap" mushroom, *Coprinus*. Passage of the spores of this mushroom through the animal's intestine actually favors germination of the spores.

Fig. 2. Some horse-dung from a stable giving rise on its surface to the fruiting bodies of the pinmold, *Pilobolus*. The arrow indicates a cluster of sporangiophores.

Fig. 3. *Pilobolus kleinii* on horse-dung. Several sporangiophores each bearing a sporangium. These were photographed at 11 a.m. By noon, the sporangia were discharged.

Fig. 4. A jar containing freshly-deposited horse-dung. It has been sealed from light except for the little window. The jar was placed near a laboratory window for several days with its window oriented to the outdoors.

Fig. 5. The same jar with its covering removed. The sporangia (black dots indicated by arrow) are clustered around the area where the window was situated.

life which was successful, in terms of its own reproduction. And so it is with most living things, this interdependence, with sequences as strange, involved and intricate as that observed in *Pilobolus*. We wonder what the next phase of development in *Pilobolus* may be. Since it requires heme from the herbivore's intestine, a reasonable guess would be that some of the future descendants of *Pilobolus* will become parasitic on intestinal tissue.

One can recount a number of such complex relationships between animals, man, dung, and the organisms in dung.

I am reminded of the story of the mycologist's wife and the U.S. customs officer. When this lady, visiting England, was about to return to the U.S., she wondered what she could bring back for her husband, a great American mycologist active in the early years of this century at Harvard. What could be more appropriate for a mycologist than some elephant dung from the fabulous London Zoo? When asked by the customs official if she had anything to declare in a particular package, she procrastinated, and stated there was nothing of value to declare.

"What's in the package, lady?"

"Elephant dung."

Following lengthy explanations, the dung was admitted. But there was a sequel to this anecdote. The mycologist, so the story goes, found an unusual fungus in the dung, and when his wife visited England the following year, he requested she bring back more of the same. As luck would have it, the same customs inspector greeted the lady upon her return to the U.S.

"Well, lady, what is it this time? More elephant dung?" And sure enough, it was.

Many microorganisms have evolved intricate life cycles involving passage through animals and distribution in fecal materials. A number of these organisms, including fungi, bacteria, viruses, protozoa, and various worms, are parasites of man or his animals. And, indelicate though it may be, one of the realities of life is fecal material. With more and more people on this earth and corresponding increases in numbers of food animals, there are increased amounts of feces, which present great technological and health problems. Thus it is clear that microbiological scatology, or whatever you want to call it, has some human relevance after all.

Dr. Maniotis is an associate professor of botany at Washington University.

Herb Society's Test Garden Serves Many Purposes

Mary A. Gamble

WHAT DOES IT TAKE *to grow herbs in the St. Louis area?* This is the basic question the members of the St. Louis Herb Society wanted answered when they asked Dr. Derek G. Burch, Chief Horticulturist at the Missouri Botanical Garden, to let them develop a "test garden" there. In this garden they would try to find the answers to the many questions about herbs which they asked themselves and each other, and which were put to them regularly by the public. In it they would try out their ideas, satisfy their curiosity, and prove or disprove their methods.

"Tests" to the herbers did not imply the exact, controlled conditions of the scientific laboratory. It meant, rather a trying out, a testing to develop a set of practical rules which, if followed, would allow the busy, hurried, and often harried St. Louis area gardeners a better than even chance of success in their gardens.

The test garden was agreed to and the plot readied for spring planting in 1967. It met ideally two fundamental requirements for an herb garden: it had full sun and good drainage. A third fundamental—fair to good garden soil—was supplied by the friable topsoil which was judged better than fair. It was not tested. Herbers are realistic. They know that more gardeners talk about testing their soil than do it.

The overall test plot measured 22 feet east and west and 72 feet north and south, with a gentle western slope. It was ploughed and cultivated, then divided into three 6-ft. by 72-ft. beds. Each of the beds then was prepared differently. In one liberal quantities of peat moss and agricultural lime were worked to provide a type of soil suitable to almost all herbs; in the second bed only the agricultural lime was added to make a sweet soil such as most herbs like; the third bed was left "as is," or unimproved.

The three beds were then planted in matching 6-ft. rows so that

every seed was subjected to three different soil conditions. For planting, shallow troughs were dug and filled with vermiculite. A marker with planting date and seed variety noted was placed at the head of the row and a steady hand then tapped the seeds from the packet, spacing them evenly the length of the trough. This done, the seeds were covered with a thin layer of vermiculite and watered gently.

This first year 25 different herbs (species and varieties) were planted, part on May 23 and the balance on May 31. First germination from the earlier planting—the dependable Sweet Basil (*Ocimum basilicum*)—was noted on May 31.

Then the unexpected happened, as it always does in gardening.

Breaking the ground for the test garden literally had set off an explosion of weed seeds which germinated and flourished beyond control. In desperation a weed and, it turned out, herb killer was applied. The results confirmed the general opinion among the traditionalist herbers that modern sprays have no place in an herb garden. But herbs and herbers are resilient and enough of the former survived for the latter to salvage the experiment.

As the summer progressed it was clear that the herbs which had been planted in the more thoroughly prepared bed (that with peat

Mary Gamble

Herb Society ladies are shown here cutting back herbs during the test garden's first season, 1967.

moss and agricultural lime applied) were winning the race. So, as herbers are pragmatic, they agreed that, unless one lived in the old-time Florissant valley or on a Missouri river bottom farm, it was foolish to try to raise herbs in totally unprepared soil when ofttimes a modicum of work would yield a measurably more bountiful harvest. It was decided that any serious gardener would be more than willing to prepare his soil properly. (Herbers are idealistic, they *believe* in gardeners.) Therefore in spring 1968 all seeds would be planted in a properly prepared bed.

This plan was followed. Seeds of 17 species and varieties of herbs were planted, part on May 7 and the balance on May 14. Unseasonably cold weather held back germination. The basils proved exceptionally slow and sorrel (*Rumex acetosa*) won the '68 germination sweepstakes. Again, there were problems, not all unexpected.

In 1968 as in 1967 the weeds flourished. And again the dominant one was purslane (*Portulaca oleracea*). To herbers, a saving grace with purslane is that it is an historic and therefore interesting plant. In Elizabethan England, one of the great ages of herbs, it was enjoyed as a "sallett" herb, and medicinally was considered "good for them which are troubled with spitting of blood." In France it was one of the ingredients of Bonne Femme soup. To weeding herbers, purslane was a reminder that many a present day weed is a once useful herb fallen on evil times.

Planting seeds of a smaller number of herbs in a single bed freed a substantial portion of the test garden for expanding another experiment, started on a small scale in 1967. This was to set out various perennial herbs in the test plot and see what happened to them under field conditions. The results with tarragon (*Artemisia dracunculus*), sage (*Salvia officinalis*), burnet (*Sanguisorba minor*) and chives (*Allium schoenoprasum*) were so good (as had been expected) that this spring other herbs were added, notably lavender (*Lavendula officinalis*). In short, the test garden has also become a nursery for a portion of the perennials which the Herb Society will sell at the annual Sale of Herb Plants (1969 date: Friday and Saturday, May 2 and 3). These field-grown herbs should provide an interesting group of "specimen" plants for the sale, as well as increasing the quantity available to customers. Thus the primary purpose of the test garden continues to be satisfied while using it as a nursery not only broadens the growing experience of Herb Society members but also improves the plant sale which benefits the Garden's greenhouse (herbers are notably practical).

Mary Gamble

Members of the Herb Society plant seed in their test garden in spring of 1968.

The test garden cannot be isolated from the Herb Society's other gardening efforts at the Missouri Botanical Garden. It is, rather, an important link in a chain, the end purpose of which is to produce more and better plants for the plant sale and, replacements for the Herb Garden viewed by the public. Some herbs which are displayed as specimens in this garden are grown in quantity in the test garden to provide material for vinegars, drying, etc., for the herb products sales which the Society holds at irregular intervals.

The test garden also serves as a repository for seedlings and surplus plants from the Herb Garden and members' gardens so that they can be *used* rather than discarded (herbers abhor waste). Well-rooted cuttings from the greenhouses and cold frames are set out in the test garden to benefit from a season in the sun. And the testing of seeds

continues. With each planting a record is kept of source and germination results to increase the usefulness of the Society's gardening records. It is all a little informal, because herbers, except in their rare formal gardens, tend to be casual. They're more serious about their gardening than themselves. Their approach is to "do as much as we can, putting first things first."

The accumulated experience of the test garden, the herb garden, and that of members in their own herb gardens, will form the basis of a special bulletin to be published jointly by the Herb Society and Shaw's Garden (planned publication date is mid-April 1969). In it the Society will tell *what worked* for its members in growing herbs in our locale.

No amateur gardeners have ever worked under more fortuitous circumstances. Dr. Edgar Anderson, internationally renowned botanist and co-founder and honorary member of the St. Louis Herb Society is infinitely patient as he provides instant knowledge, as is Dr. Burch, a Henry Shaw member of the Society.

Mr. Paul A. Kohl, Garden Floriculturist, with whom the herbers work happily the year-'round producing plants for the herb garden and plant sale, is equally generous with knowledge and advice. In addition, as Society work crews make and root cuttings, pot plants, prune and care for them, Mr. Claude A. Johnston, Grower, Floral Displays, as well as other members of the greenhouse staff, keep an interested eye on their work. If any seems not quite up to Garden standards, there's a gentle suggestion that results would be better if the work were done *this* way. Throughout the year almost every member of the St. Louis Herb Society, at one time or another, works in the herb gardens and greenhouses. All consider this a privilege, and an unequaled opportunity to learn about gardening from men who know, in one of the world's great botanical gardens.

The herbers rate the test garden a happy experience. To their prejudiced eyes it is as beautiful in its utilitarian, productive way as is their Herb Garden in its charming, 19th century formality.

The test garden has proved, among other things, that modern herbing, although rooted in tradition, thrives on experiment and change. It is this excitement and challenge which explains herbing's continuing hold on its enthusiasts who never stop asking questions and seeking answers.

Our Friend, Gilbert Pennewill

Dorothy Anderson and Dan O'Gorman

THE UNTIMELY death of Gilbert Pennewill in May was a great loss to the cause of horticulture in St. Louis. He was an active member of the Missouri Botanical Garden Horticultural Council, serving as Chairman in 1956-57. He was a past president of the St. Louis Horticultural Society as well as a member of the Board of Directors.

Mr. Pennewill enjoyed the hobby of iris hybridization and was a past president of the St. Louis Iris Society. In 1962 he was awarded the Green Bronze Medal of the Men's Garden Clubs of America, for outstanding service to the Midwest Region. An active member and past president of the Men's Garden Club of Richmond Heights, he was awarded the William Olson Medal in 1965 for meritorious service to the club.

Mr. Pennewill was always willing to help on any project of the Missouri Botanical Garden. He organized the Cutting Garden south of Tower Grove House, and spent many hours supervising and working to make it a successful project. He would be on hand to help with the children's Christmas wreath workshop, and to help distribute spring seedlings to the children. He served as a Garden Guide as well as an Answer Man, in George Pring's absence.

Mr. Pennewill was always neighborly and helpful, as well as friendly. An even-tempered man, he never lost his patience. He fitted-in without pushing-in. Now that he is gone, there is a cog missing, an inconspicuous cog that made the whole machinery of the Garden run more smoothly.

Friends of the Garden

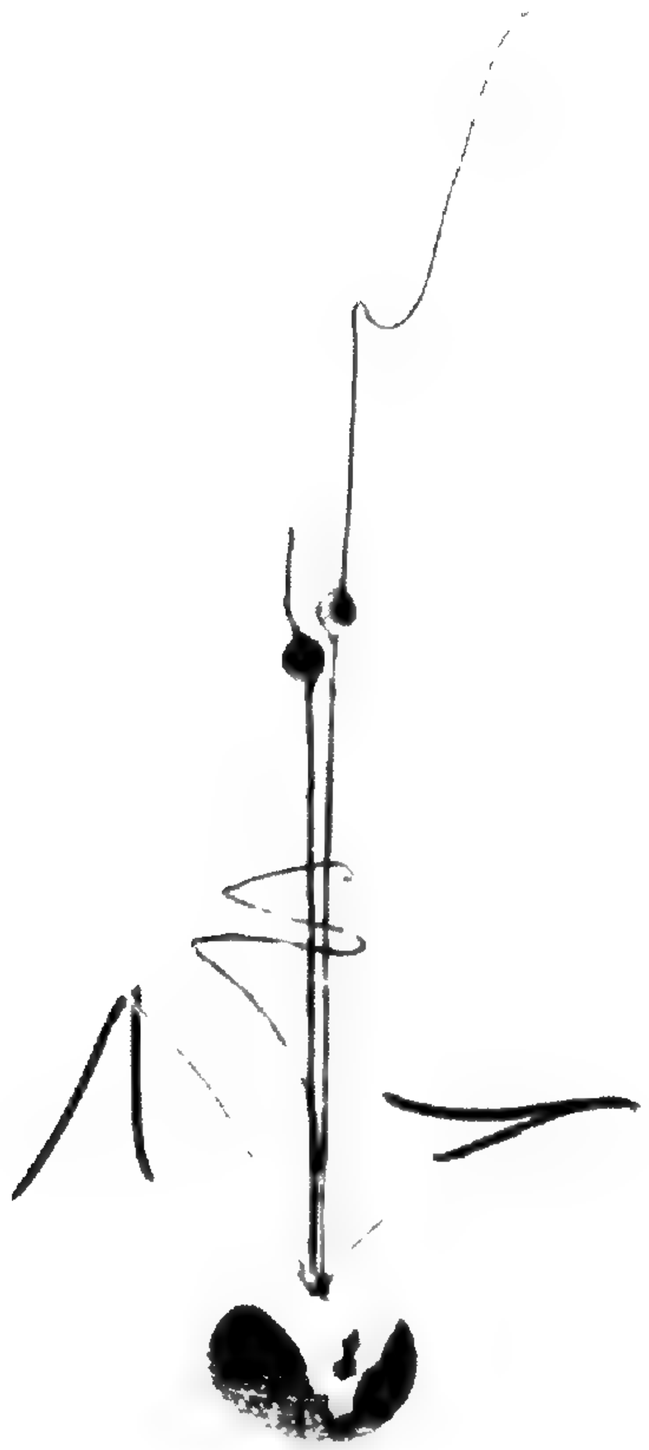
Mary Ruprecht

The Board of the Friends of the Garden held their final meeting of the year at the Museum on June 3, and the officers for the coming year were installed: President, Mrs. Guy Oliver; 1st Vice-President, Mrs. H. Leighton Morrill; 2nd Vice-President, Mrs. Tom K. Smith, Jr.; Recording Secretary, Mrs. Joseph E. Griesedieck; Ass't Secretary, Mrs. Charles F. Limberg.

The new guide program, under the direction of Mr. Kenneth Peck and Mr. Mark Paddock, will begin its course of instruction on September 17 and continue for eight Tuesday mornings. Mrs. Parker Smith will act as coordinator for this program, with Mrs. Clarence Barksdale as her co-chairman. Any of the Friends who have not availed themselves of this opportunity to become more knowledgeable about the Garden, and things botanical and horticultural, should call Mr. Peck or Mr. Paddock (TO5-0440) at once.

Another of Mr. Kohl's magnificent Chrysanthemum Shows will be previewed for the Friends about the first of November. The Garden Gate Shop will again have a three day sale of their unusual Christmas items, so you will have a chance to get a running start on the holiday season ahead!

THE ART OF IKEBANA



Florence T. Morris

FOR HUNDREDS of years the Japanese have practiced the art of Ikebana. A very weak and inadequate translation of this word is "flower arranging." A truer picture might be given if we say it is an "art of the flower," developed through infinite ingenuity, with love and understanding of flowers.

In the English translation the connotation of manual dexterity often predominates rather than artistic insight. Of course it is necessary for anyone who wishes to clearly understand Ikebana to have a knowledge of its rules and forms. The art is a great deal more than placing flowers in a container to look pretty. Ikebana, which also might be translated as "bringing flowers to life," implies an attitude toward the blossoms which is based upon a way of looking at and living with nature. Ikebana is a way of living—in other words, a philosophy.

This disciplined art form will be taught at the Garden in five sessions beginning November 6. (For further information, call TO 5-0440.) The teachers, Mrs. Walter E. Morris, assisted by Mrs. Bruce Johanboeke and Mrs. Theodore Guhman, are all of the Ikenobo School. This is one of the largest and oldest schools in Japan, having been in existence for five hundred years. It is now headed by the 45th Headmaster, Senei Ikenobo in Kyoto, Japan.

Benefit the Missouri Botanical Garden While Enjoying the Trip of a Lifetime!

Pan American

The ruins of Sacsahuaman, showing Indians relaxing at the ruins of the baths built for the noblemen of the Incas.

Join the "Friends" GARDEN TOUR OF SOUTH AMERICA

January 16th through February 7th, 1969. These twenty-three days will include the sightseeing hi-lights plus visits to private gardens and estates not generally open to the public. Our own Lad Cutak will be along to enlighten you on the horticultural aspects. There will also be plenty of time for beaching, fishing, golf and shopping for those who wish to indulge themselves. May we send you a brochure?

Contact: Friends of the Garden Office TO 5-0440 or Sante Travel Agency PA 6-3040

NEW GUIDE BOOK

Barbara Lawton

Experts check the large proof sheets of the new guide book, to make sure color and register are correct.

Barbara Lawton

THERE IS ALWAYS a need and desire for the Garden to better communicate with its visitors and friends. With this in mind, the Missouri Botanical Garden has created a department of publications. This new department is off and running with its first major production, a much needed *Guide Book to the Missouri Botanical Garden.* This handsome full-color guide (44 pages) is being sold for $1.25 in several places, including the Main Gate and the Garden Gate Shop. Well designed and comprehensive, it makes a fine souvenir or momento of a trip to the Garden, as well as telling the Garden's story to old and new friends alike.

The Publications Department has also produced an informational brochure which includes a map of the Garden. This is being given to each paying visitor.

Plans are being made for a series of publications dealing with gardening and horticulture in the Midwest. The first will be on herb gardening and is scheduled for production in early spring.

WHO, WHAT, WHERE, WHEN

THE MINISTER TO THE EMBASSY of the Republic of China, Shih-ying Woo, visited St. Louis in the late spring. Dr. Woo came to the Garden on a Sunday afternoon and was escorted through the grounds by Mrs. Emily Horner, one of the Garden's ambassadors of good will. He most enjoyed the Linnaean Garden where the iris and peonies were at their peak.

KIM GRAY (Mrs. Raymond) joined the Garden in July as Dr. Burch's assistant. Originally from Albuquerque, New Mexico, Kim recently received her degree from Oregon State University where she majored in botany with an emphasis on horticulture. Kim's husband is serving a three year hitch in the Army. Kim enjoys fishing, ceramics, sports, and dogs.

THE MUSEUM BUILDING has a new look. The south room has been remodeled and is now a full fledged kitchen, The make-do arrangements for meetings at which food is served are a thing of the past now that the beautiful new equipment has been installed.

THE CENTRAL STATES CHAPTER of the Society of American Travel Writers held its annual meeting in St. Louis on June 14 thru 16. St. Louis lived up to state tradition in showing the journalists the tourist potential of our city and it is hoped that the travel editors, writers of major daily newspapers, auto touring magazines and national travel publications will respond with articles on the attractions they saw in St. Louis. A reception and tour was given in the Climatron, with luncheon in the Flower House preceded by a short talk by Dr. David Gates who welcomed the guests to the Garden. One hundred members were in attendance, seated at tables which carried a blooming orchid as a centerpiece. Among the notables were Robert S. Kane, president of the Society and author of a series of books on travel; Senator Noel Cox of the Missouri Tourism Commission; Uzi Michaeli and Menachem Eyal, directors of the Israel Government Tourist Office.

RECENT HERBARIUM VISITORS include the following: Dr. James S. Pringle, Royal Botanical Gardens, Hamilton, Ontario, Canada; Dr. Mildred E. Mathias, University of California, Berkeley; Dr. Jerry C. Anway, Ohio University, Athens; Miss Rosemary Grosvenor, Government Herbarium, Salisbury, Rhodesia; Prof. Joseph Ewan, Tulane University, New Orleans; and Miss Mireya D. Correa A. of the University of Panama, Panama.

Miss Correa is an old friend of our herbarium staff, having helped and participated in many of the expeditions to Panama from the Missouri Botanical Garden. She works closely with the U.S. Army Tropic Test Center at Fort Clayton, Canal Zone, helping organize the herbarium at the test center, contributing to vegetational study of the Albrook Site, and assisting the many plant collectors who go to Paceoueo.

THE NATIONAL HEMEROCALLIS SOCIETY held its annual meeting in St. Louis on July 4-6. About 300 members visited the Garden on July 6, toured the grounds from 8:30 a.m. to noon, and met in the Hemerocallis Test Garden where important seedling daylilies were grown by several hybridizers. These and new hybrids were sent to the Garden in the autumn of 1966 and exhibit a range of colors from the traditional yellow and orange to pinks and various hues of browns.

THE AMERICAN ASSOCIATION OF NURSERYMEN, INC. held its 93rd annual convention at the Chase-Park Plaza Hotel on July 13-17, with over 700 members in attendance. This association consists of wholesalers, landscapers, retailers and allied associates of the nursery industry. Over a hundred exhibitors held a trade show in conjunction with the meeting. The Garden set up an exhibit of flowering orchids and bromeliads in the lobby of the Chase-Park Plaza. The plants were set on a table against a background of pictures of Garden scenes and the various projects of the Garden. Dr. David Gates, Mark Paddock and Lad Cutak, along with their wives, represented the Garden at the Wholesale Nursery Growers Barbecue held at Forrest Keeling Nursery in Elsberry on July 13. Many of the nurserymen visited the Garden during their stay in St. Louis.

The Missouri Botanical Garden Calendar

(SEPTEMBER and OCTOBER, 1968)

September 1-8..... HENRY SHAW CACTUS SOCIETY SHOW.

September 14..... CHILDREN'S SATURDAY NATURE PROGRAM. "Table Top Greenhouses." (Bring 1 lb. coffee container and plastic bag large enough to cover.) Admission is free. 10:00-11:30 a.m.

September 21..... CHILDREN'S SATURDAY NATURE PROGRAM. "Little Round Green Things and Others." Admission is free. 10:00-11:30 a.m.

September 21-23.... DAHLIA SHOW. Greater St. Louis Dahlia Society.

September 28..... CHILDREN'S SATURDAY NATURE PROGRAM. "How to Make a Terrarium." (Bring wide mouth jar or small glass bowl.) Admission is free. 10:00-11:30 a.m.

September 28, 29 HARVEST SHOW. Midwest Regional Council of Men's Garden Clubs.

October 1, 8, 15, 22, 29, Nov. 5..... NATURAL HISTORY. A new course to be taught by Edgar Anderson in the Museum Building from 7:30-9:30 p.m. Friends of the Garden, $9.00; $12.00 to others. (Cost of books extra.)

October 5..... CHILDREN'S SATURDAY NATURE PROGRAM. "Planting Bulbs." (Bring 1 lb. coffee container.) Admission is free. 10:00-11:30 a.m.

October 12..... CHILDREN'S SATURDAY NATURE PROGRAM. "Fall Treasure Hunt." Admission is free. 10:00-11:30 a.m.

October 19..... CHILDREN'S SATURDAY NATURE PROGRAM. "Fall Colors." Admission is free. 10:00-11:30 a.m.

October 26..... CHILDREN'S SATURDAY NATURE PROGRAM. "The Forests of the Rocky Mountains." Admission is free. 10:00-11:30 a.m.

October 1, 8, 15, 22, 29..... PLANT PROPAGATION FROM CUTTINGS.
at 8:00-9:30 p.m. To be taught by Mr. Clarence Barbre and Mr. Kenneth Peck in
or the Experimental Greenhouse. Friends of the Garden, $12.00;
October 3, 10, 17, 24, 31 at 1:00-2:30 p.m. $16.50 to others.

(Call TO 5-0440 for further information.)

The Missouri Botanical Garden is a fund member of the Arts and Education Council of Greater St. Louis.

Visit Your Missouri Botanical Garden

(SHAW'S GARDEN)

MISSOURI BOTANICAL GARDEN
BULLETIN

VOLUME LVI NO. 6 **NOVEMBER-DECEMBER 1968**

THINK OF US AT TREE TRIMMING TIME

We have ornaments of wood, tin, straw, metal, plastic, ceramics, glass, and cookie!

THE GARDEN GATE SHOP/at the main gate/Tower Grove and Flora

MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME LVI NO. 6 NOVEMBER-DECEMBER 1968

EDITORIAL & PUBLICATION OFFICE
Missouri Botanical Garden
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FROM THE DIRECTOR

On JANUARY 1, 1969, we will officially begin the first major Capital Fund Drive in the Garden's 110 year history.

Our goal is $3,000,000. We need a new Herbarium-Library Building and a new Education Building. Our plans are in keeping with the wishes of Henry Shaw, " . . . to convey . . . a Botanical garden easily accessible, which should be forever kept up and maintained for the cultivation and propagation of plants . . . and a museum and library . . . devoted to the science of Botany, Horticulture, and allied objects . . . to preserve the same to the use and enjoyment of the public for all time . . . ."

The Missouri Botanical Garden is one of very few institutions in the world where detailed information concerning natural history and evolution is stored and the plants of the world are kept for posterity. If fire or storm destroyed these invaluable assets, future generations would be denied a knowledge of our evolutionary heritage.

No new buildings for science or education have been built at the Garden for over 60 years. Today we are overcrowded to such a degree that trailers have been placed on the grounds to accommodate the overflow of students and research staff. In the years ahead the demand for use of our facilities and assets will continue to grow as the Garden's resources become even more valuable to our crowded world.

We need the help of the entire community to carry on the initial contribution of Henry Shaw. We need special help from you to tell your neighbors about the Garden as a reservation of natural beauty and of its contributions to health, education, and the general betterment of mankind.

David M. Gates

GARDENING IN ST. LOUIS

November and December

There are still pleasant days in the late fall when gardeners can enjoy crisp weather and bright skies while completing the season's garden chores.

Prune and trim shrubs that are not spring-flowering. Cut out old wood on barberry, mock-orange, and spirea. Cut root suckers from lilacs. Evergreen and holly snippings are elegant for Christmas decorations.

Dig up annual beds and cut back chrysanthemums and other perennials when they are through blooming, after several hard frosts. Dahlia roots should be dug and stored early in the period.

Rake as necessary. Composting and mulching can take care of much of the leaf disposal problem.

Mulch flower beds and around the base of bushes. Mulch not only holds moisture in soil, it will also prevent frost heaves and improve garden beds as trace elements and organic matter mix with the soil. The acid-loving plants such as azaleas will welcome a mulch of oak leaves.

Mound up the earth or compost around roses after they have been pruned back to a maximum height of three feet. This will prevent bud graft damage which can be caused by alternate freezing and thawing.

If rainfall and snow are in short supply be sure to water bushes, shrubs, and evergreens, taking particular care not to overwater newly planted specimens.

Chickweed is in full growth now. It is easily controlled with a 2-4,D spray applied on a warm day. This weedkiller will not hurt grass but the maker's directions concerning keeping it off shrubs and other broadleaf plants must be followed exactly.

Before settling in for the winter by the fire, clean, repair, and lightly oil garden tools.

Water and feed house plants regularly, repotting when necessary. A periodic soaking in the sink will help these winter friends cope with the dryness of central heating.

Begin feeding the birds and provide them with water. These winter visitors are a joy to watch during the cold months.

CHRISTMAS ROSE

(Helleborus niger)

Carla Lange

THE ILLUSTRATION of the Christmas rose (*Helleborus niger*) on the cover of this issue of the Bulletin was copied from Brunfels' *Herbarum viva eicones* (live portraits of plants) published in 1530 at Strassburg. The excellent illustrations were executed by Hans Weiditz, a pupil of Albrecht Dürer's and mark a new dawn in the history of herbals. The plants were drawn from nature in their real state, sometimes so vividly original that the artist even showed plants in a wilting state. The plant illustrations in the old herbals prior to Brunfels' work were done by various artists who copied successively from wood blocks used in previous herbals and in all probability never saw the plants themselves.

The Christmas rose grows wild in the alpine regions of Central and Southern Europe, Greece and Asia Minor. In this country it is a cultivated perennial which thrives on soil rich in lime. Once planted it should not be disturbed as it is very sensitive to frequent changes of location. In its native lands the Christmas rose blooms before spring arrives, often on mild days in December around Christmas time, thereby earning its common name, Christmas rose.

The Chrysanthemum

Nobuyuki Kubota

THE CHRYSANTHEMUM is among America's best-loved flowers. Each fall thousands of visitors come to the breathtaking Chrysanthemum Show in the Floral Display House (November 3-24, 1968). Paul Kohl begins growing the plants for the show in the spring, and by the first of November, through hard work and some horticultural magic, the mums are at the height of their glory. Basket and cascade mums of many shades hang in the large greenhouse. Beds of all types of chrysanthemums line the old brick walks. This show is for many the most beautiful event of the year at the Garden.

Chrysanthemums thrive in our country, and it's hard to believe that they have only been here since the late 18th century. A native of eastern Asia, the common chrysanthemum was found in an ancient book of the Chou period (12th-8th century B.C.). In China, a fossil of the plant was found that is 500,000 to 1,000,000 years old.

There is a Japanese legend about this elegant flower: Long ago a man lived at the edge of the *Kan Koku* (sweet valley), a place of great fame. It was said that the water of that mountain stream was sweet and good for the health, and that if a person drank the water he would live long. This man knew the tradition and, one day as he walked around the upper stream, he came to a place where sweet fragrance filled the air. There were large numbers of big chrysanthemums, and the petals were falling down into the stream. The man ladled some water into a cup and took it to the Emperor who drank this *Kiku Sui* (chrysanthemum water) and lived 700 years.

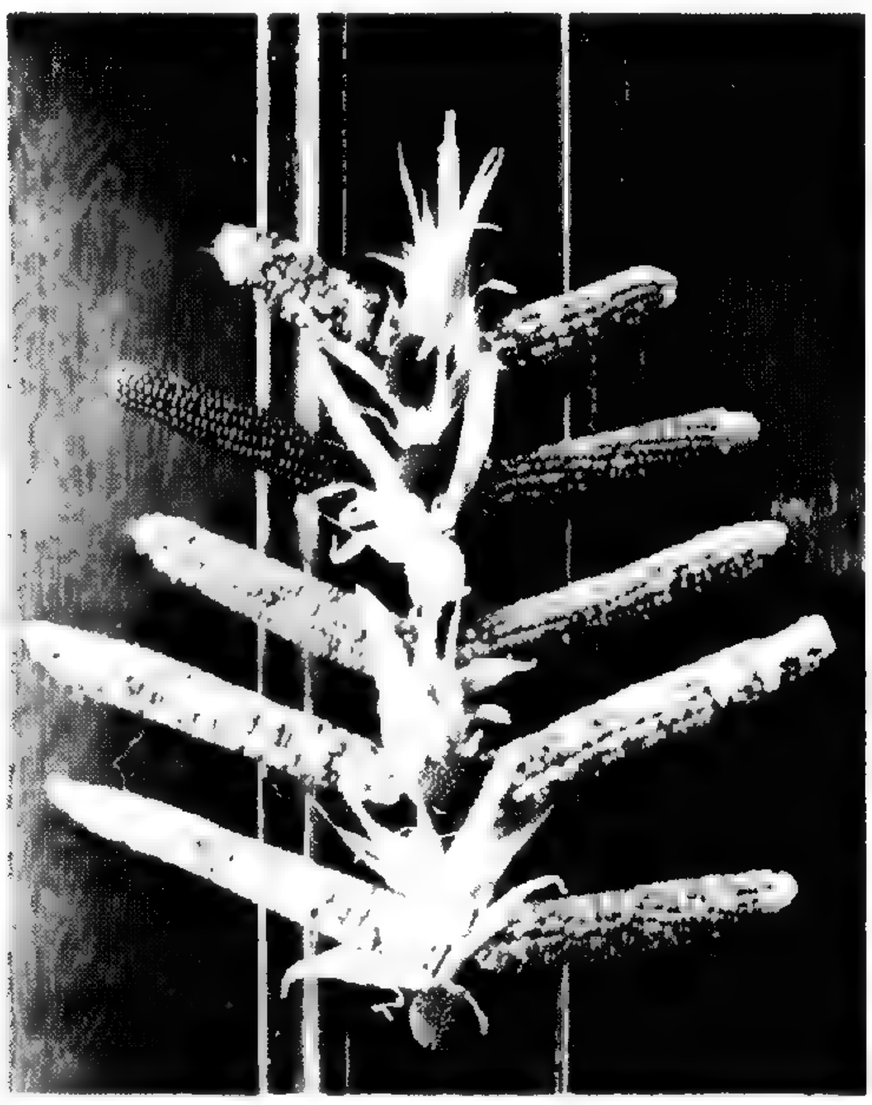
The chrysanthemum has been the Imperial Emblem of Japan since the 12th century and is esteemed as a symbol of nobility and preciousness. The crest of the Emperor is a chrysanthemum of 16 petals. In Japan white stands for purity, therefore the Japanese people think most highly of the white chrysanthemum which has come to symbolize the spirit of God.

The handsome and valuable chrysanthemum, which has been so successfully bred into many different types and hues, is an Oriental import of great and regal heritage.

Mr. Kubota, whose field is the philosophy of education, teaches at a college in Tokyo.

DRIED FLOWER WREATH. A wreath for all seasons. A decorative note much in evidence in California on the fireplace wall. It is equally handsome used as a table centerpiece. It lends itself to many combinations of dried material and oftentimes has large tassels in blending colors of yarn. Our wreath is made of pink strawflowers, purple statice, red cockscomb, and small bunches of bright red star flowers. Bunches of burgundy glass grapes give it a special sparkle.

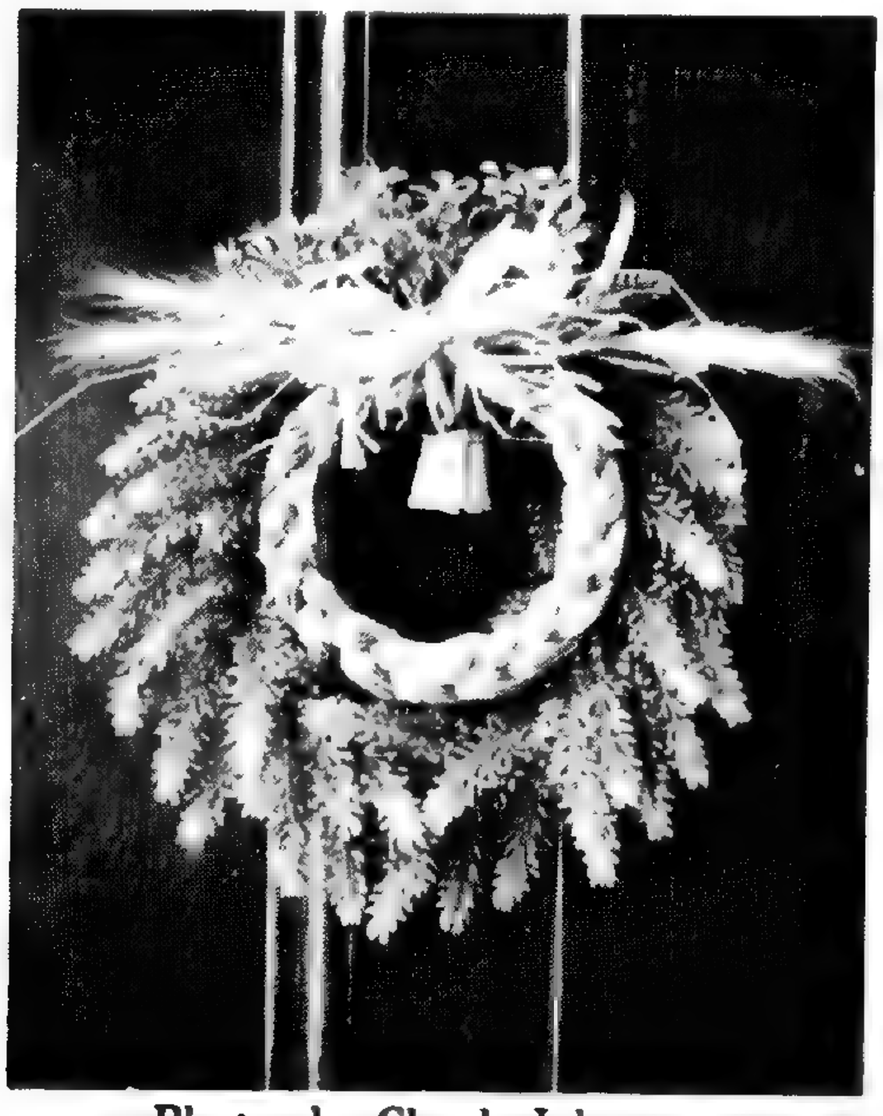
THE SANTA LUCIA CROWN. A wreath made of iron holding five white candles, five apples facing downward on large spikes, and five English walnuts on lower spikes. Evergreens are intertwined. A Swedish tradition, it is lighted on December 13 in celebration of Santa Lucia day.



A HARVEST DECORATION for a wall or a door. This old iron corn dryer has large colorful ears of Indian corn fastened on spikes. In the center are ears of red and white strawberry corn. A most attractive way to greet Thanksgiving guests. (Courtesy of Dorothy O'Brien)

A HARVEST WREATH. Featuring a wreath of braided corn husks inside a circle of evergreens. Decorated with dried stalks of grain and tied with raffia, a cow bell hangs from the center.

DELLA ROBBIA WREATH. This equisite wreath of pine cones, true-to-life fruits and bright red ribbon bow was made by Sandra Allen of Ralph Allen Ltd. We think of it as a holiday tradition but it would enhance a home at any season.



Photos by Claude Johnston

Glorious Wreaths for All Seasons

Mary E. Baer

Decking the house with evergreens at the time of the winter solstice is an ancient tradition. It is a reminder that life continues to flourish even when the soil is hard and fruitless and trees are stripped bare. Circling the victor's head with a wreath of laurel was an old Roman custom. A happy blending of these two traditions is the symbolic evergreen wreath hung on the door to celebrate the birthday of Christ. The wreath is always a gay and ready sign that those within are in a festive mood.

Wreath making can be done any time and the workable materials come in delightful imaginative variations. From early summer until autumn the countryside abounds with material to dry, from grasses to grains. There are seed pods, leaves, pine cones, ears of bright-hued Indian corn and many, many other materials free for the taking.

Mary Baer, a founder of the St. Louis Herb Society, is a recognized national authority on drying and arranging flowers. For many years, people admired her nineteenth-century arrangements in Tower Grove House.

Renyold Ferguson, St. Louis Post-Dispatch

The 45 year old offspring of the Daniel Boone elm succumbs to *Phloem Necrosis* disease and is cut down on August 14, 1968.

Daniel Boone Elm Succumbs to Disease

Ladislaus Cutak

THE LARGEST SEEDLING Daniel Boone "Judgment Tree," which has been growing at the Garden for 45 years, recently succumbed to the virus disease known as *Phloem Necrosis*. This disease is comparatively new, making its appearance a little over 25 years ago in the Midwest, where it has decimated hundreds of American elms. The first symptoms of the disease were noted earlier in the year when the extreme top of the tree and outer tips of the branches were defoliated. There is no known cure for this disease at present. The only thing that can be done is to cut down and burn the infected individual. Ex-

Renyold Ferguson, St. Louis Post-Dispatch

Kenneth Peck counting rings and explaining *Phloem Necrosis* disease to his nature study class.

tensive research has been conducted on the disease, and sometimes claims have been made in combating it, but as yet no lasting success has materialized.

The Garden specimen had attained a height of 45 feet and a branch spread of 80 feet. It was one of the three seedlings planted at the Garden from seed gathered by George Pring in 1922 from the original Judgment Tree on the old Boone Homestead in St. Charles County. Our specimen stood on the lawn at the northeast end of Tower Grove House, and its loss leaves a great void in front of the residence, particularly to the visitors who were used to seeing the elm at that spot.

The original Daniel Boone Elm still grows beside an ice-water spring on the Boone Homestead in peaceful Femme Osage Valley not too far from St. Louis. Now a venerable monarch over 200 years old, it is revered as a historic object and memento of Daniel Boone's days in Missouri. Under this luxuriously branched *Ulmus americana* the famous frontiersman conducted his court for a decade and settled many a dispute between white man and Indian. He was given this authority by the Spanish commandant and later when the United States Government established its own legal system in the territory, disputes were still brought to Boone for settlement and his decisions honored.

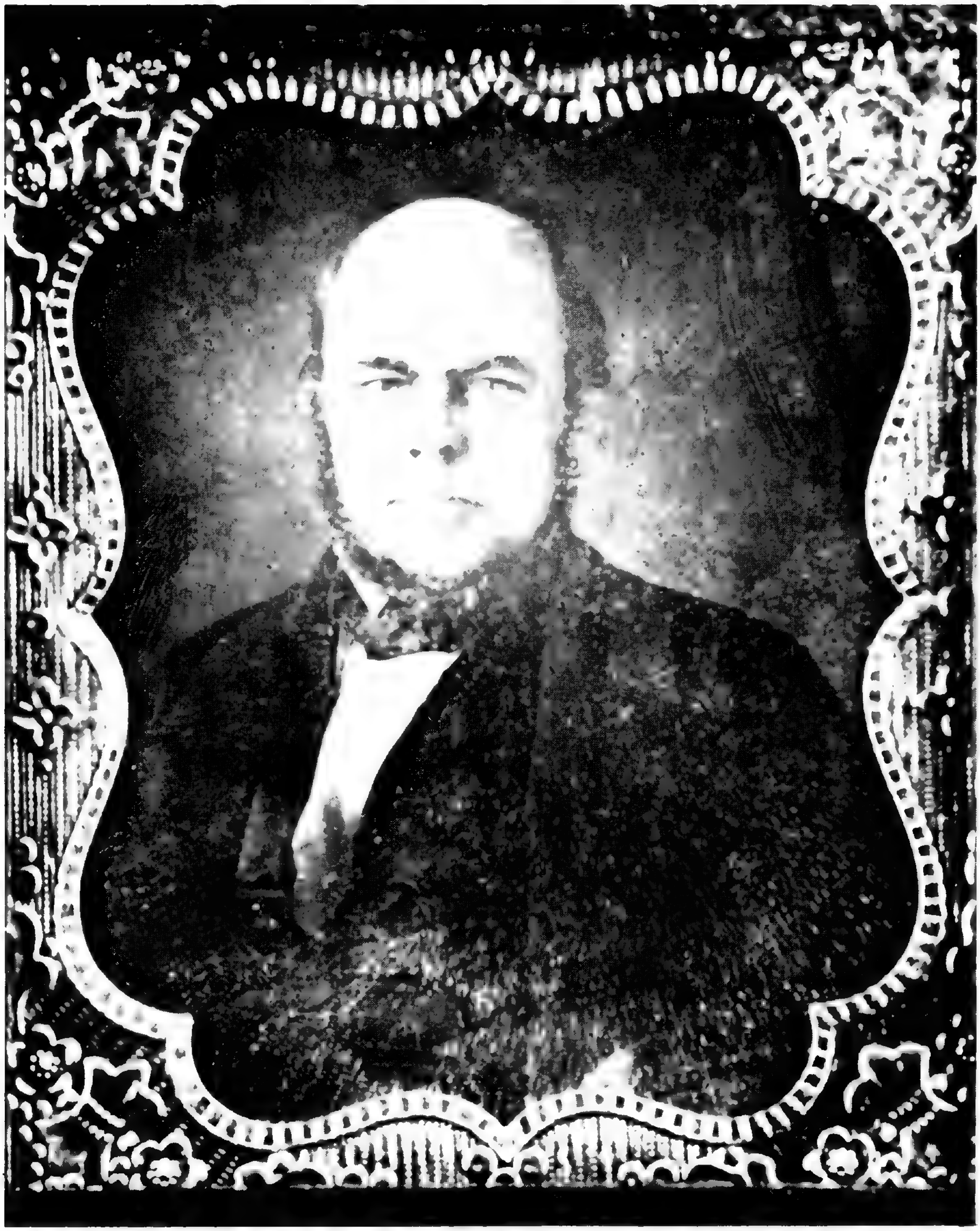
GEORGE ENGELMANN, 1809-1884
Scientific Father of the Garden

Barbara Lawton

THE MISSOURI BOTANICAL GARDEN has been, since its very beginning, familiarly called Shaw's Garden after its founder. Henry Shaw *did* plan and finance the Garden, but few people realize that it would have been little more than a superb park without the zeal and foresight of George Engelmann. It was he who saw to it that the Garden became truly a botanical garden based upon not only display, but also research and education. Mr. Shaw might have foregone the research and education without the guidance and perserverence of Engelmann.

Like Shaw, Engelmann came to this country as a young man. Both were independent and adventurous. Both became great successes in their fields; Shaw amassing a fortune in the hardware business, Engelmann eminently successful as a physician, surgeon, and scientist. In the 1800's it was perhaps even more difficult than today to constructively channel personal fortunes toward worthwhile scientific enterprises. Scientists were constantly distracted from their immediate work by the need for funds to support and advance their research. Dr. George Engelmann, hard at work on the flora of United States, was understandably thrilled to discover Henry Shaw, who was both well-heeled and interested in botany. In April, 1856, Engelmann wrote to Asa Gray, Professor of Botany at Harvard: "We have a very rich Englishman here, Shaw, an old resident and bachelor who concluded to devote his time and fortune to the founding of a Botanic Garden and Collection, Kew in miniature, I suppose. (He corresponds with Hooker.) I hope something valuable and permanent will come of it."

George Engelmann was born in Frankfurt-am-Main, Germany on



Missouri Historical Society

George Engelmann at about forty years of age. This photocopy is of a daguerreotype in the collection of the Missouri Historical Society. The only other portraits of Engelmann, to the author's knowledge, are the painting which hangs in the Museum Building and a similar photograph, both done in later years.

February 2, 1809. His parents were intelligent and respected members of the community who conducted a girls' school in Frankfurt. This was quite advanced, for in those times the education of girls was not considered necessary or even advisable. Eldest son in the family of thirteen, he said in a later memoir, "I began in my fifteenth year to be greatly interested in plants." His parents gave him his early schooling and at the age of eighteen, with the aid of a scholarship from the Reformed Congregation of Frankfurt, he began the study of medicine at the University of Heidelberg. Medicine in the early nineteenth century was still botanically oriented; the study of medicinal plants was of major importance to the young medical student. While at Heidelberg, Engelmann knew, as fellow students, the botanists, Karl Schimper and Alexander Braun. And later in Paris, he became acquainted with Louis Agassiz, the naturalist and zoologist who later was to lock horns with Darwin on theories of evolution. These early friendships were the nucleus of what became a worldwide correspondence and circle of scientific friends. Science, being a human endeavor, is first and foremost based upon contact between men. Engelmann realized this from the start and corresponded at great length with an ever-increasing number of scientists and explorers.

Engelmann was apparently a good student but became too involved in student uprisings, and so transferred to the University of Berlin in 1828. Here he again was involved in the political agitations and once more transferred, this time to the University of Wurzburg. These uprisings were the early stirrings of the revolutionary movements for democracy and unification of Germany in 1848 and 1849. Wurzburg was closer to his parents' home. They were also sympathetic to the revolutionary movement. Young Engelmann received his medical degree in 1831. His thesis, on monstrosities and aberrant forms of plant life, revealed not only ability as a scholar, but also a rare talent for accurate drawing.

A wonderful term in Paris with his friends, Braun, Agassiz, and Constadt followed. Engelmann said of this time: "We led a glorious life in scientific union in spite of the cholera." Cholera was raging in Paris in 1832. Coincidently radical political thinking was raging in Paris, too. That firebrand of all times, Karl Marx, was holding forth in the city when Engelmann was there.

In Germany the socialist, Duden, had attracted a lot of attention from the better educated of the malcontents with his thrilling, though somewhat erroneous, accounts of the resources and frontier life in

Missouri. Immigration to the United States was reaching flood stage at this time. Its population was approaching thirteen million. (Engelmann would live to see this figure quadrupled.) Young Engelmann's uncles, impressed by stories of profitable land investment and the rush to the frontier, wanted him to look into the investment possibilities in Missouri. It's quite possible that they also wished to see him out of the potentially dangerous political situations for which he seemed to have such an affinity. Dr. Engelmann shared the thoughts of the revolutionary Burschenschaften, but he, unlike many of his acquaintances, was no fugitive. He sailed for America in 1832 and headed for Belleville, Illinois, which was an odd little community of displaced persons. Here he met once again Ferdinand Jacob Lindheimer, George Bunsen and other associates from Frankfurt and his university days. Lindheimer was to become a very important plant collector in America's West.

Engelmann was well endowed with the German capacity for hard and thorough work. He began the research work for his uncles at once. He studied the flora, mining resources, and settlements of the Mississippi Valley. Medicine took a back seat during these two years. It was a lonely life in this new country. Engelmann's enthusiasm and the lure of the virtually unexplored country led him to botanizing trips on horseback through Illinois, Missouri, and Arkansas. When, in the autumn of 1835, the work for his uncles was completed, he was also out of funds. He states that he even had to sell his gun and part with his faithful horse. Now his profession of medicine would become his main resource. He moved to St. Louis, which was at this time little more than a trading post, a supply depot for western exploration and emmigration. There were only eight to ten thousand inhabitants. In the 49 years that George Engelmann lived in St. Louis, it grew to be a metropolis of over 400,000 people.

Obviously such a settlement would have great need for a doctor. His advanced medical skills plus familiarity with German, French, and English guaranteed a successful career to Dr. Engelmann. His medical practice soon came to demand the major portion of his time. In the little spare time he had, he continued to botanize. He probably had had better and more thorough training in the anatomy of plants than any native American botanists. He studied and made permanent notes and careful sketches of all the new things he described. These fill some sixty volumes which are among the treasures of the Missouri Botanical Garden Library.

He sent specimens of plants to European institutions. In the late 1830's Asa Gray ran across some of Engelmann's herbarium specimens in Berlin. Gray, who has come to be known as the finest botanist America ever produced, immediately recognized the skill and judgment of the St. Louis doctor and wrote a complimentary letter to him. Thus began Engelmann's most important botanical friendship. (Out of it came the voluminous correspondence now preserved at the Gray Herbarium and the Missouri Botanical Garden Library.)

Dr. Engelmann returned to Germany in 1840 to marry Dora Horstmann, a distant cousin and childhood sweetheart. On their way back to St. Louis, the couple stopped off in Cambridge, Massachusetts, where they met Asa Gray. The two men hit it off as well or better in person than they had by letter. Eastern botanists, under Gray's leadership, were attempting to establish the complete flora of North America. This was of utmost importance at this time, for with the growing tide of immigrants, many new plants were being introduced. It would soon be difficult to tell the true native plants from the gone-wild newcomers. The West was being explored both by aristocratic Europeans and by government and privately financed efforts. Engelmann became Gray's pipeline to the West.

Explorative, boundry, and railroad survey expeditions bought supplies, started from St. Louis, and returned there. Dr. Engelmann thus was in the right place at the right time. He sent botanical emissaries along whenever possible, and asked that expedition members bring back properly annotated plant specimens. A specimen was of little use without a precise record of where it had come from. One of the greatest opportunities came after the Mexican War when many expeditions were sent into the Southwest to survey the Mexican-United States boundry. Out of this came the famous Engelmann treatise, *United States and Mexican Boundry Survey, Cactaceae of the Boundary (1857-8)*.

Henry Shaw had come to St. Louis in 1819 with a small stock of cutlery, furnished by his uncle who manufactured hardware in Sheffield, England. He began business in rented quarters on the second floor of a riverfront building. This small beginning grew beyond his wildest expectations into the general merchandising business through which he earned his fortune. By 1840, Shaw felt that he had accumulated an ample amount for any man and spent the next few years traveling throughout Europe and the Mediterranean region. While in England he visited the two places which became the inspiration for the botanical

garden in St. Louis. One was Chatsworth, a magnificent estate known for its fabulous gardens. The other was Kew, a botanical institution of the first order, where he met Joseph D. Hooker, England's renowned botanist. Upon returning to St. Louis in 1851, he hoped to realize an ambition to use his country estate with its handsome house, called Tower Grove, as the basis for the embryonic botanical garden.

What a fortunate coincidence that both Shaw and Engelmann landed in St. Louis! But even though their general aims were the same, it should not be assumed that it was easy sailing in the formative days of the Missouri Botanical Garden. Dr. Engelmann realized from the first the problems that would undoubtedly arise, as we can see from his letter to Asa Gray in May, 1856: "I have not yet seen much of Shaw, and am unfortunately not the proper person in address and diplomacy, etc., to work with him—still I hope for the best; he seems very zealous. Get Hooker to encourage him! He has already had a letter from Hooker referring him to me! Which had a good effect."

The botanists, presenting a united front, did have good effect on Henry Shaw, for in 1857 Dr. Engelmann was off to Europe, buying important botanical books and bargaining successfully for the purchase of the Bernhardi Herbarium in Leipzig. This large collection of some 40,000 species was the beginning of the Garden's present famous Herbarium. At the same time Shaw was busily building on the Tower Grove grounds, "a fine stone wall around 10 acres of fine, slightly sloping ground," a greenhouse of considerable dimensions, "a fine entrance, porter's or guardian's lodge, etc." "He has also prepared his plans for a Museum, Library, and Herbarium; of course, according to the Kew plan—but unfortunately he has had the plan of the *old* Museum only, and worked and planned on that!—the rooms, 1 for Library, the 2 for Herbarium, are too small, and there is no working room in the building if it be not the basement."*

It is amazing that the Garden progressed as quickly as it did, for the 40's, 50's, and 60's were times of many stresses in St. Louis, as well as the rest of the country. There were devastating riverfront fires, economic crashes, and cholera epidemics, to say nothing of the national turmoil leading to the Civil War. In 1861, George Engelmann wrote, "It is not at all impossible that St. Louis in the West will be, what Washington is in the East, the great prize to be fought for, and only think the honor, many imagine, that the Missouri Botanical Garden,

**Quotes are from George Engelmann letters to Asa Gray.*

with its substantial buildings and the long and solid walls surrounding it, situated on an elevation in a large cultivated plain, can not fail to be the principal Battlefield! No jesting about it."

The conflicts of interest between Shaw and Dr. Engelmann continued after the official establishment of the Garden in 1858. It was very difficult for Engelmann to get across to the untrained Shaw the need for certain things to assure the success of the Garden as a true botanical garden. It may have been equally hard for Shaw to convince Engelmann of certain hard-core business and financial facts. The letters from George Engelmann to Asa Gray are revealing:

> *October 17, 1859.* "Shaw is busy getting greenhouses in order before winter. He continues zealous, but unfortunately does not know enough and is in many things a little narrow minded."
>
> *April 10, 1860.* "I am afraid we can not pull well together—I can not influence him. I do not understand the soft soaping as the western phrase it;—a man who has no real scientific zeal nor knowledge who must be got to do things by diplomacy, I can not do much with. The proper way would be to get him interested in what interests us and seems important to us, but that I unfortunately do not understand."
>
> *June 12, 1860.* "Shaw is working ahead but I do not see much of him; we are very good friends but I am afraid would not hitch well together. Scientific botany is secondary or tertiary with him, while I can not get up an enthusiasm for what interests him most."
>
> *November 1, 1860.* "Shaw is going slowly, but still going on. He has the ornamental as much at heart as the scientific, which I think is very well to popularize his establishment. Times, unfortunately, do not permit him to spend any money on herbarium or library, which is unfortunate, but we must take what he is willing to do and to give."

The two men, in spite of these personal misgivings, apparently pulled together well enough: for each one brought to the Garden in full measure his own gifts of time, money, ability, and above all, dedication.

Modern botanists owe a great deal to Dr. Engelmann. Much of his work is still regarded as fundamental. In addition to over one hundred published botanical papers, Engelmann accumulated over sixty large volumes of notes on plants. The Missouri Botanical Garden has a wealth

of material in both the Engelmann writings and the Engelmann Herbarium.

Not only a doctor and a botanist, Engelmann had a long interest in meteorology. His accurate thermometric, barometric, and hydrometric observations (which go from January, 1836 to December, 1882) are the only reliable record of that time for the Mississippi Valley. The Academy of Science of St. Louis was founded in 1856 through the instigation of Dr. Engelmann.

George Engelmann was a man of great ability and capacity. He died on February 4, 1884 at the age of 75 from a chill received while out in the winter cold taking a meteorological reading; scientist to the end. Joseph D. Hooker later wrote to Henry Shaw that Engelmann was "a man whose labors as a most conscientious and painstaking botanist have never been surpassed."

Missouri Historical Society

This bronze commemorative medal was struck in honor of the semi-centennial anniversary of the Academy of Science of St. Louis. Sculptor, Max Deidel, shows Engelmann in his later years.

BOOK CORNER

Views and Reviews by Edgar Anderson

THE FRIENDS OF JOHN GERARD (1545-1612), SURGEON AND BOTANIST

by Robert H. Jeffers

(*Herb Growers Press*)

This book helps interpret the Garden's outstanding collection of herbals, the ancient plant books which flowered when medicine and botany found their way out of magic into science.

John Gerard's *The Herball or Generall History of Plantes*, London, 1597, is among the latest of them but was the first in English. Jeffers has used the ample Elizabethan historical record to harvest detailed chit-chat about Gerard, his life, friends, garden; the London of his time. These gleanings do more than help us understand Gerard. Because printed records are so much richer for Elizabethan scholars than for the earlier and greater herbalists, we gain new insights into the minds of those who published over 50 years earlier.

We learn not only that John Gerard was born in Cheshire and went to school there, but that in later life he recalled passing on his way to school "a wood where raspberries grow wild."

He was certainly a born botanist. All his life he loved and studied plants of all kinds, medicinal herbs, ornamentals, scrawny roadside weeds. There is a record of one such weed whose seeds he carried home to grow and to preserve a specimen for his private herbarium.

He was well-schooled in Latin. He read, spoke, and wrote it fluently as did other learned men of his time. From Cheshire he went on to London to serve as an apprentice and became "a Freeman of the

company of Barber-Surgeons" in 1569 at the age of 24. He had a distinguished career as a botanist, herbalist, and surgeon; was superintendent of Lord Burley's three gardens for 21 years.

Gerard's own home and garden were on the south side of Holbern at its junction with Fetter Lane. We learn that he collected and studied "a plant he found growing on the boundary wall enclosing the house and grounds of the Earl of Southampton, not far from his own home." One of his experiences rouses the sympathy of several of us in the St. Louis Herb Society, for like us he bothered to get good seed of the famous Dittany of Crete, a close relative of marjoram, and grew it several years only to have it killed "during an exceptionally cold winter."

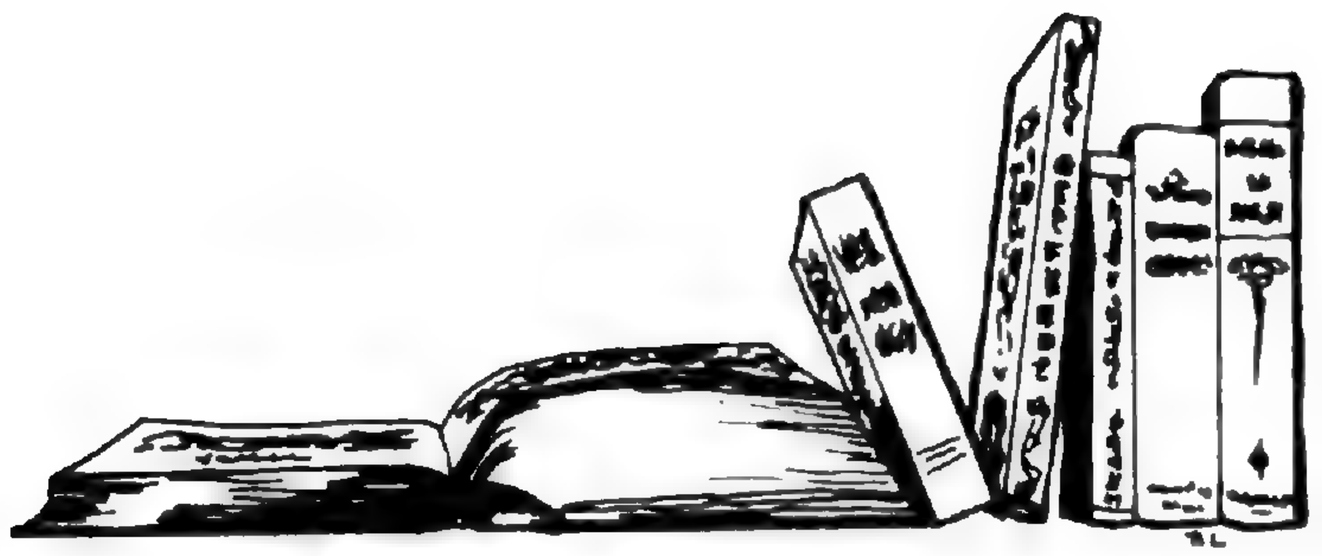
He traveled widely in England collecting plants and visiting the gardens of other herbalists. From these visits and travels, as well as by letter, he built up his herbarium and became known to the scholars of his day.

He not only published his herbal in 1597 but issued two successive catalogues of his own herb garden, the first such list to be published in England, therefore a foundation stone in establishing dates of introduction for exotic plants. He was the first person to grow, and to flower, the potato plant in England, and was proud of it. He wangled a job as a ship's surgeon for his servant William Marshall so William could collect plants in the Mediterranean region for Gerard's garden.

The very titles of some of Gerard's friends (and he had many) have an important ring to them, as for instance Randolph Bull, "citizen and goldsmith of London, clockmaker to Queen Elizabeth, Keeper of the Great Clock at Westminster to James I." Through such connections, on August 1, 1599, Queen Elizabeth issued an order by which his friend Thomas Thorney, a warden of the BARBER-SURGEONS COMPANY, lent him "a corslet, a head piece, a sword, and a dagger." Yet when we read Gerard's Herbal what most delights us is his simple, running English prose, as when he notes the common vervain as "growing in untilled places neere unto hedges, high waies and commonly by ditches everywhere."

Jeffers quotes an entry of Henry David Thoreau of Concord and Harvard University in his journal: "To Cambridge where I read in Gerard's Herbal. His admirable though quaint descriptions are to my mind greatly superior to the more modern scientific ones. He describes not according to rule but to his natural delight in plants."

Jeffers' book is a rich mine of such information but, alas, it does not read like Gerard or Thoreau.



THE WILD GARDENER IN THE WILD LANDSCAPE

by Warren G. Kenfield

(*Hafner*) $7.50

Warren G. Kenfield is the pen-name of a brilliant, well know, outspoken ecologist, an authority on both the use and the misuse of sprays in controlling vegetation. He has a robust sense of humor and maintained his alias by reviewing the book objectively under his own name in a scientific journal!

Seven years ago I spent an Indian Summer day visiting, with him, the artistic and efficient landscapes he had been (and still is) developing out of an old abandoned farm-site in Northern New England. Some of the color plates in his book may be more arresting than the woodlands and pastures I saw that afternoon, but to a visitor like me who had long been interested professionally in the problem of minimum care procedures for country estates, the actual pastures and woodlands were far more impressive than his beautiful book.

I shall review the substance of the book by condensing its essence out of his own words and phrases (pp. 5, 19, and 20). "Naturalistic Landscaping: a practical art, involving the esthetic manipulation of plants and communities. It will allow you *to carve out what you do not want*, forming a pleasing whole. It appeals to the person who likes wild nature wild . . . but modified a bit and when he glimpses a view of a distant hill, marred by a big, unnecessary tree, he is willing to tip the scales of nature with one finger."

"In Naturalistic Landscaping, the chances are that you must start with "brushland". The word brush is not a good botanical term; it merely indicates woody plants you do not want, abandoned agricultural land growing up to a miscellaneous mass of trees, shrubs, grasses, and other plants. Cheer up! This is the best possible land with which to start. The choice of what to carve is yours.

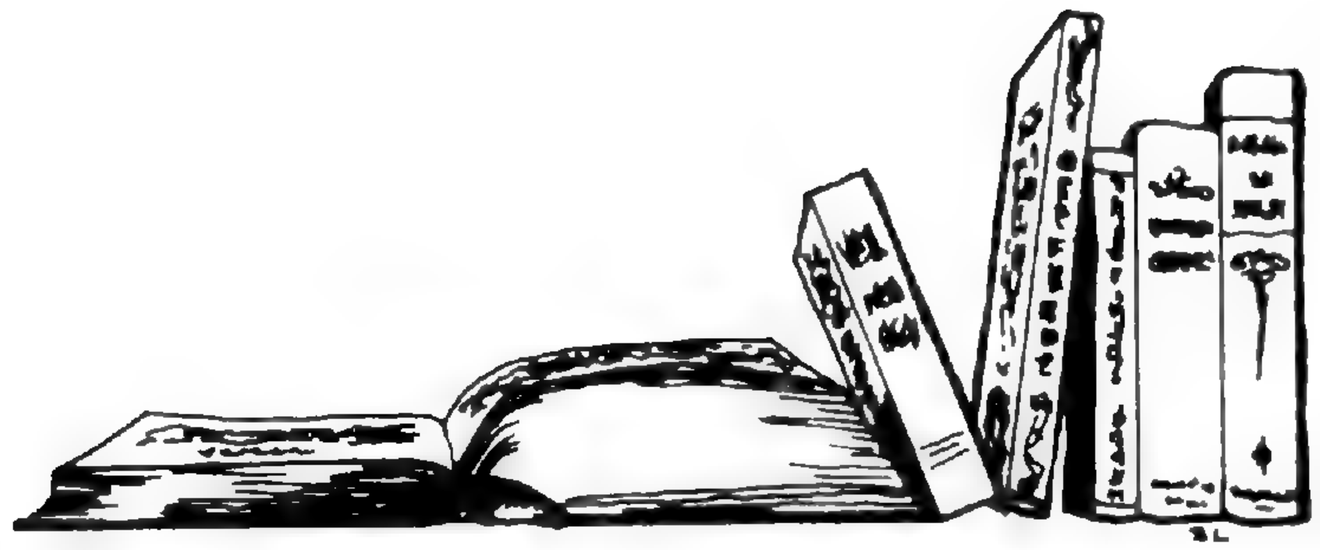
POISONOUS PLANTS OF HAWAII

by Harry L. Arnold, M.D. (*Tuttle*) $2.50

The author, a prominent physician in Honolulu, first brought out this book in 1944 to help answer "the ceaseless stream of inquiries from doctors and the laity about poisonous plants." In addition to his own long experience, he had the active cooperation of the well-known Hawaiian botanist, Otto Degner.

As Dr. Arnold points out, most of the ornamental plants a tourist sees in Hawaii "came from such countries as India, Madagascar, Ceylon, Brazil, and Burma." It will therefore be useful for any family making an extended visit to the Tropics or sub-Tropics for the first time.

Only a few of these attractive plants are highly poisonous but a few of the most beautiful and most widely grown are among the most dangerous. On Oahu the most frequent fatalities are from *Thevetia peruviana*, the so-called yellow oleander (there is also an orange-flowered variety). Since this handsome tree also flowers well in northern greenhouses and conservatories, it has been chosen as an example of Dr. Arnold's listings. The following account (though condensed slightly) is typical of the whole book: "A small handsome tree with glossy leaves. It's name, 'be still,' is from its almost ceaseless quivering motion in the slightest breeze. Widely planted throughout the Islands, its fruits are like small irregularly shaped apples. Each contains one large nut-like seed. All parts of this tree are dangerously poisonous to animals and to man. Two known fatal cases have been seen by the author, both children who ate the fruit. The active principle is thevetin, a digitalis-like substance which is coming into medical use as a heart disease remedy. Thevetia seeds are shipped from Honolulu in quantity for use in manufacturing this drug. Symptoms of poisoning resemble those of digitalis (foxglove)—Early cases should be made to vomit and given a brisk cathartic. Atropine is to some extent an antidote, but can be used only by a physician."



FANTASTIC TREES
by Edwin A. Menninger
(*Viking*) $8.95

Here is a perfect book for either your coffee table or for a biology library! It contains fascinating picture-essays on puzzling, dangerous, or spectacular trees. The almost 250 pictures were winnowed from all over the world. Each one helps in telling a story; many are superb just as photographs.

All this has been expertly ordered up by an alert, informed mind; sometimes under titles that veil the author's vast competence. If, for instance, the heading, Boojum Tree, catches your attention in leafing through the book, you will find an authoritative two-page monograph. The boojum tree forms desert forests of long poles along an inaccessible 200 mile belt in eastern Baja California. The common name is straight out of Lewis Carroll (*The Hunting of the Snark*) and was given it by a desert ecologist from Tucson.

The chapter on Ant Trees includes the peculiar "whistling thorn" of Kenya, *Acacia propanolobium*. Its long spines swell at the base into globes in which ants make their nests, and in return protect the plant. Winds blowing across the holes made by these insects generate whistling noises, hence the common name. Recent experiments prove that botanists have long been in error in assuming the globes to be galls, reactions to injury by the ants. The shrub produces the grape-like swellings; the ants use them. Menninger heads his accurate analysis of the story: "The whole riddle of which came first, the chicken or the egg, gets a rerun . . ."

WHO, WHAT, WHERE, WHEN

Dr. David M. Gates will be speaking on the morning of November 9 at a conference entitled The Environmental Crisis: a Regional Conference on Air, Land, and Water Pollution. The conference, which will be held in Wilson Hall at Washington University, is being sponsored by Open Space Council, Center for the Biology of Natural Systems, Missouri Botanical Garden, Health and Welfare Council, and the Department of Public Administration and Metropolitan Affairs of Southern Illinois University. Ian McHarg, landscape architect of Philadelphia, will be the keynote speaker. Dr. Barry Commoner and Dr. Robert Karsh of St. Louis, and Alfred Kahn of SIU will also speak. Through this conference the Open Space Council hopes to establish a citizens' coalition for action to preserve the quality of our environment. (Contact the School of Continuing Education at Washington University, VO 3-0100, for more information.)

The 1968 Jesse M. Greenman Award for the best Ph.D. thesis paper in plant systematics was awarded to Dr. Carl S. Keener, Assistant Professor of Botany at Pennsylvania State University. Dr. Keener's award winning paper, "A Biosystematic Study of *Clematis* Subsection Integrifoliae (*Ranunculaceae*)", represents a modern approach of determining evolutionary relationships among closely related species by utilizing techniques of morphology, anatomy, chromosome studies, chemistry, and ecology. The Greenman Award is given annually by the Alumni Association of the Missouri Botanical Garden in honor of Dr. Jesse M. Greenman, the dedicated scholar and teacher who was curator of the Herbarium from 1913 until 1945.

Changes in Dr. Gates' Ecology Staff reflect both expansion of current programs and exploration of new approaches. Dr. Fred O. Lanphear will be investigating the effect of vegetation on the reduction

of noise. Dr. Oscar H. Soule will be expanding the energy budget of animals research to include a number of vertebrate species not previously studied. Dr. George R. Hoffman will extend the research program on the energy budget of plants to include plant canopies and simple plant communities. Drs. Lanphear and Soule will be supported by the Center for the Biology of Natural Systems, Washington University. Dr. Hoffman will be supported by the United States Atomic Energy Commission. Dr. Hyrum B. Johnson has been appointed the first Ford Foundation Fellow. Mrs. J. Emil (Sylvia) Morhardt has joined the staff as the first Ford Foundation Predoctoral Fellow. Finally, to assist in all these programs and add continuity to the overall research objectives, the staff now includes a full time technician, Mr. Gerald W. Pingel.

The Herbarium Staff has been increased to better handle the expanded workload. Dr. Duncan M. Porter joined the Garden staff in September as Assistant Botanist and Curator of the Flora of Panama. He has also been appointed Assistant Professor in the Botany Department of Washington University. During his postdoctoral assistantship at the California Academy of Sciences, Dr. Porter wrote familial treatments for the flora of the Galapagos Islands. Marshall R. Crosby, systematic bryologist, has joined the Herbarium staff as Assistant Botanist and Acting Curator of Cryptogams, filling a much needed position in the study of lower plants. He is completing work on his doctorate which is anticipated in February, 1969. Dr. Joan W. Nowicke joined the staff in August as Research Associate for the Flora of Panama. A Fulbright scholar, Dr. Nowicke's dissertation was a pollen-classifying study of the *Phytolaccaceae* (pokeweed family). Dr. Sally Walker, another new Research Associate, will be carrying out cytological investigations with Dr. Lewis, dividing her time between Washington University and the Garden.

The Garden's Museum of Useful Plants has one of the most complete collections of prehistoric and recent cultivated plants of the New World. Techniques developed here for the analysis of evolutionary trends shown in these collections are useful for the study of relationships of communities to plants and of communities to other

communities and cultures. This fall two of the most active research workers on such materials visited the Garden. Dr. Thomas W. Whitaker, Geneticist for the U. S. Department of Agriculture and the scientist responsible for the breeding of the most important kinds of cantaloupe and lettuce grown in the West, spent a week working on wild and cultivated squashes with Dr. Cutler. Dr. Vorsila Bohrer, Ethnobotanist at the University of Arizona, worked for ten days on the many collections of plants from archeological excavations in the Southwest which have recently been submitted to the Garden for study. Dr. Bohrer has published papers on plants found in archeological sites and used by the Zuni and Navajo Indians of the region in which she lived while she conducted her research.

Edgar Anderson and his wife, Dorothy were in Johnston, Iowa this summer. Dr. Anderson extended his work with corn and initated field work on *Perilla*, an ornamental herb. He worked and visited with former students and old friends at Pioneer HiBred Corn Co. Having been raised on an agricultural campus in Michigan, he enjoyed being involved with Pioneer's international plant, poultry and cattle research facilities. Dr. Anderson spoke at the corner stone laying of the national headquarters of the Men's Garden Clubs and to the Des Moines Rose Society. He wrote several papers for publication. The principal one is a review of the species concept, a problem which is one of his chief professional interests. His work in this field has brought international renown to the Garden.

The Garden's New Guide Book was given the Master of Graphic Arts Award in recognition of excellence in craftsmanship by the Hopper Paper Co. The award was presented by William F. Obear, President of Tobey Fine Papers, Inc. to Barbara Lawton, Manager of Publications, and to Edward J. Turner, President of Universal Printing Co.

Thank You for a Great 1968
to the

12,000 St. Louisans who insured the success of the 1968 Arts and Education Fund by giving more than $840,000 to the most successful campaign in our history.

1,200 volunteer workers, under the leadership of General L. J. Sverdrup and Eugene F. Williams, Jr., who made the Fund a success by their devoted hard work.

350 donors of dreams, goods and services to the CAMELOT auction for the benefit of the member organizations of the Arts and Education Council.

250 members of the CAMELOT Committee, under the chairmanship of Mrs. C. Alvin Tolin, who worked to make the first CAMELOT auction such a resounding success.

2 national foundations—Danforth and Rockefeller—who made possible a substantial M.E.C.A. arts program in the innercity through a grant to the Arts and Education Council.

100 People who helped make possible the nine Summer programs funded through the Arts and Education Council as part of the Mayor's Council on Youth Opportunity.

2 newspapers, five television and countless radio stations which carried the arts and education story to a wider audience this year.

THANK YOU
FOR MAKING 1968 OUR BEST YEAR EVER.

The Arts and Education Council
of Greater Saint Louis

CHEFS' ADVENTURE IN CUISINE
A ☆☆☆ EVENT!

Although women do most of the world's cooking, men still do it best. The St. Louis Herb Society and the Laclede Gas Company will prove it in a demonstration of gourmet cooking.

January 15, 1969 from 6 to 8 p.m.

Shrewsbury Branch of Laclede Gas Co.
4118 Shrewsbury Ave.

☆ A noted St. Louis Chef and restaurateur supported by husbands of Herb Society members will make their favorite dishes. (Guests will receive recipes).

☆ Door Prizes and Refreshments.

☆ Proceeds benefit the Capital Fund Drive of Shaw's Garden.

$5.00 per person
(tax deductible)

For tickets call Mrs. Morton Mallory, HE 2-8607 or Mrs. Kenneth Maurer (after 5 p.m.) PE 9-0447.

Order early—a limited supply

(For a Christmas gift—*formidable!*)

Tower Grove House

The Historical Committee held their regular board meeting and made many plans for Henry Shaw's Tower Grove House for 1968-1969.

The Committee hopes to have many different and interesting collections displayed in the three cabinets in the halls. At present Mrs. Neal S. Wood's collection of ruby glass is in the second floor cabinet.

A collection of Old Paris gold wedding band and white china (1860) is displayed in the back hall opposite the kitchen. This was given to The Tower Grove House by Mrs. Martha V. Kaltwasser.

In the back hall near the office we have our own collection of the Dewdrop, also Dewdrop and Star pressed glass.

Anyone having an interesting collection of the Shaw period, please let us display it for the public to enjoy. Call Mrs. V. Brewer PR 3-9000 and one of the Historical Committee will contact you.

South American Adventure

THE FRIENDS' Garden Tour of South America is filling rapidly with those who are anticipating the after-Christmas doldrums. Are you among the St. Louisans who shudder to think of our dank dark Mississippi Valley winter? By the sixteenth of January, 1969, it will be early summer in Rio de Janeiro!

Mr. Ladislaus Cutak, of the Missouri Botanical Garden, will accompany the tour. Mr. Cutak is not only an interesting companion and a horticultural expert, but also an outstanding amateur photographer. Bring your Brownie!

This carefully planned trip has something for everyone. You will have an opportunity to swim and sun, to shop for precious stones or alligator bags, to visit private estates not open to the usual tourist, to savor the Spanish colonial and Indian past of this enormous continent as well as the beauties of Brasilia, the world's most modern capital. You may even want to fish for three days in Bariloche, Argentina, while you feast your eyes on scenery that resembles Switzerland!

If you want additional information about this exciting "South American Adventure", call Mrs. Gleason—at TO 5-0440. She has brochures on the trip. The wooly bear caterpillars predict a long cold winter ahead!

The Missouri Botanical Garden Calendar

(NOVEMBER and DECEMBER, 1968)

November 2.....CHILDREN'S SATURDAY NATURE PROGRAM. "Bird Feeders." (Bring empty half-gallon milk carton.) Admission is free. 10:00-11:30 a.m.

November 2, 9.....ORCHID ARRANGEMENT AND CORSAGE MAKING. To be taught by Mr. Lloyd Kallial in the New Growing Houses from 9:30 a.m. until noon. Friends of the Garden, $6.00; $8.00 to others.

November 3-24.....CHRYSANTHEMUM SHOW

November 9.....CHILDREN'S SATURDAY NATURE PROGRAM. "Fun with Fruit." Admission is free. 10:00-11:30 a.m.

November 12, 19, 26, December 3 at 7:30-9:30 p.m. and November 23, 30 at 2:30-4:30 p.m. WINTER BOTANY. This course of six sessions on the recognition of woody plants in winter will be taught by Dr. Edgar Anderson and Mr. Kenneth Peck in the Museum Building. Friends of the Garden, $9.00; $12.00 to others.

November 16.....CHILDREN'S SATURDAY NATURE PROGRAM. "Ants in Your Plants." Admission is free. 10:00-11:30 a.m.

November 23.....CHILDREN'S SATURDAY NATURE PROGRAM. "Winter Window Vegetable Gardens." (Bring rigid container, 10″ x 10″ x 3″ deep.) Admission is free. 10:00-11:30 a.m.

November 30.....THE HOME GREENHOUSE. This course for those who wish to and December 7 learn how to manage their own greenhouses will be taught by Dr. Derek Burch and Mr. Paul Kohl in the New Growing Houses from 10:00 a.m. to 3:00 p.m. (Bring a sandwich. Coffee and soda provided.) Friends of the Garden, $9.00; $12.00 to others.

November 30.....CHILDREN'S SATURDAY NATURE PROGRAM. "Insectivorous Plants." Admission is free. 10:00-11:30 a.m.

December 1 thru....POINSETTIA SHOW.
January 4, 1969

December 7.....CHILDREN'S SATURDAY NATURE PROGRAM. "The Coldest Island." The natural history of Antarctica. Admission is free. 10:00-11:30 a.m.

December 14.....CHILDREN'S SATURDAY NATURE PROGRAM. "Making Christmas Cards." Admission is free. 10:00-11:30 a.m.

December 21.....CHILDREN'S SATURDAY NATURE PROGRAM. "Christmas Wreaths." (Bring a wire coat hanger bent into a hoop.) Admission is free. 10:00-11:30 a.m.

December 28.....CHILDREN'S SATURDAY NATURE PROGRAM. "Nature Movies." Admission is free. 10:00-11:30 a.m.

(Call TO. 5-0440 for further information.)

MISSOURI BOTANICAL GARDEN BULLETIN
A SELECTIVE INDEX FOR VOLUME LVI (1968)

NOTE: This is a selective index and therefore there are omissions of certain regular features of the *Bulletin* such as "From the Director," Friends of the Garden, various news articles and rosters, "Who, What, Where, When," etc.

The index is in three parts: Title, Author, and Book Reviews.

*indicates that an article is illustrated in some fashion.

TITLE INDEX

AUTHOR INDEX

BOOK REVIEWS

(A)—*Edgar Anderson, reviewer.*

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Visit Your Missouri Botanical Garden

(SHAW'S GARDEN)

THE Missouri Botanical Garden's main entrance is at Tower Grove and Flora Place. The Garden is served by both the Sarah (No. 42) and the Southhampton (No. 80) city bus lines.

The Missouri Botanical Garden Arboretum—1600 acres—established at Gray Summit, Missouri, in 1926, is open to the public.

The Garden—70 acres—is open every day except Christmas and New Year's. For the main entrance, grounds, Climatron, display greenhouses, and Floral Display House:

May 1 through October 31.....9:00 a.m. to 6:00 p.m.
November 1 through April 30.....9:00 a.m. to 5:00 p.m.
Sundays and Holidays.....9:00 a.m. to 7:00 p.m.

For Tower Grove House:

May 1 through October 31.....9:00 a.m. to 5:00 p.m.
November 1 through April 30.....10:00 a.m. to 4:00 p.m.

The Display House presents four major shows: November, Chrysanthemums; December, Poinsettias; February, Orchids; April, Spring Flower Show. During the year other shows, competitions, and festivals are sponsored by various garden clubs and flower societies.

Courses in botany and horticulture for adults are conducted by the Garden staff. Children's nature classes are provided free on Saturdays from mid-September to early June. The Pitzman Nature Program is held for children during the summer. The Garden is world famous for its scientific research program. The scientists of the Garden hold teaching appointments on the staff of Washington University.

The Missouri Botanical Garden was established for the public's benefit in 1859 by Henry Shaw. The Garden, a non-profit institution, relies for support solely upon contributions from the public, the Arts and Education Council, and income from the Shaw estate. The Garden receives no city or state tax support.

Support your Garden and take part in Garden activities through the Friends of the Garden. Information may be obtained from the Main Gate or by mail or phone (TO 5-0440).